#### The Regional Municipality of York

## Municipal Class Environmental Assessment Study – Langstaff Road from Weston Road to Highway 7

Drainage and Stormwater Management Report

December 13, 2021 FINAL REV. 1







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The Regional Municipality of York

FINAL Rev. 1

Project No.: 16M-01457-01 Date: December 13, 2021

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Senior Project Manager, Water Resources

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#### 1 INTRODUCTION

#### 1.1 Project Description and Purpose

The Regional Municipality of York (hereafter referred to as "York Region") retained WSP to undertake the Municipal Class Environmental Assessment (EA) Study of Langstaff Road from the west of Weston Road to Highway 7 in the City of Vaughan. The proposed works involve widening of Langstaff Road from two / four lanes to six lanes between Weston Road and Dufferin Street. The study limits are bounded by Weston Road to the west and Highway 7 to the east. The Don River West Branch, Westminster Creek and Black Creek are the most prominent natural features within the study limits. The study area is shown in **Figure 1**.

The proposed improvements on Langstaff Road include:

- Widening of Langstaff Road up to six lanes from Weston Road to Dufferin Street
- A connection across the CN MacMillan Rail Yard from Creditstone Road to Keele Street
- Construction of a grade separation at Metrolinx GO Transit Barrie Line
- Implementation of intersection improvements
- Improvement of pedestrian and cycling facilities, and provision for transit amenities

Between Weston Road and Highway 7, Langstaff Road is an east-west arterial road under the jurisdiction of York Region. The existing road is a four-lane urban arterial road to the west of the CN MacMillan Rail Yard and a two-lane rural arterial to the east of the (CN) MacMillan Rail Classification Yard with a posted speed of 60 km/hr. Land uses adjacent to the Langstaff Road corridor are mostly light industrial and commercial areas, with some residential, as well as parks and open areas. Residential areas are largely located near the westerly and easterly study limits. Most of the area is heavily urbanized, including large areas of industrial and commercial buildings with flat roofs surrounded by paved areas for parking and driveways.

Three watercourses were identified within the study area along Langstaff Road. The watercourses include Black Creek (a tributary to Humber River), West Don River (a west branch of Don River) and Westminster Creek (a tributary to West Don River).

While the EA Study initially considered potential improvements to the interchange at Highway 400 and Langstaff Road, following extensive consultation with MTO, it was concluded that the planning of the improvements to the interchange will be subject to a future corridor study due to the extended scope of work along the Highway 400 corridor. As such, this drainage report considers Langstaff Road at Highway 400 (i.e. overpass) as 4-lanes under the proposed condition assessments and does not include any assessment related to Highway 400 access ramps. Drainage assessment associated with the Highway 400 interchange will be developed as part of the future corridor study.

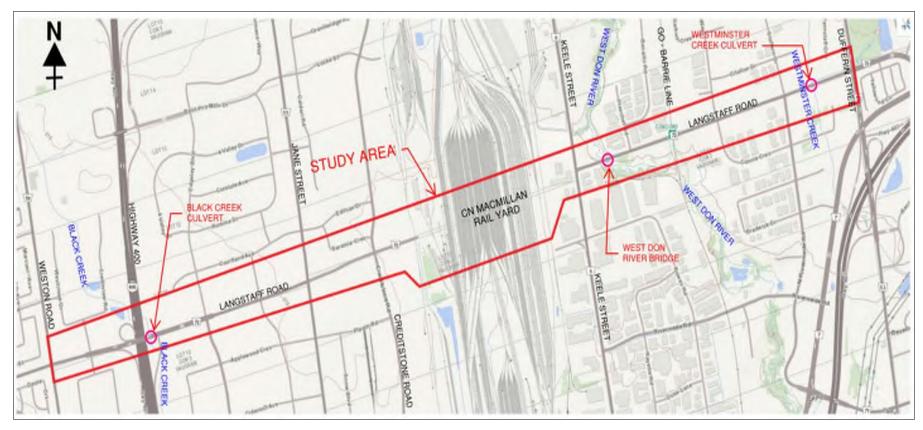


Figure 1: Study Area

Based on the prevailing policy framework, the following broad design objectives have been established to minimize the potential impacts of the proposed roadway improvements on the surrounding environment:

- Provide an effective / efficient drainage system
- Minimize risk to public safety
- Maintain flow paths for upstream lands
- Maintain or enhance the quality of storm runoff
- Maintain or reduce flood risk for lands within and surrounding the transportation corridor
- Minimize future maintenance requirements
- Promote stormwater management measures on lands available in the transportation corridor.

#### 1.2 Study Purpose – Drainage and Stormwater Management

The purpose of the Drainage and Stormwater Management (SWM) Report is to provide a clear and traceable decision making process with respect to the proposed watercourse crossing design and stormwater management design concept to support seeking 'approval in principle' for various aspects of the design from the relevant regulatory agencies such as the Toronto and Region Conservation Authority (TRCA) and Ontario Ministry of Natural Resources and Forestry (MNRF), for watercourse crossing structures and stormwater management associated with the preliminary design.

This Drainage and Stormwater Management Report documents the hydrologic and hydraulic analyses undertaken, addresses the existing drainage characteristics, identifies issues related to drainage and stormwater management conditions, determines acceptable opening sizes of major crossing structures and proposes a feasible stormwater management strategy for the proposed roadways.

#### 1.3 Scope of Work

The scope of work entails the following:

- Understand thoroughly the characteristics of the existing drainage system, its flow pattern, constraints and design requirements based on the latest standards and policies.
- Hydraulic analyses of the watercourse crossings to assess the impacts of proposed works and culvert replacements.
- Hydrologic assessments of road corridor to determine the increase in flow due to proposed improvements.

- Design of stormwater quality treatment facilities to achieve an enhanced Level of water quality treatment for the roadway runoff.
- Design of quantity control measures to control the post-development flows to existing conditions flows as required by the reviewing agency.
- Provide erosion and sediment control recommendations as required.
- The constraints and recommendations related to the watercourse crossings provided in the preliminary design will be incorporated in the assessment and design of the proposed drainage system.

#### 1.4 Background Information

WSP obtained relevant drainage information and mapping from TRCA and York Region. The following reports were reviewed for the background and used in the assessments and analyses of this study:

 Don River Hydrology Update, PCSWMM Model and Report, TRCA, prepared by AECOM, December 2018.

This report was prepared by AECOM for TRCA and provides an update on Don River hydrology using the PCSWMM platform using the latest available land use and cover, topographic and soil information. The hydrology update model has defined flows for Regional Storm (Hurricane Hazel) and design storm flows for both existing and future land use conditions at each subwatershed or node points.

The original model of the Don River was updated in the 1990s using the HYMO hydrologic model. This model was further updated in 2004 by Marshall Macklin Monaghan by using Visual OTTHYMO model.

- Hydrology Update, Toronto and Region Conservation Authority, prepared by Marshall Macklin Monaghan, 2004
- Don River Watershed Plan Surface Water Hydrology / Hydraulics and Stormwater Management, Report on Current Conditions, TRCA, 2009
- Don River Watershed Plan Baseflow and Water Use Assessment, Report on Current Conditions, TRCA, 2009
- Don River Watershed Plan Fluvial Geomorphology Report on Current Conditions, TRCA, 2009
- Humber River Hydrology Update, Final Report, TRCA, Prepared by CIVICA, June 2015.
- West Don River HEC-RAS models (Basin 5) and related Floodplain maps received from TRCA
- TRCA Stormwater Management Criteria, 2012

- Municipal Structure Inspection Report of Bowes Bridge (West Don River Bridge at Langstaff Road, Structure # 72-20 B0150 and Westminster Creek Culvert, Structure # 72-20 C1670, completed by AECOM, Nov 2014
- GO Transit Barrie Line Hydraulic Analysis Memo (2015) prepared by MMM Group for Metrolinx
- As built drawings of Langstaff Road received from York Region

#### 1.5 Site Investigation

A field investigation of the study area and existing drainage features was conducted by WSP in April 2018. There are two watercourse crossing culverts and one bridge structure within the study area along Langstaff Road. The bridge structure is located over West Don River. In addition to two watercourse crossing culverts, there are three drainage culverts conveying roadway runoff across Langstaff Road.

Recently in June 2021, WSP Team visited the site to investigate the drainage features in the vicinity of Langstaff Road immediately west of CN MacMillan Rail Yard and to understand the drainage conditions of the area thoroughly. Immediately west of CN MacMillan Rail Yard, an outlet of a 1650 mm dimeter storm sewer exists on the southside of Langstaff Road and the storm sewer outlets to a ditch which drains to one of the City of Vaughan's stormwater management pond located south-west of CN MacMillan Rail Yard. This SWM Pond is refereed in this report as SWM Pond C and shown in **Exhibits 3-10** and **3-20**.

Regarding two watercourse crossing culverts and bridge, a review of relevant background information was conducted before proceeding with the hydraulic analysis of these structures.

Photographic inventory of the site investigation is provided in **Appendix A**.

#### 2 DESIGN CRITERIA AND STANDARD

Stormwater management and hydraulic structure criteria were selected on the nature of the proposed works. Guidelines and criteria from all regulatory bodies were considered. Relevant criteria were selected based on the location of structures within the study limits.

#### 2.1 Design Criteria - Crossing Structure

The design and hydraulic performance criteria adopted in this study that relates to the crossing structure design includes design flows, minimum freeboard, vertical clearance, allowable overtopping frequency, and flow depth at culvert inlets. Langstaff Road, after the improvement, will be considered as an Urban Arterial. The following criteria were extracted from the Ontario Ministry of Transportation (MTO) Highway Drainage Design Standards (2008):

- WC-1 Design Flows (Bridges and Culverts): This standard identifies the minimum design flows for the sizing of structures for flow conveyance on regulated and non-regulated watercourses.
  - On an Urban Arterial road, a watercourse crossing with a span of less than or equal to 6.0 m should be designed to convey the flow generated during a 50-year design storm. For structures with spans greater than 6.0 m a 100-year flow shall be used.
  - On Regulated Watercourses the Regulatory Flow (Regional Flow) shall be calculated in all cases where floodline mapping is available, where there is a potential risk to public safety, or where there is potential damage to adjacent properties. For these watercourses, the Regulatory Flows are determined with the Hurricane Hazel storm event.
- WC-2 Freeboard and Clearance at Bridge Crossings: This standard identifies the soffit clearance and freeboard for bridges over water bodies. For the roadway, the soffit clearance and freeboard for the design flow should be 1.0 m or higher.
  - A <u>Desirable Freeboard</u> is measured vertically from the Energy Grade Line elevation for the design flow to the edge of the travelled lane at the low point. This freeboard is a recommended value although it is recognized that, due to site-specific considerations, it is not always feasible to provide this amount.
  - A <u>Minimum Freeboard</u> of 1.0 m is measured vertically from the high-water level for the design flow to the edge of the travelled lane at the low point.
- WC-7 Culvert Crossings on a Watercourse: This standard identifies the minimum freeboard, minimum clearance and the maximum flood depth at culvert crossings.

- Overtopping Criterion: There should be no overtopping of the road during the 100-year storm event at the lowest point on the road profile of all culvert crossings. If possible, the overtopping in the Regional Storm Event will also be avoided.
- Flood Depth at Culverts: The standard recommends a maximum flood depth (or head water elevation) at the upstream face of the culvert of 1.5 times the diameter or rise of the culvert (HW/D) for a culvert with a diameter or rise less than 3 metres. For a culvert with a rise between 3.0 metres and 4.5 metres, the flood depth at the upstream face must be equal to or less than 4.5 times the diameter or rise of the culvert. This standard applies to closed-footing culverts and open-footing culverts with non-erodible bottoms.
- SD-1 Design Flow for Surface Drainage Systems: This standard identifies the minimum design flows that shall be used for the sizing of road surface drainage systems (minor and major drainage systems such as piped and surface systems). For an arterial road, and collector road the minor system shall be designed for the 10-year design flow and the major system shall be designed for the 100-year design flow.

**Table 2-1** provides a summary of the MTO Drainage Design Standards applied to this assessment.

Table 2-1: MTO Drainage Design Standards for Culverts and Bridge

| Item | Design Standard                       | Description   | Standard | Section |
|------|---------------------------------------|---|----------|---------|
| 1    | Design Flow Storm                     | 50-Year (for existing structure with total spans ≤ 6 m)                                     | WC-1     | 1.1.1   |
|      |                                       | 100-Year (for spans > 6 m)  |          |         |
| 2    | Top of Road Freeboard (Min.)          | >1.0 m (Top of Road Elevation at<br>Low Point - Design Flow Water<br>Surface Elevation)     | WC-7     | 3.1.2   |
| 3    | Top of Road Freeboard<br>(Desired)    | >1.0 m (Top of Road Elevation at<br>Low Point - Design Flow Energy<br>Grade Line Elevation) | WC-7     | 3.1.1   |
| 4    | Relief Flow (Max. Depth over roadway) | Max. depth over roadway should not exceed 0.3 m for Regulatory Storm                        | WC-13    | 3.2.1   |
| 5    | Relief Flow (Velocity x Depth)        | Velocity x Depth should not exceed 0.8 m <sup>2</sup> /s for Regulatory Storm               | WC-13    | 3.2.2   |
| 6    | Flood Depth (Culvert)                 | HW/D <= 1.5   | WC-7     | 3.5     |
| 6    | Clearance (Bridge)                    | Design Flow Water Surface<br>Elevation – Soffit Elevation ≥1.0 m                            | WC-2     | 3.2.2   |

#### 2.2 Design Criteria - Stormwater Management (SWM)

Based on the standards and criteria provided by the Regulatory agencies, general stormwater management objectives and practices have been identified to minimize the impacts of the proposed Langstaff Road Improvements. The identified objectives are to maintain, where feasible, the existing drainage pattern, minimize peak flow increases and potential roadway overtopping and provide quantity and quality control of runoff for all new pavement areas.

The MTO *Drainage Management Manual* (1997), TRCA SWM Criteria (2012), Ministry of the Environment (MOE) *Stormwater Management Planning and Design Manual* (2003) (note: MOE is now Ministry of the Environment, Conservation and Parks) and York Region Design Guidelines (2020) provided the guidelines and policies for the selection and design of the stormwater management measures required to mitigate the impacts of the proposed works.

Based on TRCA SWM Criteria (2012), the followings are requirements relevant to the Langstaff Road EA Study:

#### **Don River Watershed:**

- The Don River Watershed includes the West Don River and Westminster Creek within the project area.
- Control post-development peak flows to pre-development levels for all storms up to and including the 100-year storm (i.e. 2, 5, 10, 25, 50, and 100-year storms).
- Unit flow rates have been established and should be used for all sites located north of Steeles Avenue that are greater than 5 ha.

#### **Humber River Watershed:**

- Includes Black Creek within the project area.
- Control post-development peak flows to pre-development levels for all storms up to and including the 100-year storm (i.e., 2, 5, 10, 25, 50, and 100-year storms) except for the main branches of the Lower, Main, East, Upper and West Humber where no quantity control is required.
- Unit flow relationships have been established and should be used for all other sites located in the Humber River Watershed not discharging to the main channels listed above.

The unit flow control requirements (Quantity Control Release Rate) of the Don River and Humber River is provided in **Appendix B.** 

The following stormwater management criteria were considered in the preliminary design:

 Water Quality Control Criterion: Ideally, a target of a long-term removal of 80% of total suspended solids (TSS) on an average annual basis will be implemented as

- city streets are a major contributor of water quality contaminants. However, the linear nature of city streets and the configuration of existing infrastructure may inhibit the ability to retrofit Langstaff Road to provide this level of TSS treatment.
- SWM Quantity Control Criterion: Any localized increase in flows due to the proposed project should be controlled to the unit flow rate for both the Humber and Don River watersheds.
- Water Balance: Based on TRCA SWM Criteria (2012), Figure C 10: Recharge Area Classification within TRCA Area, Langstaff Road and its surrounding area falls under the category Low Volume Recharge Area (LGRA). The project area does not fall under Wellhead Protection Areas (WHPA). A 5 mm storm event would be held on-site and discharged through infiltration, evapotranspiration or potentially, rainwater reuse.
- Erosion Control: Based on TRCA SWM Criteria (2012, Section 4.2), on-site retention of 5 mm is required for erosion control.

The Wet Weather Flow Management Guideline has also indicated that for small sites (site area <2 ha) the on-site minimum runoff retention from a small design rainfall event (typically 5 mm) considered under the Water Balance Criteria will be sufficient, as the on-site retention reduces the erosive energy of the flow.

#### 2.3 Design Storm

The rainfall Intensity-Duration-Frequency (IDF) parameters and storm distributions used for the hydrologic analysis are summarized below. Detailed information is included in **Appendix B.** 

For the Don River Watershed, the Soil Conservation Service (SCS) 12-hour storm distribution of York Region IDF was used in the analysis to generate the peak flows for the roadway drainage. The SCS 12-hour storm distribution is the governing storm event, as per "Stormwater Management Criteria" from TRCA dated August 2012.

For the Humber River Watershed, the Atmospheric Environmental Service (AES) 6-hour and 12-hour storm distributions are the governing storm event, as per "Stormwater Management Criteria" from TRCA dated August 2012. The AES 12-hour storm distribution was used to generate the pre-development flows for the 2-year to 100-year storm events to provide consistency across the study area.

**Table 2-2** shows a comparison between rainfall depths between York Region IDF and AES storm files of the Humber River watershed.

The comparison shows that York Region IDF rainfall values are slightly higher for 12-hour; therefore, rainfall values from the York Region IDF, was carried forward in the analysis.

**Table 2-2: Rainfall Depths Comparison** 

| Rainfall Depth (mm)  |      |      |      |      |      |      |  |  |  |
|--|------|------|------|------|------|------|--|--|--|
| Distribution / IDF Source 2-yr 5-yr 10-yr 25-yr 50-yr 100-yr |      |      |      |      |      |      |  |  |  |
| 12-hour TRCA   | 42.0 | 54.4 | 62.7 | 73.1 | 80.8 | 88.5 |  |  |  |
| 12-hour York Region IDF                                      | 40.9 | 53.0 | 63.2 | 73.7 | 81.5 | 89.4 |  |  |  |
| 6-hour TRCA  | 36.0 | 47.8 | 55.7 | 65.6 | 73.0 | 80.3 |  |  |  |
| 6-hour York Region IDF                                       | 36.2 | 46.9 | 56.2 | 65.1 | 72.2 | 79.2 |  |  |  |

Note: 12-hour and 6-hour AES Storm files were obtained from the Humber River Hydrology Update. Rainfall depths were extracted from the storm files.

#### 3 HYDROLOGICAL ANALYSES

This section discusses the existing soil, land use, drainage, and hydrological assessments for pre- and post-development conditions.

The study area straddles two watersheds. These are the Don River watershed and Humber River watershed.

For the Langstaff Road EA Study, a Visual OTTHYMO (VO5) hydrologic model was used to estimate localized runoff generated from the roadway and to calculate storage requirements to control flows from widened road sections to the required levels as per unit flow rates. This is to ensure that there will be no impact to the overall watershed hydrology for both Humber River and West Don River watersheds.

Unit flow rate details of the West Don River watershed and Humber River watershed are included in **Appendix B**.

#### 3.1 Existing Drainage Condition

The study area lies within the watersheds of the Humber River (Black Creek tributary) and West Don River. There are three watercourses that cross Langstaff Road, which are Black Creek (tributary of Humber River), West Don River (tributary of Don River) and Westminster Creek (tributary of West Don River). **Figure 1** shows the extent of the study area and location of the existing crossing structures.

#### 3.1.1 West Don River (West Branch of Don River)

The West Don River flows in a south-southeasterly direction towards Lake Ontario and crosses Langstaff Road approximately 250 meters east of Keele Street. The West Don River valley is classified as a Greenbelt Urban River Valley, as per the Ontario Provincial Greenbelt Act. The West Don River has its headwaters atop the Oak Ridges Moraine, specifically, the Maple Spur, approximately eight kilometres northwest of the study area.

#### 3.1.2 Westminster Creek

A small and mainly channelized warm water creek which flows north to south and crosses Langstaff Road approximately 300 meters west of Dufferin Street. This creek originated from approximately 2.8 km north of Langstaff Road. Roadside ditches of Langstaff Road from both east and west sides drains to this creek. The Westminster Creek crosses Langstaff Road by a 2-cell (each 3.7 m span) concrete box culvert.

#### 3.1.3 Black Creek

Black Creek, a tributary to the Humber River, flows through the western portion of the study area in the proximity of Highway 400, in a north to south direction. The headwaters of Black Creek are located northwest of the intersection of Rutherford Road

and Weston Road, which is now under residential development. Black Creek flows through a mainly channelized corridor south-southeast through the study area; however, certain reaches have been re-naturalized. Black Creek crosses Langstaff Road within the existing Highway 400 interchange by a 3-cell concrete box culvert, whereby the creek flows through a wide ditch with wetland vegetation beyond Langstaff Road ROW. Black Creek has been identified as a warm water creek within the Langstaff EA study area. The drainage divides between Black Creek (Humber River Watershed) and the Don River West (Don River Watershed) at Langstaff Road lies close to Jane Street.

#### 3.1.4 Existing Drainage along Langstaff Road

The flows from the Langstaff Road area between Jane Street to the west study limits at Weston Road falls under the Humber River Watershed. The study area east of Jane Street falls under the West Don River Watershed. **Exhibits 3-1** to **3-10** illustrate existing conditions drainage mosaic of Langstaff Road corridor. All exhibits are included at the end of the report before appendices.

The minor system runoff from the roadway area west of Highway 400, Catchments 105 (drainage area of 1.63 ha) and 110 (drainage area of 1.49 ha), will be collected via storm sewers and directed to the existing storm sewer that runs southerly along Silmar Drive and Jevlan Drive, and ultimately discharges to the existing SWM Pond. The major storm runoff drains overland and ultimately drains by existing storm sewer.

Between Millway Avenue and Highway 400, the existing Langstaff Road (Catchments 115, 120, 125 and 130) drains toward Edgeley Boulevard and are collected by an existing 1200 mm diameter storm sewer. The storm sewer runs westerly from the south side of the road and outlets to Black Creek just south of Langstaff Road. The runoff from Jane Street and Millway Avenue is collected in an existing storm sewer that runs North to South side of Langstaff Road along Millway Avenue.

Runoff from Catchments 135 and 140 is conveyed by storm sewers and connected to the Storm Sewer C at Creditstone Road which runs southerly. This storm sewer discharges to SWM Pond C and drains to one of the tributaries of West Don River on the westside of the CN MacMillan Rail Yard.

Runoff from external Catchments 300 and 305 is conveyed by Storm Sewer D which outlets to the south-east of Langstaff Road and CN MacMillan Rail Yard Access Road. The outflow from this storm sewer discharges to SWM Pond C. More detailed discussion of external drainage is provided in **Section 3.2.1.** 

Catchments 145 and 150 mostly include the area of the CN MacMillan Rail Yard. Overland flow from these catchments drain to a tributary of West Don River.

East of Keele Street, runoff from Catchments 155 and 160 will be conveyed by storm sewer which outlets to the West Don River on the downstream of the bridge from the west side.

Between Planchet Road and Connie Crescent, Langstaff Road has a rural road cross section (i.e. shoulders and ditches). Roadway area drains to roadside ditches on both the north and south side. Runoff from Catchment 190 and 180 drains the northside ditch

which convey the flow westerly up to Station 6+335. The existing 500 mm diameter culvert located at this station conveys the north side ditch flow to the southside ditch. The southside ditch starts from Catchment 195 and drains westerly collecting runoff from Catchment 185 and flows from the existing culvert. The ditch further drains westerly up to Station 6+220 and then it is conveyed by a storm sewer towards the West Don River. This storm sewer also collects runoff from Catchments 165 and 170 and ultimately outlets to the West Don River on the downstream of the bridge from the existing outlet located on the east bank of the river. There is no runoff quality and quantity control measures under existing conditions.

An existing storm sewer along Spinnaker Way that runs from the north side of Langstaff Road turns east on Langstaff Road and approximately 240 m east of Spinnaker Way (Station 7+140), this storm sewer (1050 mm diameter) runs southerly to Connie Crescent. This storm sewer turns east on Connie Crescent and then again run south along North Rivermede Road discharging ultimately to Westminster Creek. Between Connie Crescent and North Rivermede Road, Langstaff Road has a rural road cross section and drainage from the roadway is conveyed by ditches. The flow from the north side ditch of Catchment 205 is directed to the south side ditch via a twin 900 mm dimeter CSP culvert. The southside ditch drains easterly up to station approximately 7+140 which is then directed to a 1050 mm dimeter (42 inch) storm sewer (as per constructed drawing of December 12, 1979, Drawing# 77-104-8, 77-104-9, Sheet 3 of 5) which runs southerly.

Runoff from Catchments 215 and 220 drains by north and south side ditches, respectively and discharges into Westminster Creek from the west side.

Runoff from Catchment 225 is conveyed by the north side ditch and discharges into Westminster Creek. Two existing storm sewers (1650 mm dimeter and 750 mm diameter) from Dufferin Street outlets to northside ditch at north-west corner of Langstaff road and Dufferin Street. One of the storm sewers is the storm outlet of the SWM facility located north-east of Dufferin Street and Langstaff Road intersection. Runoff from Catchment 230 is conveyed by the southside ditch to Westminster Creek.

#### 3.1.5 Surface Soil and Land Use

Land use along the study area is highly urbanized consisting of a dense mix of commercial and industrial businesses, with only a small percentage of green areas (less than 10%) remaining in a relatively natural state. East of Dufferin Street and west of Weston Road, land use transitions to residential with some recreational / parkland east of Dufferin Street.

Land use features are summarized below:

- Lands adjacent to Langstaff Road between Weston Road and Dufferin Street are designated for employment
- Lands east of Dufferin Street are designated residential
- Core features of the Natural Heritage System are identified in three locations:
   within the Highway 400 / Langstaff Road Interchange; along the valley crossing

just east of Keele Street; and at the woodland located in the northeast quadrant of Langstaff Road and Dufferin Street.

Based on the Soil Survey Report No. 19 (Soils Survey of York County) of the Ontario Soil Survey, the predominant soils within the study area are Silt loam, interspersed with Clay with sand spots.

According to the Ontario Soil Mapping, these soils were classified as hydrologic soil groups (HSG) "BC" and "C", which represents soils with moderate to low runoff potential.

#### 3.1.6 Existing Conditions Hydrologic Modelling

The hydrologic analysis is carried out by using Visual OTTHYMO (VO5) model which is a single event hydrologic model used to simulate hydrographs by modelling rainfall, infiltration, runoff and routing through a watershed. This model uses the Soil Conservation Service Curve Number (CN) Method of estimating runoff characteristics in combination with instantaneous unit hydrograph routines to produce storm hydrographs.

The hydrologic response for drainage areas with a directly connected impervious land use greater than 20 percent was obtained using the STANDHYD instantaneous unit hydrograph and NASH instantaneous unit hydrograph (NASHYD) is considered for impervious land use less than 20 percent.

The existing conditions hydrological parameters including the Curve Number (CN), Initial Abstraction ( $I_a$ ), and the Time to Peak ( $T_p$ ) are provided in **Appendix B**. In this preliminary design an initial abstraction ( $I_a$ ) value of 2 mm is used for the hydrological analysis. As TRCA requires 1 mm of initial abstraction for impervious area, it is recommended to use 1 mm value of  $I_a$  during the detailed design phase.

**Table 3-1** shows the results of the hydrologic simulation for the roadway area within the Humber River Watershed using AES 12-hour storm distribution. The Visual OTTHYMO schematics and summary of output files for existing conditions are included in **Appendix B**.

Table 3-1: Existing Conditions Flows for Roadway Area within Humber River Watershed

| Nodes /       | Peak Flow Rate (m³/s) |        |         |         |         |          |  |
|---------------|-----------------------|--------|---------|---------|---------|----------|--|
| Catchments    | 2-year                | 5-year | 10-year | 25-year | 50-year | 100-year |  |
| 105           | 0.065                 | 0.090  | 0.107   | 0.129   | 0.145   | 0.162    |  |
| 110           | 0.060                 | 0.084  | 0.100   | 0.121   | 0.136   | 0.153    |  |
| 400 (105+110) | 0.125                 | 0.174  | 0.207   | 0.249   | 0.281   | 0.315    |  |
|               |                       |        |         |         |         |          |  |
| 115           | 0.035                 | 0.049  | 0.060   | 0.073   | 0.083   | 0.093    |  |
| 120           | 0.048                 | 0.066  | 0.079   | 0.096   | 0.108   | 0.120    |  |
| 410 (115+120) | 0.083                 | 0.115  | 0.139   | 0.168   | 0.190   | 0.212    |  |
| 125           | 0.081                 | 0.112  | 0.136   | 0.165   | 0.187   | 0.209    |  |
| 130           | 0.072                 | 0.101  | 0.123   | 0.150   | 0.170   | 0.190    |  |

| 405 (125+130) | 0.153 | 0.214 | 0.259 | 0.315 | 0.357 | 0.399 |
|---------------|-------|-------|-------|-------|-------|-------|
| 420 (410+405) | 0.236 | 0.329 | 0.399 | 0.483 | 0.547 | 0.611 |

As per the results shown in **Table 3-1**, Hydrograph 400 drains to the existing storm sewer that runs along Silmar Drive and Jevlan Drive, and ultimately outlets to the SWM facility located north -east of Chrislea Road and Jevlan Drive. Hydrograph 420, which is the sum of Catchments 115, 120, 125 and 130 drains to Black Creek via existing storm sewers.

**Table 3-2** shows the results of hydrologic simulation for the roadway catchment areas within the West Don River Watershed. As mentioned above, the SCS 12-hour storm distribution is used for the analysis within the West Don River Watershed.

Table 3-2: Existing Conditions Flows for Roadway Area within West Don River Watershed

| Nodes /              | Peak Flow Rate (m³/s) |        |         |         |         |          |  |
|----------------------|-----------------------|--------|---------|---------|---------|----------|--|
| Catchments           | 2-year                | 5-year | 10-year | 25-year | 50-year | 100-year |  |
| 135                  | 0.078                 | 0.116  | 0.141   | 0.174   | 0.198   | 0.234    |  |
| 140                  | 0.081                 | 0.115  | 0.139   | 0.168   | 0.196   | 0.222    |  |
| 420 (135+140)        | 0.158                 | 0.231  | 0.280   | 0.342   | 0.394   | 0.456    |  |
| 145                  | 0.218                 | 0.299  | 0.365   | 0.438   | 0.493   | 0.550    |  |
| 425 (420+145)        | 0.377                 | 0.530  | 0.645   | 0.780   | 0.887   | 1.006    |  |
| 155                  | 0.038                 | 0.055  | 0.066   | 0.080   | 0.091   | 0.102    |  |
| 160                  | 0.034                 | 0.047  | 0.057   | 0.068   | 0.078   | 0.087    |  |
| 430 (155+160)        | 0.072                 | 0.102  | 0.123   | 0.149   | 0.169   | 0.189    |  |
| 150                  | 0.397                 | 0.515  | 0.601   | 0.699   | 0.774   | 0.849    |  |
| 180                  | 0.036                 | 0.054  | 0.067   | 0.082   | 0.094   | 0.107    |  |
| 185                  | 0.030                 | 0.041  | 0.051   | 0.062   | 0.070   | 0.079    |  |
| 445                  | 0.065                 | 0.095  | 0.118   | 0.144   | 0.164   | 0.186    |  |
| 165                  | 0.036                 | 0.054  | 0.065   | 0.080   | 0.091   | 0.103    |  |
| 170                  | 0.035                 | 0.048  | 0.057   | 0.069   | 0.079   | 0.087    |  |
| 450<br>(445+165+170) | 0.136                 | 0.197  | 0.240   | 0.293   | 0.334   | 0.376    |  |
| 190                  | 0.048                 | 0.068  | 0.086   | 0.105   | 0.119   | 0.134    |  |
| 195                  | 0.048                 | 0.071  | 0.086   | 0.105   | 0.120   | 0.135    |  |
| 455                  | 0.096                 | 0.139  | 0.172   | 0.210   | 0.238   | 0.269    |  |
| 458 (450+455)        | 0.232                 | 0.335  | 0.412   | 0.503   | 0.573   | 0.645    |  |

| Nodes /       | Peak Flow Rate (m³/s) |        |         |         |         |          |  |
|---------------|-----------------------|--------|---------|---------|---------|----------|--|
| Catchments    | 2-year                | 5-year | 10-year | 25-year | 50-year | 100-year |  |
| 205           | 0.062                 | 0.089  | 0.114   | 0.140   | 0.160   | 0.181    |  |
| 210           | 0.058                 | 0.082  | 0.103   | 0.126   | 0.144   | 0.162    |  |
| 460           | 0.120                 | 0.171  | 0.217   | 0.266   | 0.305   | 0.344    |  |
|               |                       |        |         |         |         |          |  |
| 215           | 0.042                 | 0.058  | 0.071   | 0.085   | 0.095   | 0.107    |  |
| 220           | 0.042                 | 0.061  | 0.074   | 0.09    | 0.102   | 0.115    |  |
| 470           | 0.084                 | 0.119  | 0.145   | 0.175   | 0.197   | 0.221    |  |
| 225           | 0.062                 | 0.086  | 0.106   | 0.128   | 0.145   | 0.162    |  |
| 230           | 0.049                 | 0.068  | 0.081   | 0.100   | 0.112   | 0.126    |  |
| 475           | 0.111                 | 0.154  | 0.187   | 0.228   | 0.257   | 0.287    |  |
| 480 (470+475) | 0.195                 | 0.272  | 0.332   | 0.402   | 0.454   | 0.508    |  |

#### 3.2 Proposed Drainage Condition

Under the proposed (ultimate) conditions, Langstaff Road will be widened to 6-lane urban cross-section between Weston Road and Dufferin Street. However, as noted in Section 1, while the EA Study initially considered potential improvements to the interchange at Highway 400 and Langstaff Road, following extensive consultation with MTO, it was concluded that the planning of the improvements to the interchange will be subject to a future corridor study due to the extended scope of work along the Highway 400 corridor. For the purpose of this Class EA Study, Langstaff Road at Highway 400 (i.e. overpass) is assumed as 4-lanes for the proposed condition assessments and it also does not include any assessment related to Highway 400 access ramps. Drainage assessment associated with the Highway 400 interchange will be developed as part of the future corridor study.

The existing drainage pattern of the subwatershed will be maintained under the proposed improvement works.

**Exhibits 3-11** to **3-20** (included at the end of the report) illustrate the proposed conditions drainage mosaics along the roadway which are prepared to estimate localized runoff generated from the roadway. Storage pipe (super pipe) and dry SWM pond facilities are provided at different locations to control the flows from the roadway to the pre-development conditions or unit flows, whichever is applicable, for the receiving storm sewers and watercourses.

The proposed drainage related works involve the following:

- A new culvert (LC1) at Station 4+390
- A dry SWM pond to control the peak flow based on the release rate of the Don River subwatershed unit flow

- A Wet SWM pond to control the peak flow based on the release rate of the Don River subwatershed unit flow and to provide enhanced level of water quality treatment
- Pipe storage pipe facilities for peak flow control
- Oil and grit separator units at the outlet of storage pipe facilities for runoff quality control
- Infiltration galleries for water balance as a LID measure
- Other Drainage improvements as required

#### 3.2.1 Proposed Drainage Along Langstaff Road

The following is considered for the roadway drainage of Langstaff Road between Jane Street and the westerly study limit at Weston Road within the Humber River Watershed:

- The major and minor system runoff from the roadway area west of Highway 400, Catchments 105 and 110 will be collected via storm sewers. The runoff will be controlled to the existing condition 10-year flow through a pipe storage system (HSP-1A and HSP-1B) and the outflow from these storage pipes will be discharged to the existing storm sewer that runs from Silmar Drive / Jevlan Drive as in existing conditions and ultimately discharged to existing SWM Pond. Two OGS will be provided at the outlet of the pipe storage systems for additional quality measures.
- Between Highway 400 and Jane Street, both major and minor system runoff from the roadway Catchments 115 and 120, as well as Catchments 125 and 130 will be conveyed by storm sewers and will be controlled by a pipe storage system (HSP-2 and HSP-3). The runoff catchments on Langstaff Road between Millway Avenue and Jane Street are draining towards Millway Avenue and it is proposed to be diverted to the West towards Edgeley Blvd and a storage facility of HSP-3. Under existing conditions, a 1200 mm diameter storm sewer runs westerly from Edgeley Boulevard to Black Creek from the southside of Langstaff Road and discharges into Black Creek uncontrolled in term of both quality and quantity. Therefore, the proposed pipe storage system will control the flow from the post-development to the pre-development level to maintain the existing drainage pattern. An OGS will be provided downstream of the pipe storage system for the quality treatment of runoff.

The following is considered for the roadway drainage of Langstaff Road between Jane Street and Dufferin Street within the West Don River Watershed:

- The major and minor system runoff from the 2.70 ha roadway area east of Jane Street, Catchments 135 and 140, will be collected via storm sewers. The runoff will be controlled through a pipe storage (DSP-1) then discharged to a dry SWM facility (DDP-1).
- The major and minor system runoff from the 3.05 ha of Catchment 145 (including pond area) and outflow flows from pipe storage DSP-1 will be conveyed by storm sewers and will discharge to the dry SWM facility (DDP-1) located on the north-east corner, at approximate Sta. 4+200, of the proposed overpass of Langstaff Road

across CN MacMillan Rail Yard (on the west side of the yard). This SWM facility will provide quantity control of peak flow based on the unit flow release rate (Sub-basin 6) and the controlled outflow will be discharged to the upstream of proposed Culvert LC1, located just east of Creditstone Road. An OGS will be provided for quality control.

A detailed investigated has been carried out to confirm the drainage area draining to proposed Langstaff Culvert (LC1). For this purpose, drainage boundary prepared for the PCSWMM Hydrologic Model has been reviewed, conducted site visit to confirm the drainage condition and collected the storm sewer information from the York Region to determine the actual sewershed area since the area upstream of the Langstaff Road is all developed.

Based on the storm sewer information received from York Region, as well as from the information gathered from the site investigation in 14 June 2021, **Exhibit 3-20** has been prepared which illustrates the drainage pattern of the area. This exhibit illustrates the following:

- Catchment A does not completely drain to SWM Pond A. Only Area A1 drains to Pond A and remaining almost half of the area (Area A2) drains to Pond B via Storm Sewer E. Controlled flow from Pond A is conveyed by Storm Sewer A to the outlet point at West Don River as shown in **Exhibit 3-20**. Outflow from Pond B also discharges to the West Don River.
- Similarly, Catchment B is divided in three segments.
  - Area B1 is drained by Storm Sewer A and outlets to the West Don River.
  - Runoff from Area B2 is conveyed by Storm Sewer C which runs southerly along Creditstone Road and directed to SWM Pond C.
  - Runoff from Area B3 is conveyed by Storm Sewer D which runs southerly and discharged south of Langstaff Road and east of CN MacMillan Rail Yard Access Road by a 1650 mm diameter storm sewer. Therefore, Area B3, drainage area of 26.5 ha (Catchment 325) contributes to Culvert LC1.
- Catchment C is divided into two segments.
  - Runoff from Area C1 is conveyed by Storm Sewer C and directed to SWM Pond C.
  - Runoff from Area C2 is conveyed by Storm Sewer D which was continued from Area B3 and discharges just south of Langstaff Road as discussed above.
- Catchment D is divided into three segments.
  - Runoff from Area D1 is conveyed by Storm Sewer B and directed to SWM Pond B for runoff quality and quantity control.
  - Runoff from Area D2 together with Area C2, total drainage area 21.7
     ha (Catchment 300) contributes drainage to Culvert LC1.

 Runoff from Area D3 is conveyed by existing culverts and channel to Pond C as shown in Figure 2.

Therefore, as discussed above, Catchment 300 (drainage area 21.7 ha, Area C2 +Area D2) and Catchment 325 (drainage area 26.5 ha, Area B3) contribute runoff to Culvert LC1. The total drainage area draining to Culvert LC1 from the northside of Langstaff Road will be 48.2 ha. These areas are drained by a 1650 mm diameter sewer (Storm Sewer D) and discharged south of Langstaff Road and east of CN MacMillan Rail Yard Access Road. The outflow from this storm sewer ultimately drains to SWM Pond C for runoff quality and quantity control via existing ditch.

At Sta. 4+320, the new alignment of Langstaff Road crosses CN MacMillan Rail Yard Access Road by a bridge. Due to this bridge crossing, it will not be possible to convey the road runoff by a storm sewer from Sta. 4+670 westerly to Sta. 4+295. Road runoff will be drained overland in this stretch of the roadway and will be captured by catch basins just west of CN Access Road Bridge and will be directed to dry SWM facility DDP-1. Because of this constraint, it will not meet the minimum spread requirement. Therefore, during the detailed design phase, it is recommended to explore the possibility of utilizing the City of Vaughan SWM pond (SWM Pond C) located just south of the CNR overpass so that road runoff can be conveyed by a storm sewer and discharged into the SWM Pond C.

- A wet pond SWM pond facility (DWP-1) is proposed at the north-west corner of the proposed overpass of Langstaff Road across the CN MacMillan Rail Yard and Keele Street. This SWM facility will collect major and minor system runoff from Catchments 150 (drainage area of 3.81 ha) and controls flows based on the Don River unit flow release rate (Sub-basin 1). This wet SWM facility will provide an enhanced level of quality treatment. The controlled outflow will be conveyed by a storm sewer which will be connected to the existing storm sewer on the east side of Keele Street and outlets to West Don River via existing outlet. This facility will be overcontrolled to balance as much as possible the uncontrolled flow from Catchments 155 and 160. Runoff from Catchments 155 and 160 will be conveyed by storm sewer and discharged to the West Don River as in existing conditions.
- The major and minor system runoff from the new urbanized roadway including Catchments 165, 170, 180 and 185 will be conveyed by storm sewers to a pipe storage facility. This pipe storage facility (DSP-2) will control the flows based on the Don River unit flow release (Sub-basin 5) and the controlled outflows will be discharged to the downstream side of the bridge utilizing the existing outlet. Since no quantity control is proposed for runoff from Catchments 155 and 160 this pipe storage will also be over controlled to account for the uncontrolled flows. The quality treatment for the catchment will be provided by an OGS before discharging to the receiving watercourse.
- Due to the proposed overpass of GO Transit Barrie Line, runoff from Catchments
   190 and 195 can not be directed to the existing outlet location, i.e. downstream of

the West Don River Bridge. The major and minor system runoff from the roadway area between the GO Transit Barrie Line and North Rivermede Road, i.e. Catchments 190, 195, 205 and 210 will be discharged to two separate storage pipe system (DSP-3A and DSP-3B). The storage pipe will control the combined flow equivalent to the 10-year flow of Catchments 205 and 210 to maintain the existing flow conditions at the outlet. The controlled outflow from the storage pipe will be conveyed to the existing 1050 mm pipe that runs southerly between Connie Crescent and north Rivermede Road (approximate Sta. 7+140) and conveys the flow maintaining the existing drainage pattern.

- The major and minor system runoff from the new urbanized roadway of Catchment 215 and 220 will be conveyed by storm sewers and will discharge to a pipe storage (DSP-4) located on the east side of Staffern Drive. This SWM facility will provide quantity control of peak flow based on the unit flow release rate (Sub-basin 8A) and the controlled outflow will be discharged to the downstream side of Langstaff Road culvert at Westminster Creek. An OGS will be provided for runoff quality control.
- Similarly, runoff from Catchment 225 and 230 will be discharged to a pipe storage facility (DSP-5) located to the west of Dufferin Street which will provide peak flow control of the roadway runoff. This linear facility will control the flows based on the Don River unit flow release rate (Sub-basin 8A) and the controlled outflow will be discharged on the downstream of Langstaff Road culvert at Westminster Creek. An OGS will be provided for quality control.
- Under existing conditions, the north side ditch located between Westminster Creek and Dufferin Street used to convey the flow from the two existing storm sewers (1650 mm dimeter and 750 mm diameter) from Dufferin Street. During the interim 4-lane scenario, the existing ditch will be maintained. For the ultimate 6-lane scenario, to accommodate the widened road section, ditch section will be modified with retaining wall along the side of Langstaff Road; however, the existing capacity of the ditch will be maintained.

As per the survey information, the existing channel has a bottom width of 0.42 m, side slope 2.67H:1V and channel slope 0.67%. Within the maximum allowable depth of 1.0 m, the maximum capacity of the existing channel is 5.44 m<sup>3</sup>/s.

The proposed modification of the channel section includes 2.5H:1V side slope on the north side and vertical wall on the side of Langstaff Road, bottom width 1.75 m and channel slope 0.67% (existing). Within the maximum allowable depth of 1.0 m, the maximum capacity of the channel would be 5.46 m<sup>3</sup>/s.

The analysis of existing and proposed channel is provided in **Appendix E**.

#### 3.2.2 Proposed Conditions Hydrologic Modelling

As noted in **Section 2.3**, the hydrologic assessments of the roadway corridor were carried out using the SCS 12-hour and AES 12-hour storm distributions.

For the proposed Langstaff Road Improvements preliminary design study, a Visual OTTHYMO hydrologic model is developed to estimate the localized runoff generated from the roadway and to calculate storage requirements to control flows from the widened road sections to the pre-development levels or unit flow release rate to ensure that there will be no impact to the overall watershed hydrology due to the road widening.

The hydrologic parameters for proposed conditions, VISUAL OTTHYMO schematics and output files for post-development conditions are included in **Appendix B**. In the preliminary design as part of the EA Study, an initial abstraction ( $l_a$ ) value of 2 mm is used for the proposed conditions hydrological analysis. As TRCA requires 1 mm of initial abstraction for impervious area, it is recommended to use 1 mm value of  $l_a$  during the detailed design phase.

**Table 3-3** summarizes the results of the proposed conditions hydrologic modelling for the road corridor located within the Humber River Watershed. The analysis is based on the AES 12-hour storm distribution.

Table 3-3: Proposed Conditions Flows for Roadway Area within Humber River Watershed

| Nodes / Catchments | Peak Flow Rate (m³/s)<br>(AES 12-hour) |        |         |         |         |          |  |
|--------------------|--|--------|---------|---------|---------|----------|--|
|                    | 2-year                                 | 5-year | 10-year | 25-year | 50-year | 100-year |  |
| 105                | 0.069                                  | 0.094  | 0.111   | 0.133   | 0.149   | 0.166    |  |
| 520 (HSP-1A)       | 0.050                                  | 0.075  | 0.091   | 0.110   | 0.124   | 0.139    |  |
| 110                | 0.067                                  | 0.091  | 0.108   | 0.129   | 0.144   | 0.161    |  |
| 525 (HSP-1B)       | 0.048                                  | 0.073  | 0.087   | 0.106   | 0.120   | 0.135    |  |
|                    |  |        |         |         |         |          |  |
| 115                | 0.041                                  | 0.055  | 0.066   | 0.079   | 0.089   | 0.100    |  |
| 120                | 0.055                                  | 0.074  | 0.087   | 0.104   | 0.116   | 0.129    |  |
| 410 (115+120)      | 0.095                                  | 0.130  | 0.154   | 0.183   | 0.205   | 0.229    |  |
| 510 (HSP-2)        | 0.056                                  | 0.067  | 0.074   | 0.081   | 0.084   | 0.087    |  |
| 125                | 0.100                                  | 0.136  | 0.16    | 0.19    | 0.212   | 0.235    |  |
| 130                | 0.096                                  | 0.129  | 0.151   | 0.178   | 0.199   | 0.219    |  |
| 405 (125+130)      | 0.196                                  | 0.265  | 0.311   | 0.368   | 0.411   | 0.454    |  |
| 505 (HSP-3)        | 0.171                                  | 0.227  | 0.261   | 0.288   | 0.306   | 0.325    |  |
| 420 (510+505)      | 0.226                                  | 0.293  | 0.334   | 0.369   | 0.389   | 0.411    |  |

**Table 3-4** summarizes the results of the proposed conditions hydrologic modelling for the road corridor located within the West Don River Watershed. The analysis is based on the SCS 12-hour storm distribution.

Table 3-4: Proposed Conditions Flows for the Roadway Area within West Don River Watershed

| Nodes /       | Peak Flow Rate (m³/s) (SCS 12-hour) |        |         |         |         |          |  |  |  |  |  |
|---------------|-------------------------------------|--------|---------|---------|---------|----------|--|--|--|--|--|
| Catchments    | 2-year                              | 5-year | 10-year | 25-year | 50-year | 100-year |  |  |  |  |  |
| 135           | 0.144                               | 0.188  | 0.22    | 0.258   | 0.285   | 0.317    |  |  |  |  |  |
| 140           | 0.121                               | 0.160  | 0.188   | 0.220   | 0.246   | 0.274    |  |  |  |  |  |
| 420 (135+140) | 0.265                               | 0.348  | 0.408   | 0.478   | 0.531   | 0.590    |  |  |  |  |  |
| 530 (DSP-1)   | 0.012                               | 0.028  | 0.039   | 0.044   | 0.048   | 0.052    |  |  |  |  |  |
| 145           | 0.251                               | 0.337  | 0.403   | 0.479   | 0.536   | 0.611    |  |  |  |  |  |
| 425 (420+145) | 0.261                               | 0.348  | 0.415   | 0.498   | 0.565   | 0.653    |  |  |  |  |  |
| 512 (DDP-1)   | 0.028                               | 0.052  | 0.064   | 0.074   | 0.080   | 0.086    |  |  |  |  |  |
|               |                                     |        |         |         |         |          |  |  |  |  |  |
| 155           | 0.057                               | 0.075  | 0.087   | 0.102   | 0.113   | 0.124    |  |  |  |  |  |
| 160           | 0.045                               | 0.058  | 0.068   | 0.079   | 0.087   | 0.096    |  |  |  |  |  |
| 430 (155+160) | 0.102                               | 0.133  | 0.155   | 0.181   | 0.200   | 0.220    |  |  |  |  |  |

| Nodes /       | Peak Flow Rate (m³/s) (SCS 12-hour) |        |         |         |         |          |  |  |  |  |
|---------------|-------------------------------------|--------|---------|---------|---------|----------|--|--|--|--|
| Catchments    | 2-year                              | 5-year | 10-year | 25-year | 50-year | 100-year |  |  |  |  |
| 150           | 0.399                               | 0.517  | 0.603   | 0.700   | 0.776   | 0.851    |  |  |  |  |
| 515 (DWP-1)   | 0.008                               | 0.009  | 0.010   | 0.010   | 0.011   | 0.011    |  |  |  |  |
| 440 (430+515) | 0.108                               | 0.140  | 0.163   | 0.189   | 0.209   | 0.229    |  |  |  |  |
| 400           | 0.045                               | 0.064  | 0.077   | 0.000   | 0.405   | 0.118    |  |  |  |  |
| 180           | 0.045                               | 0.064  | 0.077   | 0.093   | 0.105   |          |  |  |  |  |
| 185           | 0.039                               | 0.052  | 0.063   | 0.076   | 0.085   | 0.094    |  |  |  |  |
| 445           | 0.084                               | 0.116  | 0.141   | 0.169   | 0.190   | 0.212    |  |  |  |  |
| 165           | 0.052                               | 0.070  | 0.084   | 0.099   | 0.111   | 0.123    |  |  |  |  |
| 170           | 0.045                               | 0.059  | 0.068   | 0.080   | 0.088   | 0.097    |  |  |  |  |
| 450           | 0.182                               | 0.245  | 0.293   | 0.348   | 0.389   | 0.431    |  |  |  |  |
| 520 (DSP-2)   | 0.016                               | 0.019  | 0.020   | 0.021   | 0.022   | 0.022    |  |  |  |  |
| 400           | 0.050                               | 0.081  | 0.099   | 0.440   | 0.134   | 0.150    |  |  |  |  |
| 190           | 0.059                               |        |         | 0.119   | 0.134   | 0.162    |  |  |  |  |
| 195           | 0.069                               | 0.093  | 0.11    | 0.131   |         |          |  |  |  |  |
| 455           | 0.128                               | 0.174  | 0.209   | 0.250   | 0.280   | 0.312    |  |  |  |  |
| 555 (DSP-3A)  | 0.026                               | 0.055  | 0.080   | 0.112   | 0.135   | 0.158    |  |  |  |  |
| 205           | 0.096                               | 0.129  | 0.152   | 0.181   | 0.203   | 0.225    |  |  |  |  |
| 210           | 0.084                               | 0.112  | 0.133   | 0.157   | 0.177   | 0.196    |  |  |  |  |
| 460           | 0.180                               | 0.241  | 0.285   | 0.338   | 0.38    | 0.421    |  |  |  |  |
| 525 (DSP-3B)  | 0.074                               | 0.103  | 0.136   | 0.173   | 0.201   | 0.228    |  |  |  |  |
| 465 (555+525) | 0.010                               | 0.156  | 0.216   | 0.285   | 0.336   | 0.386    |  |  |  |  |
| 215           | 0.054                               | 0.072  | 0.085   | 0.100   | 0.111   | 0.122    |  |  |  |  |
| 220           | 0.052                               | 0.073  | 0.086   | 0.104   | 0.117   | 0.130    |  |  |  |  |
| 470           | 0.106                               | 0.144  | 0.171   | 0.204   | 0.228   | 0.252    |  |  |  |  |
| 535 (DSP-4)   | 0.010                               | 0.011  | 0.012   | 0.015   | 0.017   | 0.020    |  |  |  |  |
| 225           | 0.062                               | 0.086  | 0.106   | 0.128   | 0.145   | 0.162    |  |  |  |  |
| 230           | 0.054                               | 0.073  | 0.087   | 0.106   | 0.119   | 0.134    |  |  |  |  |
| 475           | 0.116                               | 0.159  | 0.193   | 0.234   | 0.263   | 0.296    |  |  |  |  |
| 540 (DSP-5)   | 0.022                               | 0.026  | 0.028   | 0.032   | 0.037   | 0.041    |  |  |  |  |
| 480 (535+540) | 0.032                               | 0.037  | 0.041   | 0.047   | 0.054   | 0.061    |  |  |  |  |

As discussed in Section 3.2.1, Catchment 300 (drainage area 21.7 ha) and Catchment 325 (drainage area 26.5 ha) contribute runoff to Culvert LC1. In addition to this flow, runoff from Catchment 350 as well as outflow from Dry Pond DDP-1 also drain to this culvert. For the external area (Catchments 300, 325 and 350) PCSWMM hydrologic modelling is used to determine the flow in which the parameters are taken from the Don River PCSWMM model. The outflow from the dry pond is added to the flow from these catchments to generate the overall flow for Culvert LC1.

The proposed conditions peak flow for the new Culvert LC1, located just east of Creditstone Road, Station 4+390 is summarized in **Table 3-5**.

**Table 3-5: Proposed Conditions Flows for Culvert LC1** 

| Catchment                                   | Flows (m <sup>3</sup> /s) |        |         |         |         |          |  |  |  |
|---|---------------------------|--------|---------|---------|---------|----------|--|--|--|
| Catchinent                                  | 2-year                    | 5-year | 10-year | 25-year | 50-year | 100-year |  |  |  |
| 300, 325 and 350<br>(PCSWMM)                | 1.326                     | 1.782  | 2.086   | 2.464   | 2.817   | 3.128    |  |  |  |
| Outflow from DDP-1<br>(HYD 512, (Table 3-4) | 0.028                     | 0.052  | 0.064   | 0.074   | 0.080   | 0.086    |  |  |  |
| Flow to Culvert LC1                         | 1.351                     | 1.834  | 2.150   | 2.538   | 2.897   | 3.214    |  |  |  |

**Table 3-6** provides a comparison of flows between existing and proposed conditions within the Humber River watershed with the SWM facility in-place.

Table 3-6: Comparison of Pre- and Post-Development Flows within the Humber River Watershed

| Description   | NHYD  |        | 12-h   | s (m³/s) |         |         |          |
|---|-------|--------|--------|----------|---------|---------|----------|
| Description   | טוחוו | 2-year | 5-year | 10-year  | 25-year | 50-year | 100-year |
| Existing Conditions (Ex)  | 105   | 0.065  | 0.090  | 0.107    | 0.129   | 0.145   | 0.162    |
| Proposed – Uncontrolled   | 105   | 0.069  | 0.094  | 0.111    | 0.133   | 0.149   | 0.166    |
| Proposed with Pipe<br>Storage HSP-1A (Pr)                                 | 520   | 0.050  | 0.075  | 0.091    | 0.110   | 0.124   | 0.139    |
| Difference (Pr - Ex)  |       | -0.015 | -0.015 | -0.016   | -0.019  | -0.021  | -0.023   |
|   |       |        | 1      |          |         | ·       | 1        |
| Existing Conditions (Ex)  | 110   | 0.060  | 0.084  | 0.100    | 0.121   | 0.136   | 0.153    |
| Proposed– Uncontrolled  | 110   | 0.067  | 0.091  | 0.108    | 0.129   | 0.144   | 0.161    |
| Proposed with Pipe<br>Storage HSP-1B (Pr)                                 | 525   | 0.048  | 0.073  | 0.087    | 0.106   | 0.120   | 0.135    |
| Difference (Pr - Ex)  |       | -0.13  | -0.012 | -0.011   | -0.013  | -0.015  | -0.016   |
|   |       |        | T      |          | ı       | T       |          |
| Existing (Includes<br>Catchments 115, 120,<br>125 and 130) (Ex)           | 420   | 0.236  | 0.329  | 0.399    | 0.483   | 0.547   | 0.611    |
| Proposed – Uncontrolled<br>(Includes Catchments<br>115, 120, 125 and 130) | 420   | 0.291  | 0.393  | 0.463    | 0.550   | 0.614   | 0.680    |
| Proposed with SWM<br>FacilityPipe Storage<br>HSP-2 and HSP-3 (Pr)         | 420   | 0.226  | 0.293  | 0.334    | 0.369   | 0.389   | 0.411    |
| Difference (Pr - Ex)  |       | -0.010 | -0.036 | -0.065   | -0.114  | -0.158  | -0.200   |

**Table 3-7** provides a comparison of flows between existing and proposed conditions within the Don River watershed with the SWM facility in-place.

Table 3-7: Comparison of Pre- and Post-Development Flows within the Don River Watershed

|  | NII IV/D | 12-hour SCS Storm Flows (m <sup>3</sup> /s) |        |         |         |         |          |  |  |
|--|----------|---|--------|---------|---------|---------|----------|--|--|
| Description  | NHYD     | 2-year                                      | 5-year | 10-year | 25-year | 50-year | 100-year |  |  |
| Existing Conditions<br>(Includes Catchments 135, 140<br>and 145) (Ex)  | 425      | 0.377                                       | 0.530  | 0.645   | 0.780   | 0.887   | 1.006    |  |  |
| Proposed - Uncontrolled<br>(Includes Catchments 135, 140<br>and 145)   | 425      | 0.516                                       | 0.685  | 0.811   | 0.957   | 1.067   | 1.202    |  |  |
| Proposed with SWM Facility Dry pond DDP-1 (Pr)   | 512      | 0.028                                       | 0.052  | 0.064   | 0.074   | 0.080   | 0.086    |  |  |
| Difference (Pr - Ex)   |          | -0.349                                      | -0.478 | -0.581  | -0.706  | -0.807  | -0.920   |  |  |
| Unit Flow Sub-basin 6  |          | 0.019                                       | 0.036  | 0.052   | 0.066   | 0.078   | 0.094    |  |  |
| Difference (Pr – Unit Flow)  |          | 0.009                                       | 0.016  | 0.012   | 0.006   | 0.002   | -0.008   |  |  |
| Existing (Ex) (Includes Catchments 150)  | 150      | 0.397                                       | 0.515  | 0.601   | 0.699   | 0.774   | 0.849    |  |  |
| Proposed – Uncontrolled<br>(Includes Catchments 150)   | 150      | 0.399                                       | 0.517  | 0.603   | 0.700   | 0.776   | 0.851    |  |  |
| Proposed with SWM Facility Pond DWP-1 (over controlled to account the uncontrolled flows of Catchments 155 and 160) (Pr) | 515      | 0.008                                       | 0.009  | 0.010   | 0.010   | 0.011   | 0.011    |  |  |
| Difference (Pr - Ex)   |          | -0.389                                      | -0.506 | -0.591  | -0.689  | -0.763  | -0.838   |  |  |
| Unit Flow Sub-basin 1  |          | 0.013                                       | 0.020  | 0.026   | 0.031   | 0.044   | 0.055    |  |  |
| Difference (Pr – Unit Flow)  |          | -0.005                                      | -0.011 | -0.016  | -0.021  | -0.033  | -0.044   |  |  |
| Existing (Includes Catchments 165, 170, 180 and 185) (Ex)  | 450      | 0.136                                       | 0.197  | 0.240   | 0.293   | 0.334   | 0.376    |  |  |
| Proposed - Uncontrolled  |          | 0.266                                       | 0.361  | 0.434   | 0.517   | 0.579   | 0.643    |  |  |
| Proposed with Pipe Storage system DSP-2 (Pr)   | 520      | 0.016                                       | 0.019  | 0.020   | 0.021   | 0.022   | 0.022    |  |  |
| Difference (Pr - Ex)   |          | -0.120                                      | -0.178 | -0.220  | -0.272  | -0.312  | -0.354   |  |  |
| Unit Flow Sub-basin 1  |          | 0.008                                       | 0.016  | 0.022   | 0.028   | 0.034   | 0.04     |  |  |
| Difference (Pr – Unit Flow)  |          | 0.008                                       | 0.003  | -0.002  | -0.007  | -0.012  | -0.018   |  |  |

|  |      | 12-hour SCS Storm Flows (m <sup>3</sup> /s) |        |         |         |         |          |  |  |
|--|------|---|--------|---------|---------|---------|----------|--|--|
| Description  | NHYD | 2-year                                      | 5-year | 10-year | 25-year | 50-year | 100-year |  |  |
| Existing (Includes Catchments 205 and 210) (Ex)  | 460  | 0.120                                       | 0.171  | 0.217   | 0.266   | 0.305   | 0.344    |  |  |
| Proposed – Uncontrolled<br>(Includes Catchments 190, 195<br>and 205 and 210)                 | 465  | 0.308                                       | 0.415  | 0.494   | 0.588   | 0.660   | 0.733    |  |  |
| Proposed with Pipe Storage<br>systems DSP-3A and DSP-3B<br>(Pr)<br>(Control to 10-year flow) | 465  | 0.010                                       | 0.156  | 0.216   | 0.285   | 0.336   | 0.386    |  |  |
| Difference (Pr - Ex)   |      | -0.110                                      | -0.015 | -0.001  | 0.019   | 0.031   | 0.042    |  |  |
|  |      |   |        |         |         |         |          |  |  |
| Existing (Includes Catchments 215, 220, 225 and 230) (Ex)                                    | 480  | 0.195                                       | 0.272  | 0.332   | 0.402   | 0.454   | 0.508    |  |  |
| Proposed – Uncontrolled<br>(Includes Catchments 215, 220,<br>225 and 230)                    | 480  | 0.032                                       | 0.304  | 0.365   | 0.438   | 0.491   | 0.548    |  |  |
| Proposed with Pipe Storage system DSP-5 (Pr)   | 480  | 0.032                                       | 0.037  | 0.041   | 0.047   | 0.054   | 0.061    |  |  |
| Difference (Pr - Ex)   |      | -0.163                                      | -0.235 | -0.291  | -0.355  | -0.400  | -0.447   |  |  |
| Unit Flow Sub-basin 8A   |      | 0.013                                       | 0.025  | 0.035   | 0.045   | 0.054   | 0.065    |  |  |
| Difference (Pr – Unit Flow)  |      | 0.019                                       | 0.012  | 0.006   | 0.002   | 0.000   | -0.004   |  |  |

#### 4 HYDRAULIC ANALYSIS

As noted in previous sections, the study area lies within the watersheds of the Humber River (Black Creek tributary) and Don River (West Don River and Westminster Creek). There are three watercourses that cross Langstaff Road within the study area at three locations: Black Creek (tributary of Humber River), West Don River (tributary of Don River) and Westminster Creek (tributary of West Don River).

The widening of Langstaff Road is not expected to have a direct impact to the Black Creek crossing and Westminster Creek crossing. Therefore, only the existing conditions water levels are provided for these crossings.

#### 4.1 Black Creek Crossing

Black Creek, a tributary to the Humber River, flows through the western portion of the study area, in a north to south direction. Black Creek crosses Langstaff Road within the existing interchange with Highway 400 by a 3-cell concrete culvert, whereby the creek flows through a wide ditch with wetland vegetation.

The existing culvert at Langstaff Road consists of a 3-cell culvert, the size of each is 2.4 m span x 2.4 m rise x 60 m long. All three cells are of equal size.

A HEC-RAS model and the floodplain map (Sheet No. 13C) was received from the TRCA for this watercourse.

**Table 4-1** provides the existing conditions flow for Black Creek Culvert at Langstaff Road which is extracted from the HEC-RAS model.

Table 4-1: Flow for Black Creek Culvert at Langstaff Road

| Storm Event              | 2-Year | 5-Year | 10-Year | 25-Year | 50-Year | 100-Year | Regional |
|--------------------------|--------|--------|---------|---------|---------|----------|----------|
| Flow (m <sup>3</sup> /s) | 3.07   | 4.07   | 4.85    | 5.93    | 6.83    | 7.62     | 47.8     |

**Tables 4-2** illustrates the hydraulic performance assessment of the existing Black Creek Culvert at Langstaff Road.

Table 4-2: Hydraulic Performance Analysis of Existing Black Creek Culvert at Langstaff Road

| Structure Description (Upstream Face, Section 46.392) | 50-Year                    | 100-Year                   | Regional                   |
|---|----------------------------|----------------------------|----------------------------|
| Clear Opening   | 3-cell, 2.4 m<br>span each | 3-cell, 2.4 m<br>span each | 3-cell, 2.4 m<br>span each |
| Water Surface Elevation (m)                           | 203.60                     | 203.76                     | 206.54                     |
| Energy Grade Line Elevation (m)                       | 203.63                     | 203.78                     | 206.55                     |
| Top of Road Elevation at Low Point (m)                | 211.5                      | 211.5                      | 211.5                      |
| Upstream Invert Elevation (m)                         | 202.5                      | 202.5                      | 202.5                      |
| Top of Road Freeboard (Minimum)                       | 7.90                       | 7.74                       | 4.96                       |
| Top of Road Freeboard (Desired)                       | 7.87                       | 7.72                       | 4.95                       |
| Soffit Elevation (Upstream)                           | 204.90                     | 204.90                     | 204.90                     |
| Flood Depth ((H/D Ratio)                              | 0.15                       | 0.17                       | 0.56                       |

Results provided in **Table 4-2** show that the existing culvert meets all hydraulic requirements. The Regional Storm does not overtop Langstaff Road.

The road widening is not expected to directly impact this culvert; therefore, the proposed conditions hydraulic assessment is not carried out.

The existing conditions hydraulic analysis output for the Black Creek culvert is provided in **Appendix C.** 

## 4.2 West Don River Crossing

The West Don River is the west branch of the Don River which flows in a south-southeasterly direction towards Lake Ontario and crosses Langstaff Road approximately 200 meters east of Keele Street. The location of the existing bridge on Langstaff Road is shown in **Figure 1**.

The existing West Don River bridge at Langstaff Road has a size of 11.4 m span x 2.25 m rise. This bridge is also identified as Bowes Bridge. Downstream of the Langstaff Road crossing, the river crosses through the newly constructed 3-span GO Transit Barrie Line bridge (total span length 32 m from center of the abutments).

It is identified that the proposed widening of Langstaff Road will require a replacement of the existing West Don River crossing.

A Technical Memorandum was submitted to the TRCA on May 28, 2020, which documented the hydraulic assessment undertaken to determine the need of the bridge replacement and the sizing of the replacement bridge to reduce the potential impacts to the West Don River water levels. TRCA has given consensus on the hydraulic assessment memorandum on June 15, 2020. All the details of the memorandum are included in this report.

WSP has reviewed HEC-RAS hydraulic modelling data (Basin 5) received from TRCA for the West Don River. The model does not include the new GO Transit Barrie Line crossing located downstream of Langstaff Road crossing, which was recently constructed. In consultation with TRCA, WSP has used the model prepared in 2015 for Metrolinx which included the newly constructed GO Transit Barrie Line crossing structure at the West Don River and the model is further updated for the Langstaff Road crossing.

#### 4.2.1 Flow Update on Hydraulic Model

The Don River hydrology model has been updated by using the new PCSWMM hydrological model which was approved by TRCA in 2019. Based on this update, the flows in the HEC-RAS model of West Don River, Basin 5, is required to be updated. **Table 4-3** summarizes the flows at the node points related to the hydraulic model and also provides a comparison with the previous flows. As per the "read-me first" note provided with the model, the 2-year to the 100-year flows are based on the existing condition with controlled scenario; and the Regional Storm flow is based on future conditions with the uncontrolled scenario.

Table 4-3: Summary of Flows for the West Don River HEC-RAS Model

| Flow             | HEC-           |               |        | Flow (m³/s) |         |             |             |              |          |  |  |  |
|------------------|----------------|---------------|--------|-------------|---------|-------------|-------------|--------------|----------|--|--|--|
| Node             | RAS<br>Section | Hydrology     | 2-year | 5-year      | 10-year | 25-<br>year | 50-<br>year | 100-<br>year | Regional |  |  |  |
| 5.3              | 5.53           | 2019<br>Flows | 5.89   | 7.83        | 9.04    | 10.55       | 12.69       | 15.60        | 198.16   |  |  |  |
| 5.5              | 5.53           | 2004<br>Flows | 9.47   | 13.86       | 17.75   | 28.48       | 36.72       | 44.26        | 110.88   |  |  |  |
| C346             | 5.44           | 2019<br>Flows | 10.32  | 13.25       | 14.82   | 16.70       | 18.87       | 21.08        | 252.81   |  |  |  |
| C340             | 5.44           | 2004<br>Flows | 12.15  | 17.04       | 22.50   | 33.16       | 42.22       | 50.26        | 252.39   |  |  |  |
| J584             | 5.43           | 2019<br>Flows | 11.20  | 14.39       | 16.21   | 18.42       | 20.93       | 23.42        | 259.19   |  |  |  |
| J30 <del>4</del> | 5.43           | 2004<br>Flows | 12.15  | 17.04       | 22.50   | 33.16       | 42.22       | 50.26        | 252.39   |  |  |  |
| J272 /           | 5.21           | 2019<br>Flows | 11.43  | 14.67       | 16.74   | 18.98       | 21.45       | 24.08        | 259.19   |  |  |  |
| J584             | 5.21           | 2004<br>Flows | 14.51  | 20.81       | 26.91   | 36.81       | 47.82       | 62.78        | 282.53   |  |  |  |

| Flow  | HEC-           |               |        |        | F       | low (m³     | /s)         |              |          |
|-------|----------------|---------------|--------|--------|---------|-------------|-------------|--------------|----------|
| Node  | RAS<br>Section | Hydrology     | 2-year | 5-year | 10-year | 25-<br>year | 50-<br>year | 100-<br>year | Regional |
| 5.1   | 5.155          | 2019<br>Flows | 14.49  | 18.33  | 20.78   | 23.55       | 26.60       | 30.07        | 293.08   |
| 5.1   | 5.155          | 2004<br>Flows | 16.90  | 24.63  | 31.38   | 40.51       | 53.51       | 75.50        | 313.13   |
| 7.0   | 5.00           | 2019<br>Flows | 20.37  | 26.16  | 30.41   | 35.81       | 40.95       | 46.62        | 365.39   |
| 7.2   | 5.00           | 2004<br>Flows | 16.90  | 24.63  | 31.38   | 40.51       | 53.51       | 75.50        | 313.13   |
| 14.50 | 50.44          | 2019<br>Flows | 0.89   | 1.18   | 1.37    | 1.61        | 1.84        | 2.34         | 27.60    |
| J159  | 50.44          | 2004<br>Flows | 1.92   | 2.87   | 3.49    | 6.22        | 8.99        | 14.26        | 20.17    |
| 1046  | 50.30          | 2019<br>Flows | 1.67   | 2.27   | 2.66    | 3.16        | 3.69        | 4.42         | 36.24    |
| J216  | 50.28          | 2004<br>Flows | 3.00   | 4.48   | 5.47    | 9.73        | 14.06       | 22.31        | 31.55    |
| J612  | 50.20          | 2019<br>Flows | 2.63   | 3.07   | 3.34    | 3.80        | 4.56        | 5.22         | 62.64    |
| 3012  | 50.20          | 2004<br>Flows | 4.75   | 7.10   | 8.67    | 15.42       | 17.05       | 35.36        | 50.02    |
| 0.1   | 50.10          | 2019<br>Flows | 2.72   | 3.19   | 3.46    | 3.94        | 4.71        | 5.42         | 63.27    |
| 8.1   | 50.10          | 2004<br>Flows | 5.25   | 7.85   | 9.58    | 17.05       | 17.91       | 39.10        | 55.30    |

As per **Table 4-3**, the 2019 frequency storm flows (2-year to 100-year) are lower than the 2004 flows; however, the 2019 Regional storm flow is higher in most cases.

At Node J272, the Regional Storm flow, as per the PCSWMM hydrological model, is 255.52 m<sup>3</sup>/s which is less then that of the upstream Node J584. Therefore, for HEC-RAS Section 5.21, the 2-year to the 100-year flows are based on Node J272 and the Regional storm flow is based on the Node J584 to get the conservative result.

### 4.2.2 Existing Conditions Hydraulic Analysis of Bowes Bridge

The HEC-RAS hydraulic model Basin 5 was obtained from TRCA. This model does not include the newly constructed bridge at GO Transit Barrie Line which is located just downstream of the Langstaff Road crossing. In consultation with TRCA, WSP used the model prepared in 2015 for Metrolinx which included the newly constructed GO Transit Barrie Line crossing structure and the model is further updated by adding additional cross-sections upstream of the Langstaff Road based on new survey information. The updated "Basin5\_ExRev2\_Apr2020" model is considered the existing conditions model for the hydraulic modelling of the Langstaff Road crossing.

The following updates are included for the existing conditions hydraulic modelling:

- Three sections 5.425, 5.43 and 5.435 are added on the upstream of Langstaff Road to properly reflect the topography.
- Existing road profile of Langstaff Road is updated in the model per available survey information.
- Section 5.39 on the downstream is removed as it appears to be too close to Section 5.40 and affecting the proposed conditions modelling.

The hydraulic performance summary of the existing bridge structure is provided in **Table 4-4**. The low point elevation of the existing road is 199.45 m and located approximately 50 m east of the existing bridge. The lowest point of the soffit of the existing bridge is 198.45 m.

Table 4-4: Hydraulic Performance Analysis of Existing Bowes Bridge

| Structure Description (At Upstream Face, Section 5.41) | 50-Year | 100-Year | Regional |
|--|---------|----------|----------|
| Clear opening (m)                                      | 11.40   | 11.40    | 11.40    |
| Water Surface Elevation (m)                            | 196.69  | 196.77   | 200.55   |
| Energy Grade Line Elevation (m)                        | 196.88  | 196.97   | 200.63   |
| Top of Road Elevation at Low Point (m)                 | 199.45  | 199.45   | 199.45   |
| Top of Road Freeboard (Minimum) (m)                    | 2.76    | 2.68     | -1.10    |
| Top of Road Freeboard (Desired) (m)                    | 2.57    | 2.45     | n/a      |
| Soffit Elevation (Upstream) (m)                        | 198.45  | 198.45   | 198.45   |
| Soffit Clearance (m)                                   | 1.76    | 1.68     | n/a      |

The results provided in **Table 4-4** show that the existing bridge meets the freeboard requirement for the 100-year storm event; however, the Regional Storm overtops Langstaff Road by 1.10 m. The existing bridge also meets the soffit clearance requirement of 1.0 m for the 100-year storm event.

#### 4.2.3 Proposed Conditions Hydraulic Analysis of Bowes Bridge

Under proposed conditions, Langstaff Road will be widened to six lanes with a Multi-Use Path (MUP) on both sides of the bridge. To accommodate the widened road and to improve the flooding conditions upstream of Langstaff Road, the existing structure is proposed to be replaced by a new 30 m (clear perpendicular opening) single span bridge. For the proposed conditions model, the revised existing conditions model is further updated to reflect the proposed bridge. Two immediately upstream cross-sections 5.41 and 5.42 will be removed to accommodate the widened road. The updated "Basin5\_Pr\_Opt4\_Apr2020" model is considered as the proposed conditions model for the hydraulic modelling of the Langstaff Road crossing. A comparison of

hydraulic modelling results between the existing conditions and proposed conditions is provided in **Table 4-5**.

The results in **Table 4-5** illustrates that:

- The proposed bridge has a positive impact to the upstream water levels. The water levels decreased for the 2-year to the 100-year flows and for the Regional Storm flow upstream of the structure. The 50-year water level, the 100-year design water level and the Regional Storm water level decreased by 0.24 m, 0.26 m and 0.31 m, respectively.
- The decrease in water level extends approximately 1.0 km upstream. The water levels are close to the existing conditions upstream of Section 5.45.
- At the downstream face of the structure, water levels are very close to existing conditions and further downstream, the proposed conditions water levels are the same as the existing conditions water levels.

**Table 4-5: Comparison of Hydraulic Modelling Results** 

| ر                |          |                |                       | sting<br>ditions          | Prop<br>Cond         |                           | Comp                  | arison                    |
|------------------|----------|----------------|-----------------------|---------------------------|----------------------|---------------------------|-----------------------|---------------------------|
| River<br>Station | Profile  | Flow<br>(m³/s) | W. S.<br>Elev.<br>(m) | Flow<br>Velocity<br>(m/s) | W. S<br>Elev.<br>(m) | Flow<br>Velocity<br>(m/s) | W. S.<br>Elev.<br>(m) | Flow<br>Velocity<br>(m/s) |
|                  | 2.1      |                | (A)                   | (B)                       | (C)                  | (D)                       | (C-A)                 | (D-B)                     |
| 5.47             | 2 Year   | 5.89           | 198.23                | 1.52                      | 198.22               | 1.53                      | -0.01                 | 0.01                      |
| 5.47             | 5 Year   | 7.83           | 198.33                | 1.66                      | 198.33               | 1.67                      | 0.00                  | 0.01                      |
| 5.47             | 10 Year  | 9.04           | 198.38                | 1.75                      | 198.38               | 1.76                      | 0.00                  | 0.01                      |
| 5.47             | 25 Year  | 10.55          | 198.42                | 1.93                      | 198.42               | 1.92                      | 0.00                  | -0.01                     |
| 5.47             | 50 Year  | 12.69          | 198.50                | 2.03                      | 198.49               | 2.06                      | -0.01                 | 0.03                      |
| 5.47             | 100 Year | 15.60          | 198.58                | 2.16                      | 198.57               | 2.19                      | -0.01                 | 0.03                      |
| 5.47             | Regional | 198.16         | 201.06                | 1.94                      | 201.05               | 1.95                      | -0.01                 | 0.01                      |
|                  |          |                |                       |                           |                      |                           |                       |                           |
| 5.46             | 2 Year   | 5.89           | 197.64                | 1.15                      | 197.65               | 1.13                      | 0.01                  | -0.02                     |
| 5.46             | 5 Year   | 7.83           | 197.76                | 1.24                      | 197.76               | 1.23                      | 0.00                  | -0.01                     |
| 5.46             | 10 Year  | 9.04           | 197.82                | 1.28                      | 197.82               | 1.27                      | 0.00                  | -0.01                     |
| 5.46             | 25 Year  | 10.55          | 197.93                | 1.25                      | 197.92               | 1.27                      | -0.01                 | 0.02                      |
| 5.46             | 50 Year  | 12.69          | 197.98                | 1.38                      | 198.00               | 1.34                      | 0.02                  | -0.04                     |
| 5.46             | 100 Year | 15.60          | 198.07                | 1.49                      | 198.09               | 1.45                      | 0.02                  | -0.04                     |
| 5.46             | Regional | 198.16         | 200.90                | 2.31                      | 200.88               | 2.32                      | -0.02                 | 0.01                      |
|                  |          |                |                       |                           |                      |                           |                       |                           |
| 5.45             | 2 Year   | 5.89           | 196.92                | 1.58                      | 196.90               | 1.63                      | -0.02                 | 0.05                      |
| 5.45             | 5 Year   | 7.83           | 197.04                | 1.66                      | 197.02               | 1.72                      | -0.02                 | 0.06                      |
| 5.45             | 10 Year  | 9.04           | 197.10                | 1.73                      | 197.08               | 1.80                      | -0.02                 | 0.07                      |
| 5.45             | 25 Year  | 10.55          | 197.18                | 1.72                      | 197.15               | 1.86                      | -0.03                 | 0.14                      |
| 5.45             | 50 Year  | 12.69          | 197.27                | 1.70                      | 197.23               | 1.84                      | -0.04                 | 0.14                      |
| 5.45             | 100 Year | 15.60          | 197.34                | 1.79                      | 197.29               | 1.96                      | -0.05                 | 0.17                      |
| 5.45             | Regional | 198.16         | 200.73                | 1.67                      | 200.72               | 1.68                      | -0.01                 | 0.01                      |

| _                |           |                |                              | sting<br>ditions                 | Prop<br>Cond                |                                  | Comp                           | arison                             |
|------------------|-----------|----------------|------------------------------|----------------------------------|-----------------------------|----------------------------------|--------------------------------|------------------------------------|
| River<br>Station | Profile   | Flow<br>(m³/s) | W. S.<br>Elev.<br>(m)<br>(A) | Flow<br>Velocity<br>(m/s)<br>(B) | W. S<br>Elev.<br>(m)<br>(C) | Flow<br>Velocity<br>(m/s)<br>(D) | W. S.<br>Elev.<br>(m)<br>(C-A) | Flow<br>Velocity<br>(m/s)<br>(D-B) |
| F 44             | 0.1/      | 40.00          | 400.00                       | 0.40                             | 400.00                      | 0.47                             | 0.04                           | 0.04                               |
| 5.44             | 2 Year    | 10.32          | 196.90                       | 0.46                             | 196.89                      | 0.47                             | -0.01                          | 0.01                               |
| 5.44             | 5 Year    | 13.25          | 197.03                       | 0.53                             | 197.01                      | 0.54                             | -0.02                          | 0.01                               |
| 5.44             | 10 Year   | 14.82          | 197.09                       | 0.56                             | 197.06                      | 0.57                             | -0.03                          | 0.01                               |
| 5.44             | 25 Year   | 16.70          | 197.15                       | 0.59                             | 197.13                      | 0.60                             | -0.02                          | 0.01                               |
| 5.44             | 50 Year   | 18.87          | 197.23                       | 0.62                             | 197.19                      | 0.64                             | -0.04                          | 0.02                               |
| 5.44             | 100 Year  | 21.08          | 197.30                       | 0.65                             | 197.26                      | 0.68                             | -0.04                          | 0.03                               |
| 5.44             | Regional  | 252.81         | 200.70                       | 1.44                             | 200.68                      | 1.44                             | -0.02                          | 0.00                               |
| 5.435            | 2 Year    | 10.32          | 196.81                       | 0.87                             | 196.79                      | 0.91                             | -0.02                          | 0.04                               |
| 5.435            | 5 Year    | 13.25          | 196.92                       | 0.95                             | 196.89                      | 0.99                             | -0.03                          | 0.04                               |
| 5.435            | 10 Year   | 14.82          | 196.98                       | 0.99                             | 196.94                      | 1.04                             | -0.04                          | 0.05                               |
| 5.435            | 25 Year   | 16.70          | 197.04                       | 1.03                             | 197.00                      | 1.08                             | -0.04                          | 0.05                               |
| 5.435            | 50 Year   | 18.87          | 197.11                       | 1.06                             | 197.06                      | 1.13                             | -0.05                          | 0.07                               |
| 5.435            | 100 Year  | 21.08          | 197.18                       | 1.09                             | 197.11                      | 1.18                             | -0.07                          | 0.09                               |
| 5.435            | Regional  | 252.81         | 200.65                       | 1.47                             | 200.63                      | 1.48                             | -0.02                          | 0.01                               |
|                  |           |                |                              |                                  |                             |                                  |                                |                                    |
| 5.43             | 2 Year    | 11.20          | 196.70                       | 0.62                             | 196.65                      | 0.70                             | -0.05                          | 0.08                               |
| 5.43             | 5 Year    | 14.39          | 196.83                       | 0.64                             | 196.76                      | 0.71                             | -0.07                          | 0.07                               |
| 5.43             | 10 Year   | 16.21          | 196.89                       | 0.65                             | 196.82                      | 0.73                             | -0.07                          | 0.08                               |
| 5.43             | 25 Year   | 18.42          | 196.96                       | 0.67                             | 196.89                      | 0.74                             | -0.07                          | 0.07                               |
| 5.43             | 50 Year   | 20.93          | 197.04                       | 0.68                             | 196.95                      | 0.76                             | -0.09                          | 0.08                               |
| 5.43             | 100 Year  | 23.42          | 197.12                       | 0.69                             | 197.02                      | 0.78                             | -0.10                          | 0.09                               |
| 5.43             | Regional  | 259.19         | 200.64                       | 1.05                             | 200.63                      | 1.06                             | -0.01                          | 0.01                               |
|                  |           |                |                              |                                  |                             |                                  |                                |                                    |
| 5.425            | 2 Year    | 11.20          | 196.51                       | 0.99                             | 196.26                      | 1.47                             | -0.25                          | 0.48                               |
| 5.425            | 5 Year    | 14.39          | 196.64                       | 1.06                             | 196.41                      | 1.46                             | -0.23                          | 0.40                               |
| 5.425            | 10 Year   | 16.21          | 196.70                       | 1.11                             | 196.48                      | 1.48                             | -0.22                          | 0.37                               |
| 5.425            | 25 Year   | 18.42          | 196.78                       | 1.15                             | 196.56                      | 1.52                             | -0.22                          | 0.37                               |
| 5.425            | 50 Year   | 20.93          | 196.87                       | 1.18                             | 196.63                      | 1.56                             | -0.24                          | 0.38                               |
| 5.425            | 100 Year  | 23.42          | 196.96                       | 1.20                             | 196.70                      | 1.61                             | -0.26                          | 0.41                               |
| 5.425            | Regional  | 259.19         | 200.60                       | 1.45                             | 200.29                      | 2.54                             | -0.31                          | 1.09                               |
| 5.405            | Langstaff | Road Bri       | dge                          |                                  |                             |                                  |                                |                                    |
| 5.40             | 2 Year    | 11.20          | 196.18                       | 1.15                             | 196.18                      | 1.02                             | 0.00                           | -0.13                              |
| 5.40             | 5 Year    | 14.39          | 196.34                       | 1.25                             | 196.35                      | 1.08                             | 0.01                           | -0.17                              |
| 5.40             | 10 Year   | 16.21          | 196.42                       | 1.32                             | 196.43                      | 1.12                             | 0.01                           | -0.20                              |
| 5.40             | 25 Year   | 18.42          | 196.49                       | 1.41                             | 196.50                      | 1.18                             | 0.01                           | -0.23                              |
| 5.40             | 50 Year   | 20.93          | 196.55                       | 1.52                             | 196.57                      | 1.26                             | 0.02                           | -0.26                              |

| _                | Profile  |                |                       | sting<br>ditions          | Prop<br>Cond         |                           | Comp                  | arison                    |
|------------------|----------|----------------|-----------------------|---------------------------|----------------------|---------------------------|-----------------------|---------------------------|
| River<br>Station |          | Flow<br>(m³/s) | W. S.<br>Elev.<br>(m) | Flow<br>Velocity<br>(m/s) | W. S<br>Elev.<br>(m) | Flow<br>Velocity<br>(m/s) | W. S.<br>Elev.<br>(m) | Flow<br>Velocity<br>(m/s) |
|                  |          |                | (A)                   | (B)                       | (C)                  | (D)                       | (C-A)                 | (D-B)                     |
| 5.40             | 100 Year | 23.42          | 196.61                | 1.62                      | 196.64               | 1.33                      | 0.03                  | -0.29                     |
| 5.40             | Regional | 259.19         | 199.89                | 2.85                      | 199.89               | 2.81                      | 0.00                  | -0.04                     |
|                  |          |                |                       |                           |                      |                           |                       |                           |
| 5.38             | 2 Year   | 11.20          | 195.99                | 1.32                      | 195.99               | 1.32                      | 0.00                  | 0.00                      |
| 5.38             | 5 Year   | 14.39          | 196.18                | 1.34                      | 196.18               | 1.34                      | 0.00                  | 0.00                      |
| 5.38             | 10 Year  | 16.21          | 196.26                | 1.37                      | 196.26               | 1.37                      | 0.00                  | 0.00                      |
| 5.38             | 25 Year  | 18.42          | 196.33                | 1.43                      | 196.33               | 1.43                      | 0.00                  | 0.00                      |
| 5.38             | 50 Year  | 20.93          | 196.40                | 1.50                      | 196.40               | 1.50                      | 0.00                  | 0.00                      |
| 5.38             | 100 Year | 23.42          | 196.46                | 1.55                      | 196.46               | 1.55                      | 0.00                  | 0.00                      |
| 5.38             | Regional | 259.19         | 199.93                | 1.51                      | 199.93               | 1.51                      | 0.00                  | 0.00                      |
|                  |          |                |                       |                           |                      |                           |                       |                           |

The hydraulic performance summary of the proposed bridge structure is provided in **Table 4-6**. The proposed road profile is raised in the proximity of the bridge to avoid flooding of Langstaff Road during the Regional Storm flow. The proposed road low point elevation after the improvement is 200.40 m. The lowest point of the soffit for the proposed bridge is 199.10 m.

Table 4-6: Hydraulic Performance Analysis of Proposed Bowes Bridge

| Structure Description (At Upstream Face, Section 5.41) | 50-Year | 100-Year | Regional |
|--|---------|----------|----------|
| Clear opening (m)                                      | 30.0    | 30.0     | 30.0     |
| Water Surface Elevation (m)                            | 196.63  | 196.70   | 200.29   |
| Energy Grade Line Elevation (m)                        | 196.76  | 196.83   | 200.56   |
| Top of Road Elevation at Low Point (m)                 | 200.40  | 200.40   | 200.40   |
| Top of Road Freeboard (Minimum)                        | 3.77    | 3.70     | 0.11     |
| Top of Road Freeboard (Desired)                        | 3.64    | 3.57     | n/a      |
| Soffit Elevation (Upstream) (m)                        | 199.10  | 199.10   | n/a      |
| Soffit Clarence (m)                                    | 2.47    | 2.40     | n/a      |

The results provided in **Table 4-6** show that the proposed replacement bridge meets the freeboard and soffit clearance requirements for the 100-year storm event. The road low point for the Langstaff Road profile will be raised to 200.40 m to avoid overtopping by the Regional Storm.

The results conclude that the proposed **30 m single span bridge** is hydraulically efficient and meets all the hydraulic performance requirements. The Regional Storm is not expected to overtop Langstaff Road. The proposed general arrangement drawing of the Langstaff Road Bridge at West Don River (Bowes Bridge) is shown in **Exhibit 4-1**, included at the end of the report before appendices.

The hydraulic analysis outputs for existing and proposed conditions for the West Don River Bridge and Langstaff Road (Bowes Bridge) are provided in **Appendix C**.

#### 4.2.4 Regional Flood Line Map of West Don River

Regional Flood Line maps and HEC-RAS cross-section locations for the West Don River at Langstaff Road location are prepared as per the April 2020 hydraulic modelling update and included in **Exhibits 4-2** and **4.3**. The existing and proposed conditions flood line maps are based on the updated 2019 flows for Don River. The maps illustrate the following:

- The Existing Regional Flood Line is based on the updated existing conditions model with new sections at the Langstaff Road bridge location and the newly constructed GO Transit Barrie Line bridge.
- Future Regional Flood Line is based on the proposed 30 m span bridge at Langstaff Road and the proposed profile raise.
- The map also incorporates the Regional water levels based on the new bridge at GO Transit Barrie Line, located downstream of Bowes Bridge. The general arrangement drawing of West Don River Bridge at GO Transit Barrie Line is also included in this report.
- The map also shows the Regional Flood Line (Old), which is approximately drawn from the Floodplain Map provided by TRCA and represents the Regional Flood Line before the GO Transit Barrie Line construction in 2015 / 2016.

# 4.3 Westminster Creek Crossing

Westminster Creek is within the West Don River Watershed. It is a small and mainly channelized warm water creek which flows north to south and crosses Langstaff Road approximately 300 meters west of Dufferin Street. This creek originates approximately 2.8 km north of Langstaff Road. Roadside ditches of Langstaff Road from both east and west side drain to this creek. Westminster Creek crosses Langstaff Road by a 2-cell each 3.7 m span x 1.8 m rise concrete box culvert.

This is a tributary of the West Don River and this tributary confluence to the West Don River approximately 1.4 km south of Langstaff Road just north of Highway 7.

The HEC-RAS model for Basin 5 also includes Westminster Creek. The flows at Westminster Creek were also updated based on the updated Don River hydrology model by using the new PCSWMM hydrological model. Based on this update, the flows in the HEC-RAS model of Basin 5 for Westminster Creek tributary were updated.

The hydraulic analysis memo submitted to the TRCA on May 28, 2020 also includes flows and HEC-RAS cross-section locations where the flows are to be applied. It is relevant to include a portion of **Table 4-3**, which shows the updated flows for Westminster Creek, as shown in **Table 4.7** below.

Table 4-7: Summary of Flows for the HEC-RAS Model at Westminster Creek Tributary

| Flow | HEC-           |               |        | Flow (m³/s) |             |             |             |              |          |  |  |  |
|------|----------------|---------------|--------|-------------|-------------|-------------|-------------|--------------|----------|--|--|--|
| Node | RAS<br>Section | Hydrology     | 2-year | 5-year      | 10-<br>year | 25-<br>year | 50-<br>year | 100-<br>year | Regional |  |  |  |
| J159 | 50.44          | 2019<br>Flows | 0.89   | 1.18        | 1.37        | 1.61        | 1.84        | 2.34         | 27.60    |  |  |  |
| 3139 | 50.44          | 2004<br>Flows | 1.92   | 2.87        | 3.49        | 6.22        | 8.99        | 14.26        | 20.17    |  |  |  |
| J216 | 50.30          | 2019<br>Flows | 1.67   | 2.27        | 2.66        | 3.16        | 3.69        | 4.42         | 36.24    |  |  |  |
| 3210 | 50.28          | 2004<br>Flows | 3.00   | 4.48        | 5.47        | 9.73        | 14.06       | 22.31        | 31.55    |  |  |  |
| J612 | 50.20          | 2019<br>Flows | 2.63   | 3.07        | 3.34        | 3.80        | 4.56        | 5.22         | 62.64    |  |  |  |
| 3012 | 50.20          | 2004<br>Flows | 4.75   | 7.10        | 8.67        | 15.42       | 17.05       | 35.36        | 50.02    |  |  |  |
| 8.1  | 50.10          | 2019<br>Flows | 2.72   | 3.19        | 3.46        | 3.94        | 4.71        | 5.42         | 63.27    |  |  |  |
| 0.1  | 50.10          | 2004<br>Flows | 5.25   | 7.85        | 9.58        | 17.05       | 17.91       | 39.10        | 55.30    |  |  |  |

The hydraulic performance summary of the existing culvert structure is provided in **Table 4-8**. The low point elevation of the existing road is 204.41 m and located approximately 25 m east of the existing culvert.

Table 4-8: Hydraulic Performance Analysis of Existing Westminster Creek
Culvert

| Structure Description (At Upstream Face, Section 50.18) | 50-Year      | 100-Year     | Regional     |
|---|--------------|--------------|--------------|
| Clear opening (m)                                       | 2-cell 3.7 m | 2-cell 3.7 m | 2-cell 3.7 m |
| Clear opening (III)                                     | span         | span         | span         |
| Water Surface Elevation (m)                             | 200.44       | 200.50       | 204.60       |
| Energy Grade Line Elevation (m)                         | 200.49       | 200.56       | 204.66       |
| Top of Road Elevation at Low Point (m)                  | 204.41       | 204.41       | 204.41       |
| Top of Road Freeboard (Minimum)                         | 3.97         | 3.91         | -0.19        |
| Top of Road Freeboard (Desired)                         | 3.92         | 3.85         | n/a          |
| Relief Flow Depth (Maximum Depth over roadway)          | n/a          | n/a          | 0.19         |
| Top of Road Flow Velocity (m/s)                         | n/a          | n/a          | 0.50         |
| Relief Flow (Velocity x Depth)                          | n/a          | n/a          | 0.09         |
| Flood Depth (HW/D Ratio)                                | 0.49         | 0.52         | n/a          |

Note: The hydraulic model has considered twin 3.6 m span, which is likely to consider the opening area reduction due to the hunch of the culvert

The total span of the culvert is more than 6.0 m, therefore, the design flow for the culvert is 100-year.

The results provided in **Table 4-8** show that the existing culvert meets the freeboard and Headwater over Depth requirement for the 100-year storm event.

The Regional Storm overtops Langstaff Road by 0.190 m. However, it meets the relief flow depth (less than 0.30 m) and relief flow (less than 0.8 m<sup>2</sup>/s) requirements.

The proposed road widening is not expected to impact this culvert, therefore proposed conditions analysis is not carried out. The proposed road profile has also maintained the same low point elevation as the existing profile.

The existing conditions hydraulic analysis output for Westminster Creek culvert is provided in the **Appendix C**.

## 4.4 West Don Tributary Culvert (LC1) Crossing

The design standards for the hydraulic assessment of culverts are based on the MTO HDDS (February 2008), discussed in **Section 2.1**. The CulvertMaster hydraulic modelling tool was used to estimate the headwater depth and to assess the hydraulic capacity of the proposed Culvert LC1 at the proposed connection of Langstaff Road from Creditstone Road to Keele Street Station 4+390.

The CulvertMaster modelling software was selected because it has the following capabilities:

Evaluates inlet and outlet-controlled headwater depths

- Implements the procedures recommended by the MTO
- Simulates the hydraulic performance of culverts based on user-specified flows
- Considers variable tailwater depths based on either outlet channel geometry or user specified depth discharge rating curves

CulvertMaster requires the peak design flow, culvert shape and material (Manning's 'n'), the upstream and downstream culvert invert elevations, the inlet conditions (e.g. headwall, projecting), and the tailwater conditions. When this input is provided, CulvertMaster generates the water elevation at the inlet of the culvert (i.e. headwater).

In accordance with MTO Standard WC-1, the 50-year storm was used as the design storm and the 100-year storm was used as an additional check storm for all culverts. The CulvertMaster model input includes the design and check flows, which were calculated using the hydrological assessment in **Section 3.2.2**. The hydraulic analysis involves comparing the headwater elevation to the elevation at which water would spill onto the highway to determine if the existing culvert meets the applicable freeboard and flood depth criterion. **Table 4-9** summarizes hydraulic assessment result of Culvert LC1.

Currently, there is no survey information available in the vicinity of Culvert LC1 and CN MacMillan Rail Yard. The elevation of Langstaff Road near CN MacMillan Rail Yard Access Road is close to 108 m. Based on the revised flows, the proposed size for Culvert LC1 is 2.40 m span x 1.50 m rise, which will give HWL of 206.24 m and 206.30 m for the 50-year and 100-year storm events, respectively. Therefore, the flooding impact in the vicinity of the culvert is not expected; however, it is recommended to review the flooding impact with detailed survey in the vicinity of Culvert LC1 during the detailed design phase of the CN MacMillan Rail Yard overpass design, and if required, culvert size will be revised accordingly during the detailed design.

CulvertMaster output files for the existing culverts are included in Appendix C.

Table 4-9: Hydraulic Performance Evaluation of Proposed Culvert within the West Don River Watershed

| Culvert | Culvert Chainage Culvert Size a |   | Culvert Parameters   |                      | Spili         |                  | Flow (m³/s)       |                   | Headwater<br>Elevation, HGL<br>(m) |        | Velocity<br>(m/s) |        |
|---------|---------------------------------|---|----------------------|----------------------|---------------|------------------|-------------------|-------------------|------------------------------------|--------|-------------------|--------|
| No. (m) | (m)                             | Туре  | U/S<br>Invert<br>(m) | D/S<br>Invert<br>(m) | Length<br>(m) | Elevation<br>(m) | Design<br>(50-yr) | Check<br>(100-yr) | 50-yr                              | 100-yr | 50-yr             | 100-yr |
| LC1     | 4+390                           | 2.4 and Jevlan m<br>span x 1.5 m rise<br>Concrete Box | 205.35               | 205.10               | 68            | 219.50           | 2.897             | 3.214             | 206.24                             | 206.30 | 2.35              | 2.43   |

# 5 FLUVIAL GEOMORPHOLOGY

Fluvial geomorphological assessment for the Langstaff Road Municipal Class Environmental Assessment Study was carried out by GeoMorphix Ltd. The details of the geomorphological assessments are included in the Geomorphological Erosion and Meander Belt Width Assessment Report, which was submitted by GeoMorphix in June 2017. The report is included in **Appendix D**. The text below, which is extracted from the geomorphology report, provides some key recommendations for reference.

Culvert crossings are evaluated in the context of limiting or mitigating impact to creek form and function. Crossings should achieve the following:

- Address potential channel migration
- Maintain sediment transport processes for frequent storm events
- Provide a span that is respectful of potential future channel erosion / migration
- Maintain velocity differentials through the culvert for frequent storm events
- Be placed away from actively migrating meanders
- Be placed along a stable and straight length of channel at a perpendicular angle to the watercourse.

Given these considerations, for Black Creek and Westminster Creek, we recommend the existing crossing spans of 7.2 m and 6.8 m, respectively, be maintained at a minimum. The current crossing sizes are appropriate as both streams are straight and armoured with gabion baskets and/or concrete meshing, and therefore are not expected to migrate laterally. Furthermore, the crossings are in good condition and fully encompass the existing average channel bankfull widths.

With regards to the West Branch of Don River, present channel alignment did not suggest any further planimetric adjustment towards the road. We recommend the current crossing span of 11 m be improved upon to a minimum of 15 m in width. The additional 4 m would provide a buffer against any potential erosion issues to the crossing footings, as the channel currently contacts both walls of the existing crossing. The addition of an overbank buffer would also permit passage for terrestrial wildlife beneath Langstaff Road.

It is important to note that further amendment to the recommended crossing spans is possible. In the case where only a portion of the suggested width can be provided due to other design considerations (e.g., the presence of subsurface infrastructure or the shallowness of the road), the incorporation of channel bioengineering may also help to reduce a given crossing span while maintaining channel form and function.

# 6 STORMWATER MANAGEMENT

#### 6.1 Overview

The proposed improvement of Langstaff Road will result in an increase in impervious area compared to the existing land use. Increased pavement areas as a result of the widened road are proposed to be addressed by stormwater quality treatment and quantity control measures designed according to the requirements for the West Don River and Humber River in their respective watersheds. Runoff from the new urbanized roadway will be conveyed by a new storm sewer system located within the road right-of-way.

Storage BMPs such as wet pond and dry pond can be effective in providing combined quality treatment and/or quantity control where drainage areas are sufficient, and space is available. Storage pipe system can be effective for a small drainage area and in the case of unavailability of space for other storage BMPs.

Within the study area, runoff from the proposed roadway will ultimately discharge to the existing watercourses via storm sewers. The roadway areas result in a significant increase in impervious area which eventually will result in a larger potential for erosion, flood risk, and water quality degradation along the receiving watercourses. Therefore, road runoff needs to be treated before discharging into the receiving watercourses.

The overall objective of the stormwater management plan is to implement measures to enhance the quality of runoff, satisfy the quantity control targets will be provided for post to pre-development control, and to reduce erosion potential. Under existing drainage conditions there is no stormwater management measure in place within the study area.

The following sections discuss the proposed stormwater management strategy for the Langstaff Road improvements.

# 6.2 Impact of the Proposed Roadway

The proposed road improvement of Langstaff Road will increase runoff from the road corridor due to an increase in impervious areas.

**Table 6-1**: provides a comparison of impervious area under existing and proposed conditions. The proposed conditions impervious calculation is based on ultimate 6-lane widening. The table also shows the peak flow increase due to the increase in impervious areas within the ROW.

As shown in the table below, due to increase in imperviousness, the 100-year peak flow increases up to 24% from existing along Langstaff Road. Therefore, to reduce the impacts of sediment loading as well as increased peak flow into the receiving watercourses, stormwater management measures are required for runoff quality and quantity control. The proposed measures are discussed in **Section 6.3**.

**Table 6-1: Impervious Area Comparison** 

| _         |                           |   |       | Ro                     | ad Are | a within                 | ROW                               |               |                                      |
|-----------|---------------------------|---|-------|------------------------|--------|--------------------------|-----------------------------------|---------------|--------------------------------------|
| Catchment | Station<br>(From -<br>To) | Total<br>Area<br>(ha)                     | Imper | sting<br>rvious<br>rea | Impe   | posed<br>ervious<br>irea | Increase in<br>Impervious<br>(ha) | %<br>Increase | 100-year<br>Peak<br>Flow<br>Increase |
|           |                           |   | (ha)  | %                      | (ha)   | %                        |                                   |               |                                      |
| 105       | 1+510 to                  | 1.63                                      | 0.99  | 0.61                   | 1.12   | 0.69                     | 0.13                              | 13            | 2%                                   |
| 110       | 2+188                     | 1.49                                      | 0.85  | 0.57                   | 1.04   | 0.70                     | 0.19                              | 23            | 5%                                   |
| 115       | 2+188 to                  | 1.00                                      | 0.46  | 0.46                   | 0.63   | 0.63                     | 0.17                              | 37            | 8%                                   |
| 120       | 2+664                     | 1.24                                      | 0.71  | 0.57                   | 0.91   | 0.73                     | 0.20                              | 28            | 8%                                   |
| 125       | 2+664 to                  | 2.27                                      | 1.20  | 0.53                   | 1.75   | 0.77                     | 0.54                              | 45            | 12%                                  |
| 130       | 3+465                     | 2.08                                      | 1.06  | 0.51                   | 1.71   | 0.82                     | 0.64                              | 61            | 15%                                  |
| 135       | 3+465 to                  | 1.43                                      | 0.56  | 0.39                   | 1.41   | 0.99                     | 0.85                              | 152           | 35%                                  |
| 140       | 3+974                     | 1.27                                      | 0.66  | 0.52                   | 1.16   | 0.91                     | 0.50                              | 76            | 23%                                  |
| 145       | 3+974 to<br>4+690         | 1 3 16   1 80   1 67   73   11 /6   17 /1 |       | 0.41                   | 21     | 11%                      |                                   |               |                                      |
| 150       | 4+690 to 5+790            | 3.81                                      | 3.58  | 0.94                   | 3.62   | 0.95                     | 0.04                              | 1             | 0.20%                                |
| 155       | 5+790 to                  | 0.53                                      | 0.24  | 0.45                   | 0.49   | 0.93                     | 0.25                              | 107           | 22%                                  |
| 160       | 6+048                     | 0.46                                      | 0.26  | 0.56                   | 0.44   | 0.95                     | 0.18                              | 70            | 22%                                  |
| 165       | 6+048 to                  | 0.60                                      | 0.24  | 0.4                    | 0.43   | 0.72                     | 0.19                              | 80            | 19%                                  |
| 170       | 6+305                     | 0.43                                      | 0.25  | 0.57                   | 0.42   | 0.98                     | 0.18                              | 72            | 11%                                  |
| 180       | 6+305 to                  | 0.65                                      | 0.21  | 0.33                   | 0.34   | 0.52                     | 0.12                              | 58            | 10%                                  |
| 185       | 6+544                     | 0.47                                      | 0.23  | 0.48                   | 0.34   | 0.72                     | 0.11                              | 50            | 19%                                  |
| 190       | 6+544 to                  | 0.86                                      | 0.36  | 0.42                   | 0.49   | 0.57                     | 0.13                              | 36            | 12%                                  |
| 195       | 6+889                     | 0.79                                      | 0.33  | 0.42                   | 0.59   | 0.75                     | 0.26                              | 79            | 20%                                  |
| 205       | 6+889 to                  | 1.10                                      | 0.42  | 0.38                   | 0.85   | 0.77                     | 0.43                              | 103           | 24%                                  |
| 210       | 7+360                     | 0.96                                      | 0.42  | 0.44                   | 0.75   | 0.78                     | 0.33                              | 77            | 21%                                  |
| 215       | 7+360 to                  | 0.58                                      | 0.33  | 0.57                   | 0.47   | 0.81                     | 0.14                              | 42            | 14%                                  |
| 220       | 7+620                     | 0.65                                      | 0.30  | 0.46                   | 0.43   | 0.66                     | 0.13                              | 43            | 13%                                  |
| 225       | 7+620 to                  | 0.90                                      | 0.48  | 0.53                   | 0.48   | 0.53                     | 0.00                              | 0             | 0%                                   |
| 230       | 7+938                     | 0.70                                      | 0.40  | 0.57                   | 0.46   | 0.66                     | 0.06                              | 16            | 6%                                   |

# 6.3 Proposed SWM Strategy

The proposed stormwater management strategy will consist of pipe storage systems and SWM dry pond to control peak flow as well as oil and grit separators for quality control. **Table 6-2** summarizes the proposed SWM strategy for the Langstaff Road widening within the study limit. The details of the proposed SWM facilities are provided in **Section 6.3.1**.

Table 6-2: SWM Strategy for the Roadway Runoff

| Road Area within ROW (ha) |                        |               | Runoff Quality and Quantity Control |                             |  |   |  |  |  |
|---------------------------|------------------------|---------------|-------------------------------------|-----------------------------|--|---|--|--|--|
| From                      | То                     | Total<br>Area | Paved<br>Area                       | Quantity<br>Control<br>By   | Quality<br>Control<br>By   | Comments  |  |  |  |
| Humber                    | Humber River Watershed |               |                                     |                             |  |   |  |  |  |
| 1+510                     | 1.805                  | 1.63          | 1.13                                | Pipe<br>Storage<br>(HSP-1A) | Directed to Existing Storm Sewer at Silmar Drive and Jevlan              | Runoff from Catchments 105<br>and 110 will be controlled by<br>two separate pipe storage<br>systems. The post development<br>flow is controlled to the 10-year<br>existing conditions level to<br>connect into existing storm |  |  |  |
| 1+805                     | 2+190                  | 1.58          | 1.11                                | Pipe<br>Storage<br>(HSP-1B) | Drive. Two OGS (OGS 1 & 2) for additional quality measure.               | sewer system. The out flow<br>from the storage system further<br>directed to existing SWM Pond.   |  |  |  |
| 2+190                     | 2+660                  | 2.24          | 1.53                                | Pipe<br>Storage<br>(HSP-2)  | OGS-3-1 is<br>downstrea<br>m of HSP-<br>2 and<br>OGS-3-2 is<br>downstrea | Runoff from roadway area (Catchments 115 and 120) is conveyed by storm sewer and peak flow is controlled by a pipe storage system to the predevelopment condition. An OGS is provided at the outlet of pipe storage.          |  |  |  |
| 2+660                     | 3+460                  | 4.35          | 3.45                                | Pipe<br>Storage<br>(HSP-3)  | m of HSP-<br>3. From<br>those OGS<br>it goes<br>through<br>OGS-3         | Runoff from roadway area (Catchments 125 and 130) is conveyed by storm sewer and peak flow is controlled by a pipe storage system to the predevelopment condition. An OGS is provided at the outlet of pipe storage.          |  |  |  |

| Road Area within ROW (ha) |       |               | Runoff Quality and Quantity Control |                                  |   |  |  |  |  |
|---------------------------|-------|---------------|-------------------------------------|----------------------------------|---|--|--|--|--|
| From                      | То    | Total<br>Area | Paved<br>Area                       | Quantity<br>Control<br>By        | Quality<br>Control<br>By  | Comments   |  |  |  |
| Don River Watershed       |       |               |                                     |                                  |   |  |  |  |  |
| 3+460                     | 3+975 | 2.70          | 2.57                                | Pipe<br>Storage<br>(DSP-1)       | Outflow<br>from Pipe<br>Storage is<br>directed to<br>Proposed<br>Dry Pond | Runoff from Catchment 135 (including pond area) and 140 is conveyed by proposed storm sewers and discharged to the proposed pipe storage system DSP-1.   |  |  |  |
| 3+975                     | 4+690 | 3.05          | 1.89                                | Dry SWM<br>Pond<br>DDP- 1        | OGS-4   | The controlled outflow from pipe storage DSP-1 and runoff from Catchment 145 (including dry pond area) are conveyed by proposed storm sewers and discharged to the proposed dry SWM Pond DDP-1. Outflows from the SWM facility will be controlled based on the Don River unit flow release rate and discharged to the upstream side of the proposed Culvert LC1.                 |  |  |  |
| 4+690                     | 5+790 | 3.81          | 3.62                                | Wet Pond<br>SWM<br>Pond<br>DWP-1 | Wet SWM<br>Pond   | Runoff from Catchment 150 is conveyed by proposed storm sewers and discharged to the proposed wet SWM Pond DWP-1. Outflows from the SWM facility will be controlled based on the Don River unit flow release rate and discharged to the West Don River utilizing existing outlet. Some overcontrol will be provided to compensate uncontrolled flow from Catchments 155 and 160. |  |  |  |
| 5+790                     | 6+000 | 0.99          | 0.93                                | -                                | OGS-5   | No peak flow control is provided for Catchments 155 and 160. Overcontrol is provided in wet Pond DWP-1 and pipe storage system DSP-2. Quality control is provided by OGS-4 to provide quality control for Catchments 155 and 160.  |  |  |  |

| Road Area within ROW (ha) |       |               | Runoff Quality and<br>Quantity Control |                             |                          |  |  |
|---------------------------|-------|---------------|--|-----------------------------|--------------------------|--|--|
| From                      | То    | Total<br>Area | Paved<br>Area                          | Quantity<br>Control<br>By   | Quality<br>Control<br>By | Comments   |  |
| 6+00                      | 6+545 | 2.15          | 1.53                                   | Pipe<br>Storage<br>(DSP-2)  | OGS-6                    | Flows from Catchment 165, 170, 180 and 185 will be controlled based on the Don River unit release rate flow by a pipe storage system DSP-2. This pipe storage also provides some overcontrol to account for the uncontrolled flow from Catchments 155 and 160. An OGS will be provided before discharging to the watercourse. Outflow from the OGS is directed to the downstream end of the West Don River Bridge. |  |
| 6+545                     | 6+890 | 1.65          | 1.08                                   | Pipe<br>Storage<br>(DSP-3A) | OGS-7                    | Runoff from Catchment 190 and<br>195, 205 and 210 are conveyed by<br>storm sewers and directed to two  |  |
| 6+890                     | 7+360 | 2.06          | 1.60                                   | Pipe<br>Storage<br>(DSP-3B) | OGS-8                    | separate proposed pipe storage systems DSP-3A and DSP-3B to control peak flows to the 10-year level (equivalent to the flow generated from Catchments 205 and 210 under existing conditions Outflows from the SWM facility wi be directed to a 1050 mm (42") diameter existing trunk storm sewer.  |  |
| 7+360                     | 7+620 | 1.23          | 0.89                                   | Pipe<br>Storage<br>(DSP-4)  | OGS-9                    | Runoff from Catchments 220 and 215 will be controlled by a pipe storage system DSP-4 based on the Don River unit flow release rate before discharging to Westminster Creek. An OGS will be provided for quality treatment.   |  |
| 7+620                     | 7.940 | 1.60          | 0.94                                   | Pipe<br>Storage<br>(DSP-5)  | OGS-10                   | Runoff Catchments 225 and 230 will be controlled by pipe storage system DSP-5 based on the Don River unit flow release rate before discharging to Westminster Creek. An OGS will be provided for quality treatment.  |  |

### 6.3.1 Proposed SWM Facilities

The following section discusses in detail of the proposed SWM facilities. It includes three pipe storage systems within Humber River watershed (HSP), two dry SWM ponds in the West Don River watershed (DDP) and five pipe storage systems within the West Don River watershed (DSP).

Stage Storage Analysis of Proposed SWM facilities are included in Appendix E.

#### 1. Pipe Storage HSP-1A and HSP-1B:

Two underground Pipe Storage Systems HSP-1A and HSP-1B, are proposed on Langstaff Road to control the flow from Catchments 105 and 110, respectively. The both pipe storage facilities will control the peak flows from post- to 10-year pre-development level. The outflow from the Pipe Storage facilities HSP-1A and HSP-1B will be directed to the existing storm sewer which runs southerly from Langstaff Road via Silmar Drive and Jevlan Drive. The HSP-1A and HSP-1B facilities will service 3.21 ha of right-of-way area of Langstaff Road. Two oil and grit separators (OGS-1 and OGS-2) will be provided before discharging into the existing storm sewer for additional quality measure.

Following are the features of these pipe storage systems:

- They will be two separate 90 m long and 2400 mm x 1200 mm concrete box storage pipe, which will be installed at slope 0.20%. The outlet invert of HSP-1A and HSP-1B will be approximately 204.12 m and 205.35 m, respectively. The inverts are estimated only and depending upon the invert of the existing connecting sewer, the invert, width and length of the pipe storage facility can be adjusted during the detailed design phase.
- The controlling features for the HSP-1A consist of a 100 mm diameter orifice at an invert elevation of 204.12 m and a 250 mm diameter orifice at invert elevation of 204.91 m.
- The controlling features for the HSP-1B consist of a 100 mm diameter orifice at an invert elevation of 205.35 m and a 250 mm diameter orifice at invert elevation of 206.14 m.
- The 10-year storage volume for HSP-1A and HSP-1B will be approximately 257 m<sup>3</sup> and 252 m<sup>3</sup> while the 10-year WSL will be approximately 205.31 m and 206.52, respectively.

#### 2. Pipe Storage HSP-2:

An underground Pipe Storage System HSP-2, is proposed on Langstaff Road to control the flow from Catchments 115 and 120. The pipe storage facility will control the peak flows from post- to pre- development levels before discharging to the downstream of the Black Creek culvert at Langstaff Road. The facility will service 2.24 ha of right-of-way area of Langstaff Road. An OGS will be provided (OGS-3) before discharging the outflow to Black Creek. An additional OGS (OGS-3-1) is going to be added directly downstream of pipe storage HSP-2.

Following are the features of this pipe storage system:

— It will be a 180 m long and 3000 mm x 1200 mm concrete box storage pipe which will be installed at slope 0.20%. The estimated inlet and outlet inverts of pipe storage will be 204.81 m and 204.44 m, respectively, which need to confirm and adjusted during the detailed design phase.

- The controlling features consist of a 200 mm diameter orifice at an invert elevation of 204.44 m and a 310 mm diameter orifice at invert elevation of 205.51 m.
- The 100-year storage volume for this facility will be approximately 640 m<sup>3</sup> and the 100-year WSL will be approximately 205.62 m.

#### 3. Pipe Storage HSP-3:

An underground Pipe Storage System HSP-3, is proposed on Langstaff Road to control the flow from Catchments 125 and 130. The pipe storage facility will control the peak flows from post- to pre- development level condition before discharging to the downstream of the Black Creek culvert at Langstaff Road. The facility will service 4.35 ha of right-of-way of Langstaff Road. OGS-3 will provide quality treatment of controlled runoff from HSP-2 and HSP-3 before discharging the outflows to Black Creek. An additional OGS (OGS-3-2) is going to be added directly downstream of pipe storage HSP-3.

The outflow from the Pipe Storage facility HSP-2 and HSP-3 will be discharged to Black Creek downstream of Langstaff Road culvert from the existing outlet.

Following are the features of this pipe storage system:

- It will be a 220 m long and 3000 mm x 1200 mm box concrete storage pipe at slope 0.20%. The estimated inlet and outlet inverts of pipe storage will be 204.44 m and 204.00 m, respectively, which need to confirm and adjusted during the detailed design phase.
- The controlling features consist of a 160 mm diameter orifice at an invert elevation of 204.00 m and a 400 mm diameter orifice at invert elevation of 204.35.
- The 100-year storage volume for this facility will be approximately 792 m<sup>3</sup> and the 100-year WSL will be approximately 205.20 m.

#### 4. Pipe Storage DSP-1:

An underground Pipe Storage System DSP-1, is proposed by the oversized storm sewers on Langstaff Road to control the flow from Catchments 135 and 140 before discharging to dry SWM pond DDP-1. The facility will service 2.70 ha of the right-of-way area of Langstaff Road.

Following are the features of this pipe storage system:

- It will be a twin 3000 mm x 1200 mm concrete box pipe, 222 m long and which will be installed at slope of 0.10%. The estimated inlet and outlet inverts of the pipe storage will be 208.20 m and 207.98 m, respectively, which need to confirm and adjusted during the detailed design phase.
- The controlling features consist of an 82 mm diameter orifice at an invert elevation of 207.98 m and a 170 mm diameter orifice at an invert elevation of 208.73 m.

- The 100-year storage volume for this facility will be approximately 1598 m<sup>3</sup> and the 100-year WSL will be approximately 209.18 m.
- The outlet of the storage pipe will be connected to the dry SWM pond DDP-1 to further control the flow as per the unit flow release rate of Don River.

#### 5. Dry SWM Pond DDP-1:

This dry pond will be located on the northside of the proposed Langstaff Road overpass across CN MacMillan Rail Yard, approximately between St. 4+200 and St. 4+300 and provide the peak flow control of roadway Catchments 145 and outflow from the pipe storage DSP-1 based on the unit flow release rate of Don River Sub-basin 6. An OGS (OGS-4) will be provided at the inlet before discharging into the dry pond to reduce the frequency of pond maintenance.

Following are the control features of the SWM pond:

- The outflow from the SWM facility will discharge to the upstream of the proposed Culvert LC1 crossing at Langstaff Road. The outlet pipe from the pond will be a 450 mm diameter pipe and 1200 mm control maintenance hole configured with two 80 mm and 180 mm diameter orifice at elevations 205.60 m and 206.65 m, respectively.
- The pond will have 3H:1V side slope. The 100-year storage volume for this pond will be approximately 1898 m³ and the 100-year water surface elevation (WSL) will be 207.70 m.
- Approximately 76 m long retaining wall is required on the south-west side of the pond to maintain the roadway grading. The top elevation of the retaining wall will be 211.50 m.
- An overflow weir has been set at an elevation of 208.00 m to function during large rainfall events. The weir will have a 1.2 m crest width with 5H:1V side slopes.
- The outflow from the SWM facility will be discharged to the upstream side of proposed Culvert LC1.

#### 6. Wet SWM Pond DWP-1:

A wet SWM facility is proposed on the north-east corner of proposed Langstaff Road / CN MacMillan Rail Yard overpass and Keele Street intersection, at approximate Sta. 5+535 to 5+640. The facility will provide the peak flow control of roadway Catchment 150 based on the unit flow release rate of Don River Sub-basin 1. Pond DWP-1 will service a total roadway area of 3.81 ha of Catchment 150 with an approximate imperviousness of 88%. The SWM pond will provide an enhanced level of quality treatment of road runoff. Outflow from the SWM pond will be connected to the existing storm sewer of Langstaff Road just east of Keele Street and will be discharged to West Don River the utilizing existing outlet. An OGS (OGS-5) will also be provided before discharging the outflow to the West Don River after collecting the runoff from uncontrolled Catchments 150 and 160.

Following are the features of the SWM pond:

- The require permanent pool volume is about 1000 m³. The provided permanent pool volume is above 3000 m³. The permanent pool elevation will be approximately 206.40 m and bottom of the pond will 205.30 m, which provides a depth of permanent pool as 1.10 m.
- The outflow from this SWM facility will discharge to the West Don River tributary crossing Langstaff Road west of Keele Street. The outlet pipe from the pond will be a 450 mm diameter pipe and 1200 mm control maintenance hole configured with 80 mm diameter orifice at elevations 206.40 m.
- The pond will have 3H:1V side slopes and bottom elevation of 205.30 m. A
   0.30 m freeboard is considered above the 100-year pond level.
- The SWM facility will be used to provide over control of the peak flows as much as possible to balance the controlled flow from Catchments 155 and 160.
- The 100-year storage volume for this facility will be approximately 3004 m<sup>3</sup> and the 100-year WSL will be approximately 207.20 m.

#### 7. Pipe Storage DSP-2:

An underground Pipe Storage System DSP-2, is proposed by the oversized storm sewers on Langstaff Road to control the flow from Catchments 165, 170, 180 and 185. The storage pipe will be slightly overcontrolled to account for the uncontrolled flows of Catchments 155 and 160. The pipe storage facility will control the peak flows based on the unit flow release rate of Don River Sub-basin 5 before discharging to the downstream end of the West Don River Bridge. The facility will service 2.15 ha of right-of-way area of Langstaff Road. An OGS (OGS-6) will be provided before discharging the outflow to West Don River.

Following are the features of this pipe storage system:

- It will be a twin 3000 mm x 1200 mm concrete box pipe, 160 m long and which will be installed at slope 0.20%. The estimated inlet and outlet inverts of the pipe storage will be 197.90 m and 197.58 m, respectively, which need to confirm and adjusted during the detailed design phase.
- The controlling features consist of a 100 mm diameter orifice at an invert elevation of 197.58 m and a 400 mm diameter orifice at invert elevation of 198.70 m.
- The 100-year storage volume for this facility will be approximately 1152 m<sup>3</sup> and the 100-year WSL will be approximately 198.78 m.
- An existing outlet structure will be used to discharge the controlled flow to the West Don River.

#### 8. Pipe Storage DSP-3A and DSP-3B:

Two underground Pipe Storage Systems DSP-3A and DSP3-B, are proposed on Langstaff Road to control the flow from Catchments 190, 195, 205 and 210. The pipe storage facility will control the peak flows equivalent to the 10-year pre-development

flow of Catchments 205 and 210 to maintain the existing conditions flow rates before connecting to the 1050 mm (42") diameter existing storm sewer (as per existing contract DWG.77-104-9 & 77-104-8) which is located between Connie Crescent and North Rivermede Road and runs southerly from Langstaff Road. A thorough investigation of connection feasibility to the existing storm sewer is recommended at the detailed design stage. The facility will service 3.72 ha of right-of-way area of Langstaff Road. Two OGS units (OGS-7 and OGS-8) will be provided before discharging the outflow from these SWM systems to the existing storm sewer for additional quality measure.

Following are the features of pipe storage systems DSP-3A and DSP3-B:

- Pipe Storage Systems DSP-3A and DSP3-B will be 2400 mm x 1200 mm concrete box storage pipe with 125 m and 130 m long, respectively, and which will be installed at slope 0.20% for both SWM facilities. The estimated inlet and outlet inverts of the pipe storage DSP-3A will be 202.00 m and 201.76 m, respectively and for DSP3-B, the estimated inverts will be 202.76 m and 202.50 m, respectively. These inverts need to confirm and adjusted during the detailed design phase.
- The controlling features for the DSP-3A consist of a 115 mm diameter orifice at an invert elevation of 301.76 m and a 250 mm diameter orifice at invert elevation of 202.67 m.
- The controlling features for the DSP-3B consist of a 205 mm diameter orifice at an invert elevation of 205.50 m and a 270 mm diameter orifice at invert elevation of 203.41 m.
- The 10-year storage volume for this DSP-3A will be approximately 346 m<sup>3</sup> and the 10-year WSL will be approximately 202.95 m.
- The 10-year storage volume for this DSP-3B will be approximately 361 m<sup>3</sup> and the 10-year WSL will be approximately 203.67 m.

#### 9. Pipe Storage DSP-4:

An underground Pipe Storage System DSP-4, is proposed on Langstaff Road to control the flow from Catchments 220 and 215. The pipe storage facility will control the peak flows based on the unit flow release rate of Don River Sub-basin 8A before discharging to the downstream end of the Westminster Creek culvert. The facility will service 1.23 ha of right-of-way area of Langstaff Road. An OGS (OGS-9) will be provided before discharging the outflow to Westminster Creek.

Following are the features of this pipe storage system:

— It will be a twin 2400 mm x 1200 mm box concrete storage pipe, 110 m long and at a 0.20% slope. The estimated inlet and outlet inverts of the pipe storage will be 202.65 m and 202.43 m, respectively, which need to confirm and adjusted during the detailed design phase.

- The controlling features consist of an 80 mm diameter orifice at an invert elevation of 202.43 m and a 140 mm diameter orifice at invert elevation of 203.54 m.
- The 100-year storage volume for this facility will be approximately 632 m<sup>3</sup> and the 100-year WSL will be approximately 203.52 m.

#### 10. Pipe Storage DSP-5:

An underground Pipe Storage System DSP-5, is proposed on Langstaff Road to control the flow from Catchments 225 and 230. The pipe storage facility will control the peak flows based on the unit flow release rate Don River Sub-basin 8A before discharging to the downstream end of the Westminster Creek culvert. The facility will service 1.23 ha of right-of-way of Langstaff Road. An OGS (OGS-10) will be provided before discharging the outflow to Westminster Creek.

Following are the features of this pipe storage system:

- It will be twin 2400 mm x 1200 mm box concrete storage pipe, 111 m long and at slope 0.20%. The inlet and outlet inverts of the pipe storage will be 202.27 m and 202.05 m, respectively.
- The controlling features consist of a 123 mm diameter orifice at an invert elevation of 202.05 m and a 230 mm diameter orifice at invert elevation of 203.13 m.
- The 100-year storage volume for this facility will be approximately 553 m<sup>3</sup> and the 100-year WSL will be approximately 203.25 m.

#### 6.3.2 Oil and Grit Separators

Oil and grit separators (OGS) are provided for the quality control at the outlet point of the pipe storage systems.

- OGS-1 and OGS-2 will be provided at the outlet of Pipe Storage systems HSP-1A and HSP-1B near Silmar Drive before discharging to the existing storm sewer.
- OGS-3 will be provided at the outlet of Pipe Storage systems HSP-2 and HSP-3 at approximate Sta. 2+500 before discharging to the downstream of the Black Creek culvert. OGS-3-1 and OGS-3-2 are directly downstream from the Pipe storage systems HSP-2 and HSP-3. The location and full details will be addressed during the detail design. Runoff will go through OGS-3-1 and OGS-3-2 first before going through OGS-3.
- OGS-4 will be provided at the inlet of Dry SWM Pond (DDP-1) at approximate Sta. 4+220 before discharging into the proposed dry pond (DDP-1) to reduce the amount of maintenance.
- OGS-5 will be provided at approximate Sta. 5+980 at the storm sewer that conveyed runoff from Pond (DWP-1) and Catchments 155 and 160 before discharging to the West Don River.

- OGS-6 will be provided at the outlet of Pipe Storage systems DSP-2 at approximate Sta. 6+1040 before discharging to the downstream of the West Don River bridge at Langstaff Road.
- OGS-7 and OGS-8 will be provided at the outlet of Pipe Storage systems
   DSP-3A and DSP-3B at approximate Sta. 7+110 and 7+130 before directing to the existing 1050 mm (42") trunk storm sewer.
- OGS-9 will be provided at the outlet of Pipe Storage DSP-4 at approximate Sta. 7+605 before discharging to the downstream end of the Westminster Creek culvert.
- OGS-10 will be provided at the outlet of Pipe Storage DSP-5 at approximate Sta. 7+640 before discharging to the downstream end of the Westminster Creek culvert.

It is understood that OGS will not provide enhanced level of quality treatment; however, due to urbanization and property constraints, other treatment train approaches are not practically feasible. In some cases, the existing storm sewer drains to existing SWM facilities which provide additional quality measure (west of Highway 400, outflow from dry pond DDP-1 to SWM Pond C via Culvert LC1 and proposed one wet SWM facility DWP-1) for the enhanced level of quality treatment. Detailed sizing of OGS will be carried out during the detailed design phase.

## 6.4 Water Balance and Low Impact Development Measures

The water balance requirement is to retain a minimum of 5 mm of runoff from the site. Most of the proposed roadway will have an urban section with storm sewer systems to convey storm runoff. Therefore, it is not feasible to retain 5 mm of runoff at every section of the proposed roadway. However, measures will be provided wherever feasible using infiltration galleries and exfiltration trenches. Infiltration galleries are subject to soils and groundwater table conditions.

The Preliminary Geotechnical Investigation Report prepared by Thurber Engineering Limited was reviewed for the borehole information to find potential the depth of groundwater table. In one location, i.e. east of Creditstone Road, Sta 4+160, the groundwater table is located approximately 2.0 m below the ground surface. In this section of the road, an infiltration gallery is not feasible, as there will be not enough clearance. In other locations, groundwater table was not encountered within the borehole depth of 3.7 m, which will provide above 1.0 m separation from the bottom of infiltration galleries to the groundwater table. It is recommended to further review on the seasonally high groundwater table and adjust the depth of infiltration gallery accordingly during the detailed design phase. A table of subsurface soil conditions and depth of groundwater table based on Preliminary Geotechnical Investigation Report. This table is included in **Appendix E** of this report.

Based on the preliminary assessment, proposed LID measures may potentially be located within the boulevard between the multi-use path and cycle track. **Table 6-3** 

| provides the potential LID measures which will be further investigated during the detailed design phase. |
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Table 6-3: SWM Strategy for the Roadway Runoff

| ID                           | Catchment<br>ID | Drainage<br>Area (ha) | Proposed<br>LID<br>Features/<br>Comment | Volume for<br>5 mm<br>Runoff<br>Retention<br>(m³) | Size of Proposed<br>LID Features<br>(m) x W (m) x D (m)              | Provided<br>Volume*<br>(m³) |
|------------------------------|-----------------|-----------------------|---|---|--|-----------------------------|
| IG01                         | 105             | 1.63                  | Infiltration<br>Gallery                 | 81.5  | 40 x 1.5 x 1.0   | 24.0                        |
| IG02                         | 110             | 1.49                  | Infiltration<br>Gallery                 | 74.5  | 50 x1.5 x 1.0  | 30.0                        |
| IG03                         | 115             | 1.00                  | Infiltration<br>Gallery                 | 50.0  | 100 x 1.5 x 1.0  | 24.0                        |
| IG04                         | 120             | 1.24                  | Infiltration<br>Gallery                 | 62.0  | 40 x 1.5 x 1.0   | 24.0                        |
| IG05<br>IG06<br>IG07<br>IG08 | 125             | 2.27                  | Infiltration<br>Gallery                 | 113.5   | 40 x 1.5 x 1.0<br>42 x 1.5 x 1.0<br>65 x 1.5 x 1.0<br>60 x 1.5 x 1.0 | 124                         |
| -                            | 130             | 2.08                  | Utility conflict                        | 104.0   | -  | -                           |
| IG09<br>IG10<br>IG11         | 135             | 2.08                  | Infiltration<br>Gallery                 | 104.0   | 65 x 1.5 x 1.0<br>50 x 1.5 x 1.0<br>60 x 1.5 x 1.0                   | 105.0                       |
| IG12<br>IG13<br>IG14<br>IG15 | 140             | 1.61                  | Infiltration<br>Gallery                 | 80.5  | 30 x 1.5 x 1.0<br>55 x1.5 x 1.0<br>70 x1.5 x 1.0<br>40 x1.5 x 1.0    | 117.0                       |
|                              | 145             | 2.70<br>(roadway)     | Infiltration<br>Gallery                 | 135   |  |                             |
| ET17                         | 150             | 3.81                  | Exfiltration<br>Trench                  | 190.5   | 100 x 1.5 x 1.0  | 60.0                        |
| -                            | 155             | 0.53                  | Steep Road<br>Profile                   | 26.5  | -  | -                           |
| -                            | 160             | 0.46                  | Steep Road<br>Profile                   | 23.0  | -  | -                           |
| -                            | 165             | 0.60                  | Utility conflict                        | 30.0  | -  | -                           |
| IG18<br>IG19                 | 170             | 0.43                  | Infiltration<br>Gallery                 | 21.5  | 40 x 1.5 x 1.0<br>50 x1.5 x 1.0                                      | 54.0                        |
| -                            | 180             | 0.65                  | Potential overpass structure            | 32.5  | -  | -                           |
| -                            | 185             | 0.47                  | Potential overpass structure            | 23.5  | -  | -                           |
| -                            | 190             | 0.86                  | Potential<br>overpass<br>structure      | 43.0  | -  | -                           |

| ID    | Catchment<br>ID | Drainage<br>Area (ha) | Proposed<br>LID<br>Features/<br>Comment | Volume for<br>5 mm<br>Runoff<br>Retention<br>(m³) | Size of Proposed<br>LID Features<br>(m) x W (m) x D (m) | Provided<br>Volume*<br>(m³) |
|-------|-----------------|-----------------------|---|---|---|-----------------------------|
| -     | 195             | 0.79                  | Potential overpass structure            | 39.5  | -   | -                           |
| IG20  | 205             | 1.10                  | Utility conflict                        | 55.0  | -   | -                           |
| -     | 210             | 0.96                  | Utility conflict                        | 48.0  | -   | Ī                           |
| IG21  | 215             | 0.58                  | Infiltration<br>Gallery                 | 29.0  | 55 x 1.5 x 1.0  | 33.0                        |
| -     | 220             | 0.65                  | Utility conflict                        | 32.5  | -   | -                           |
| IG22  | 225             | 0.90                  | Infiltration<br>Gallery                 | 45.0  | 65 x 1.5 x 1.0  | 39.0                        |
| -     | 230             | 0.70                  | Utility conflict                        | 35.0  |   | -                           |
| Total |                 | 29.59                 |   | 1479  |   | 670                         |

<sup>\*</sup>Note: Provided volume is based on 40% void Ratio.

As illustrated in **Table 6-3**, the require volume for 5 mm runoff retention is 1479 m<sup>3</sup>. Based on preliminary assessment, an approximate volume of 670 m<sup>3</sup> could be potentially provided avoiding conflicts with existing utilities.

The following will be reviewed further during the detailed design phase:

- Detailed investigation and design of all low impact development and water balance measures. Based on seasonal groundwater table and soil conditions, locations and sizes of LID water balance measures could vary.
- Review conflict with existing and new utilities.
- The potential increase of the footprint of infiltration galleries to maximize retention volume in an effort to get additional retention volume.
- Field testing of hydrogeological conditions such as site-specific percolation rates, depth of bed rock, depth of seasonally high groundwater table, etc.

# 7 SEDIMENT AND EROSION CONTROL

Uncontrolled erosion and sedimentation occurring during construction can result in a loss of topsoil, a disruption of nearby watercourses and a degradation of downstream water quality. During construction, erosion and sedimentation control measures should be implemented to prevent the migration of soils from the site. The following recommendations should be considered when developing the detailed Erosion and Sedimentation Control drawings:

#### General

- Daily inspections are to be carried out particularly after rain events and repairs.
- Any in-water work that is necessary must be conducted in dry conditions within the appropriate fisheries timing window indicated by the TRCA.

#### Vegetative

- All areas not subject to active construction 30 days after area grading should be top soiled and seeded as per Special Provision 572S01 (OPSS 572) immediately after completion of such grading.
- Immediately following seed application, a straw erosion control blanket should be installed on any exposed slopes adjacent to sensitive features, as per OPSS 572.05.07, 572.05.08 and 572.07.04.05.
- The erosion control matting / blankets shall be fully biodegradable.
- Finished slopes will be graded to an acceptable slope and planted according to applicable TRCA Guidelines. Large cuts should be terraced to minimize surface erosion.

#### Structural

- As construction proceeds, diversion swales should be graded where needed along the right-of-way boundaries to intercept drainage from external areas and direct it away from exposed surfaces.
- The locations of sediment / dewatering traps should be confirmed in the field by the on-site inspector and environmental inspector.
- Temporary sedimentation traps should be sized based on 125 m<sup>3</sup>/ha of drainage area.
- The integrity of all sediment trapping devices will be monitored regularly (at least weekly, and immediately following rain events) and properly maintained; such structures will be removed only after the soils of the construction areas have been stabilized and then only after the trapped sediments have been removed.
- The contractor will identify a contingency plan for accidental sediment release.
- All culvert work should be conducted "in the dry" and inside MNRF's timing window for fisheries where applicable.

- All dewatering for culvert installation should be directed to a sediment / dewatering trap.
- Straw bale flow and/or rock checks should be provided in roadside ditches, especially in all ditches immediately upstream of their discharge into a watercourse.
- Additional erosion control works may be required during the course of construction. These may consist of silt fences, swales, and/or diversion berms.
   The location and need for these works will need to be established in the field.

#### Temporary silt fencing should be installed:

- Around sensitive vegetative features.
- Approximately 2 m from the final toe-of-slope for the roadway embankment widening areas.
- Runoff from excavated areas or unvegetated soil will not be permitted to discharge off site or directly into active or temporary watercourses or any natural areas.
- Heavy duty silt fence should be used at crossings locations where rare species are present.
- The contractor should abide by the requirements set out in the Greater Golden Horseshoe Area Conservation Authorities Erosion and Sediment Guideline for Urban Construction (December 2006).

The integration of these measures will minimize the impacts of erosion and sedimentation during the construction of Langstaff Road within project limits.

# 8 CONCLUSIONS AND RECOMMENDATIONS

Based on the preceding assessments and findings for Langstaff Road from Weston Road easterly to Dufferin Street, the following conclusions can be made:

- 1. The proposed road improvements include the widening of Langstaff Road to ultimate 6-lanes from Weston Road easterly to Dufferin Street, adding on street cycling facilities, sidewalk, connection across the CN MacMillan Rail Yard from Creditstone Road to Keele Street, grade separation at GO Transit Barrie Line, intersection improvements, streetscape and new storm sewer system.
- 2. The study area lies within two major watersheds which are the Humber River and Don River. There are three watercourses that cross Langstaff Road within the study area: Black Creek (Tributary of Humber River), West Don River (West branch of Don River) and Westminster Creek (a tributary of West Don River).
- **3.** Hydrological analysis of the roadway corridor is carried out using the Visual OTTHYMO hydrological model with the following storm distributions:
  - The SCS 12-hour storm distribution of the York Region IDF was used in the analysis to generate the peak flows for the West Don River watershed.
  - The AES 12-hour storm distribution of the York Region IDF was used in the analysis to generate the peak flows for the Humber River watershed.
  - For proposed conditions, hydrologic assessments include the proposed stormwater management facilities in place.
  - There is a requirement of unit flow rate control for the proposed work within both the Humber River and Don River watersheds.
- 4. Hydraulic performance of existing watercourse crossing structures was performed using the HEC-RAS model. HEC-RAS models for the West Don River, Westminster Creek and Black Creek were provided by TRCA in 2017.
  - The existing Black Creek culvert at Langstaff Road consists of a 3-cell 2.4 m span x 2.4 m rise x 60 m long. All three cells are of equal size. The hydraulic analysis results show that the existing culvert meets all hydraulic requirements.
  - The HEC-RAS hydraulic model of the West Don River Bridge at Langstaff Road (Bowes Bridge) is updated with the 2019 flows obtained from the TRCA utilizing the PCSWMM model. The existing HEC-RAS model is also updated with revised sections and road profile based on latest survey information. The existing bridge has a span of 11.4 m. The results of existing conditions hydraulic assessment show that the existing bridge meets freeboard and soffit clearance requirements for the 100-year design storm, but the Regional Storm overtops Langstaff Road by 1.10 m.

- The existing conditions HEC-RAS models of Westminster Creek is a part of the West Don River Model (River 2, Reach 1). The flows for this reach were also updated based on the 2019 flows. Westminster Creek crosses Langstaff Road by a 2-cell each 3.7 m span x 1.8 m rise concrete box culvert. Based on the new flows, the existing culvert meets the freeboard requirement for the 100-year storm. The Regional Storm overtops Langstaff Road by 0.19 m; however, it meets the relief flow depth and relief flow criteria.
- 5. Under proposed conditions, the widening of Langstaff Road is not expected to directly impact Black Creek and Westminster Creek culverts. Therefore, proposed conditions hydraulic assessments for these two culverts is not required.
- 6. For the West Don River bridge at Langstaff Road (Bowes Bridge), a 30 m single span structure is proposed to replace the existing structure. The proposed conditions hydraulic assessment illustrated that the proposed 30 m single span bridge is hydraulically efficient and meets all hydraulic performance requirements. The Regional storm does not overtop Langstaff Road.
- 7. A new culvert is proposed (Culvert LC1) just east of Creditstone Road to facilitate the drainage for an unnamed tributary of the West Don River. The proposed size of the culvert is 2.4 m span by 1.5 m rise.
- **8.** Under existing conditions, there is no SWM facilities for runoff quantity and quality control. The existing storm sewers and roadside ditches convey both major and minor storm runoff to the receiving watercourses.
- **9.** Under proposed conditions various stormwater systems are provided for runoff quality control and peak flow control.
  - Two dry SWM ponds and eight pipe storage systems for peak flow control.
  - Twelve oil grit separators are proposed for runoff quality treatment.
  - Infiltration galleries are provided in various location for LID and water balance measures.

Based on the preceding assessments and conclusions, following SWM strategy recommendations are made for the Langstaff Road widening:

- 1. A 30 m single span bridge to be installed to replace the existing Bowes Bridge.
- **2.** A new Culvert LC1 sized 2.4 m span by 1.50 m rise be installed to the east of Creditstone Road at Sta. 4+390.
- 3. A new SWM Dry pond facility (DDP-1) be implemented within the West Don River watershed east of Creditstone Road for peak flow control (to be controlled to the unit flow release rate). Approximately 76 m long retaining wall is required on the south-west side of the pond to maintain the roadway grading. The top elevation of the retaining wall will be 211.50 m.
- **4.** A new wet SWM pond facility (DWP-1) be implemented within the West Don River watershed at the north-west quadrant of Keele Street and Langstaff Road

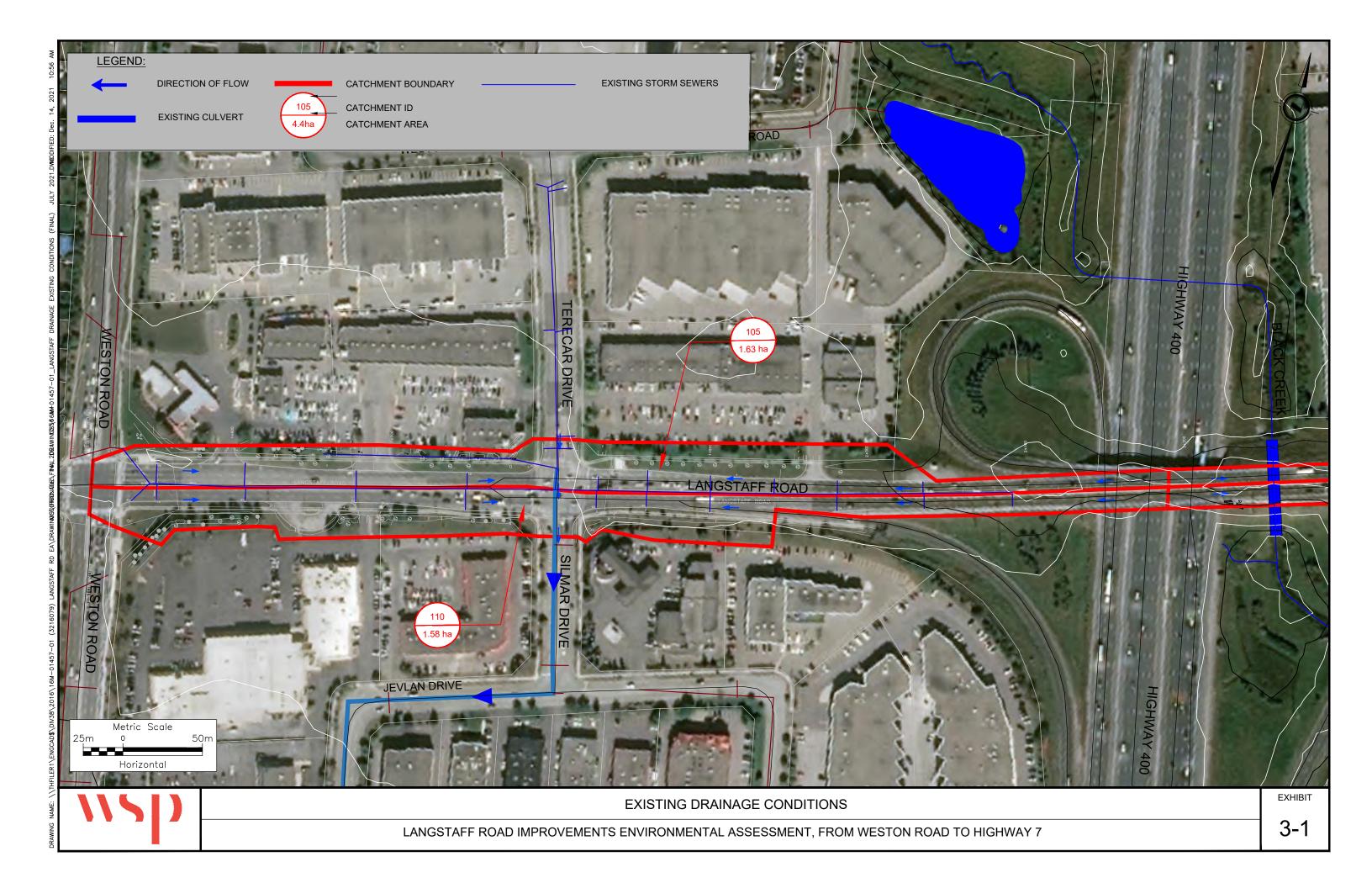
- intersection (i.e. at the east end of the CN MacMillan Rail Yard crossing) for peak flow control (to be controlled to the unit flow release rate).
- 5. Four pipe storage systems HSP-1A, HSP1-B, HSP-2 and HSP-3 be installed within the Humber River watershed. HSP-1A and HSP1-B controls the flow to the 10-year level to maintain the existing conditions flow rate and the outflow will be connected to the existing storm sewer. HSP-2 and HSP-3 will control the flow from post- to pre- development levels as in existing conditions.
- 6. A pipe storage system DSP-1 be installed within the West Don River watershed west of Creditstone Road and the outflow will be discharged to the SWM dry pond facility (DDP-1).
- 7. A pipe storage system DSP-2 be installed within the West Don River watershed between Keele Street and the GO Transit Barrie Line which will provide peak flow control based on the unit flow release rate.
- 8. A pipe system DSP-3A and DSP-3B be installed within the West Don River watershed between the GO Transit Barrie Line and North Rivermede Road which will control to the existing 10-year flow rate and the outflow be connected to the existing 1050 mm sewer. A detailed investigation of the existing 1050 mm sewer and its conditions must be reviewed in the detailed design phase.
- 9. Two pipe storage system DSP-4 and DSP-5 be installed within the West Don River watershed on both west and east sides of Westminster Creek, respectively, which will provide peak flow control based on the unit flow release rate.
- **10.** Twelve Oil-grit separators be implemented at different locations for runoff quality control. The sizing of OGS will be confirmed during the detailed design phase.
- 11. Infiltration galleries and/or exfiltration trenches be implemented at 20 locations as a preliminary recommendation for water balance requirement. However, the location and size of all infiltration galleries depend on the soil and groundwater conditions and utility conflicts which will be further reviewed during the detailed design phase.
- 12. During the detailed design phase, it is recommended to explore the possibility of utilizing the City of Vaughan SWM Pond C located just south of the CNR overpass so that runoff of Langstaff Road from the east of CNR Access Road to the high point at CNR overpass can be conveyed by a storm sewer and discharged into the City of Vaughan's SWM pond to reduce the road spread.

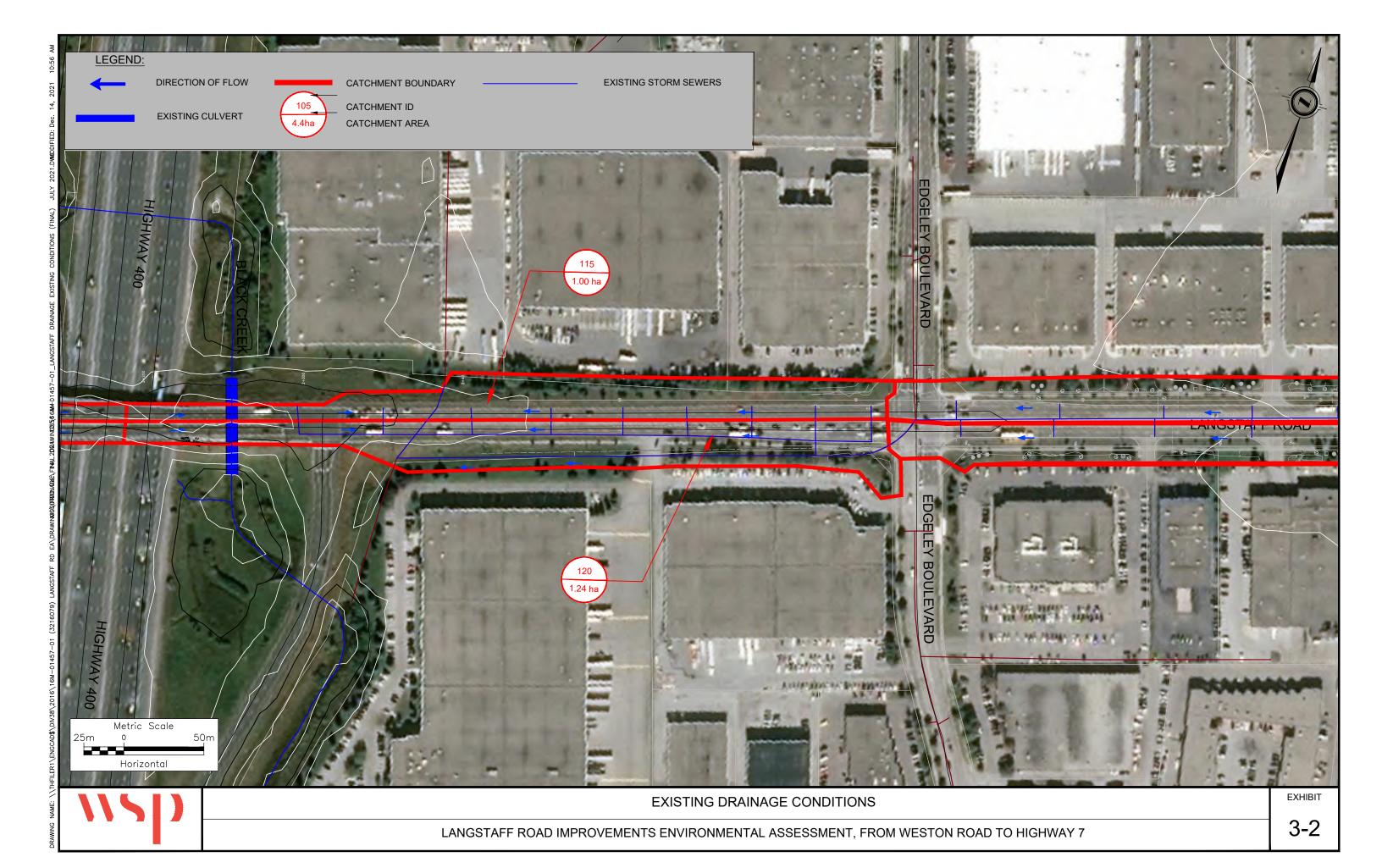
Following commitments are carried forward for the detailed design phase:

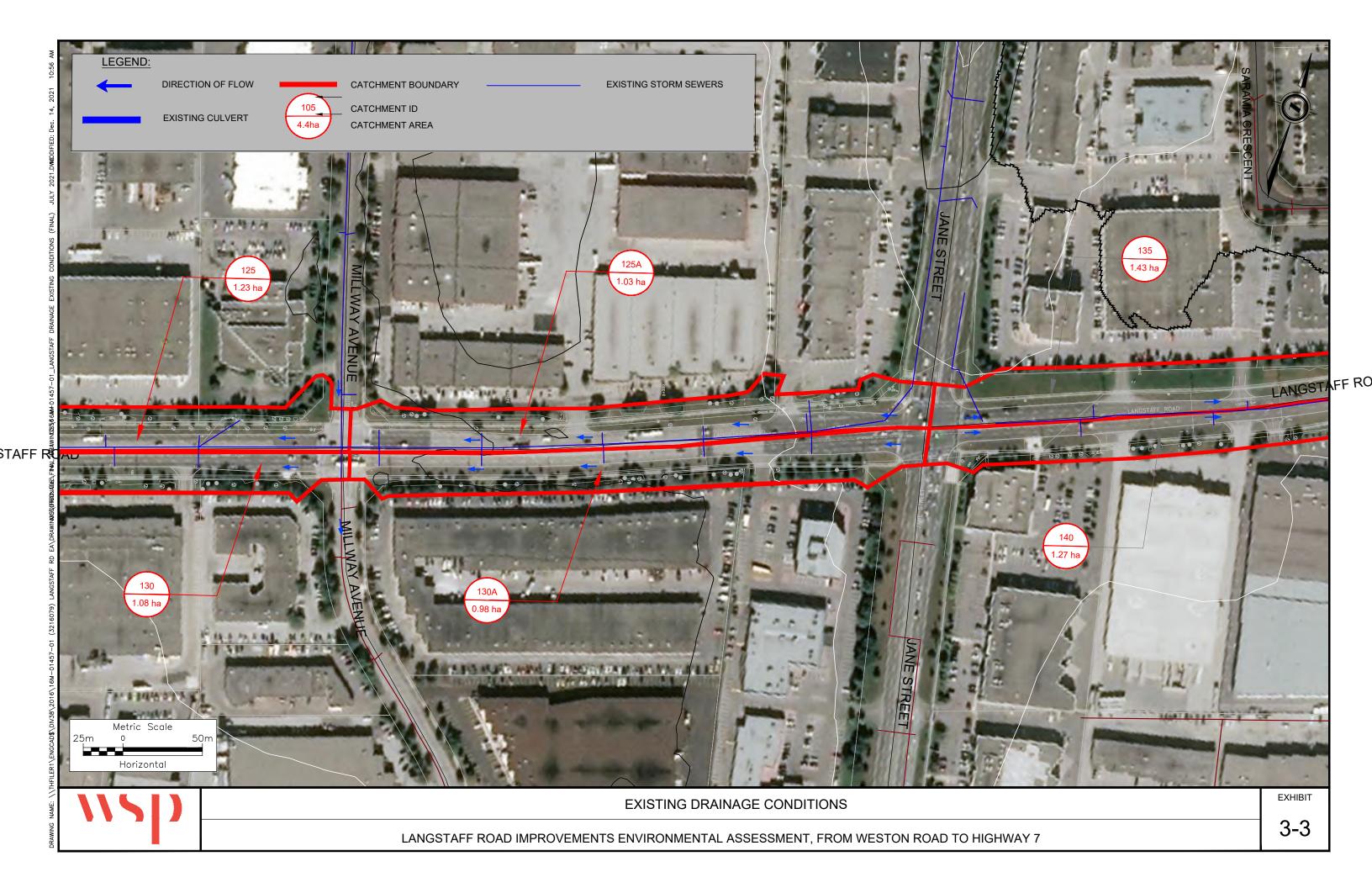
- The hydraulic modelling of all crossings will be updated as per the TRCA's updated hydraulics models available at that time.
- In the existing and proposed conditions hydrologic modelling of the road corridor, an initial abstraction value of 1.0 mm for impervious areas will be used.

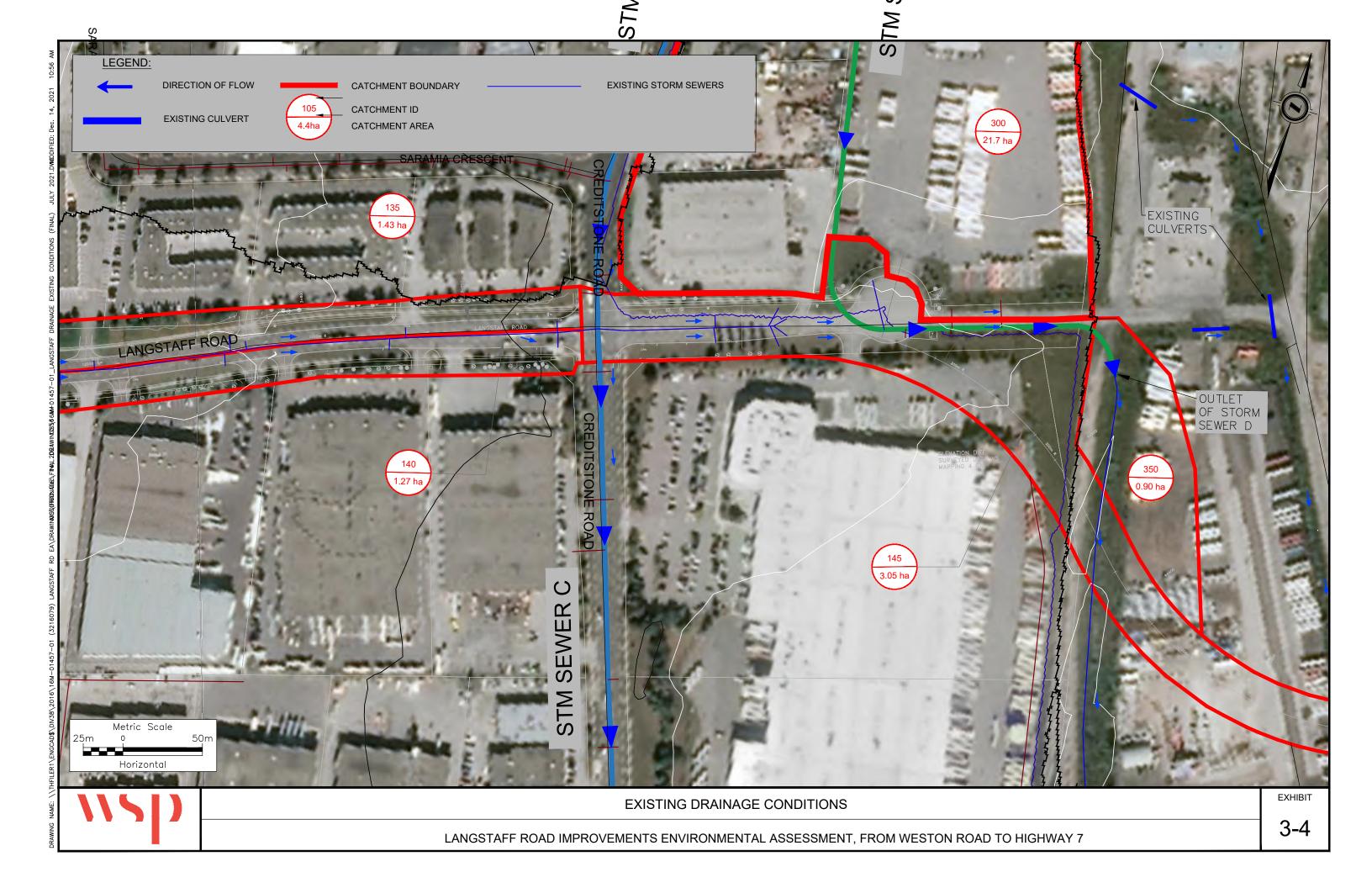
- While determining the size (length, width and depth) of infiltration galleries and / or exfiltration trenches, seasonal groundwater table, infiltration test and conflict with utilities will be further reviewed.
- Investigate the drainage area and capacity of existing SWM Pond C (under jurisdiction of City of Vaughan) located south of the Langstaff Road overpass to determine if it is feasible to convey runoff from a portion of Langstaff Road overpass bridge to the SWM pond.
- During the overpass bridge construction, review of the flooding impact of proposed Culvert LC1 will be completed with detailed survey in the vicinity of Culvert LC1. The proposed size of Culvert LC1 will be updated accordingly.

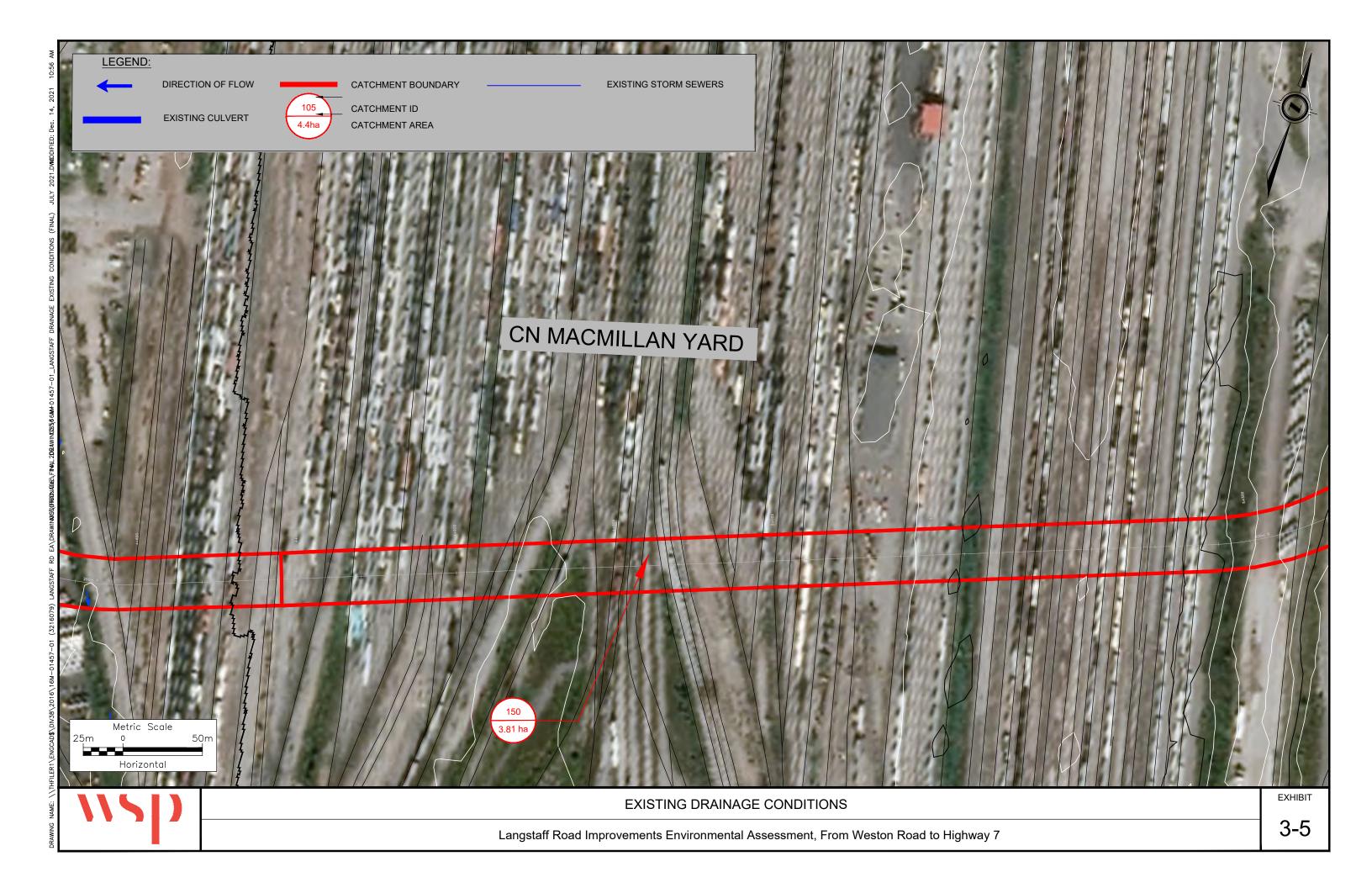
# **Exhibits**



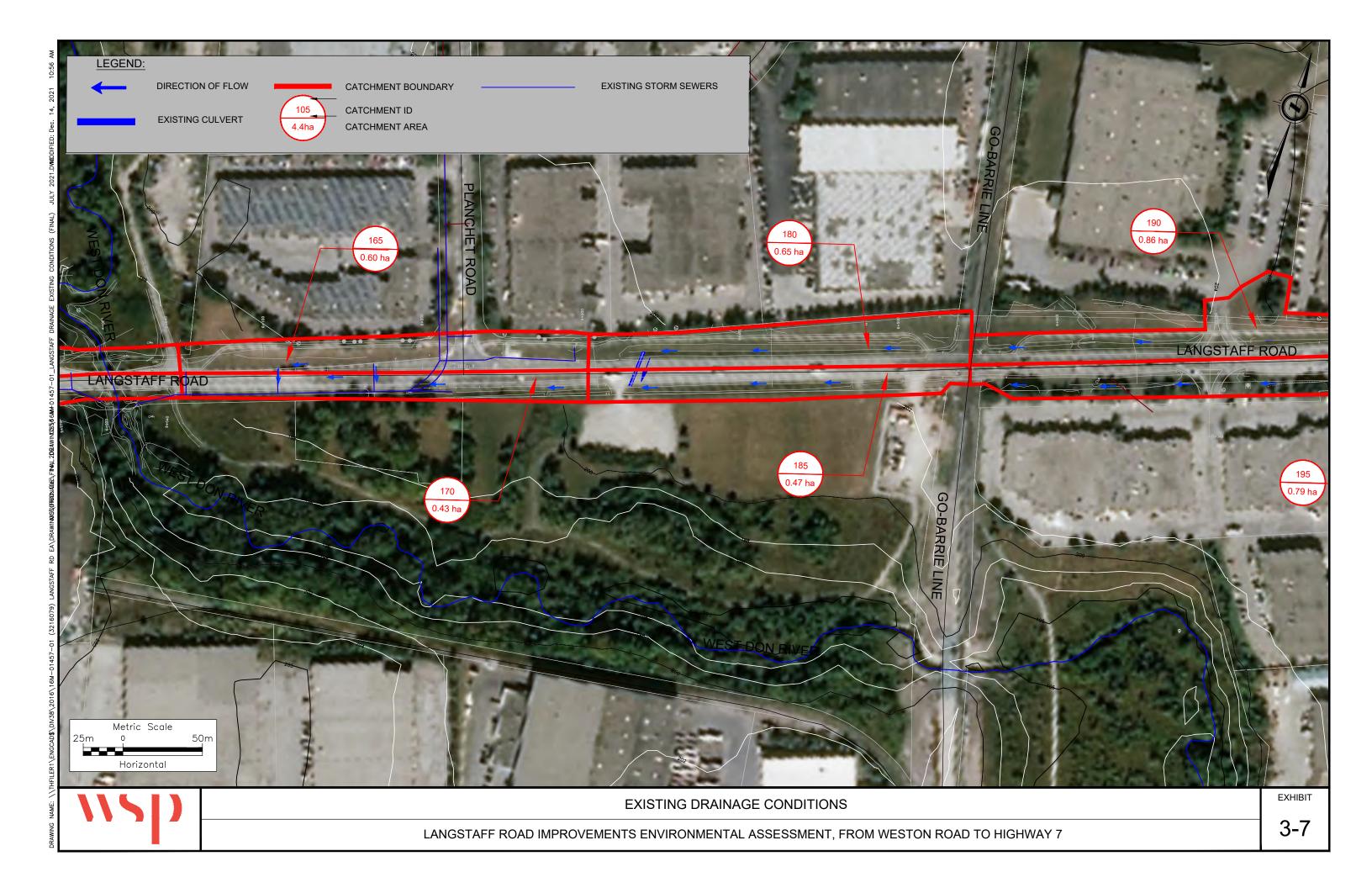


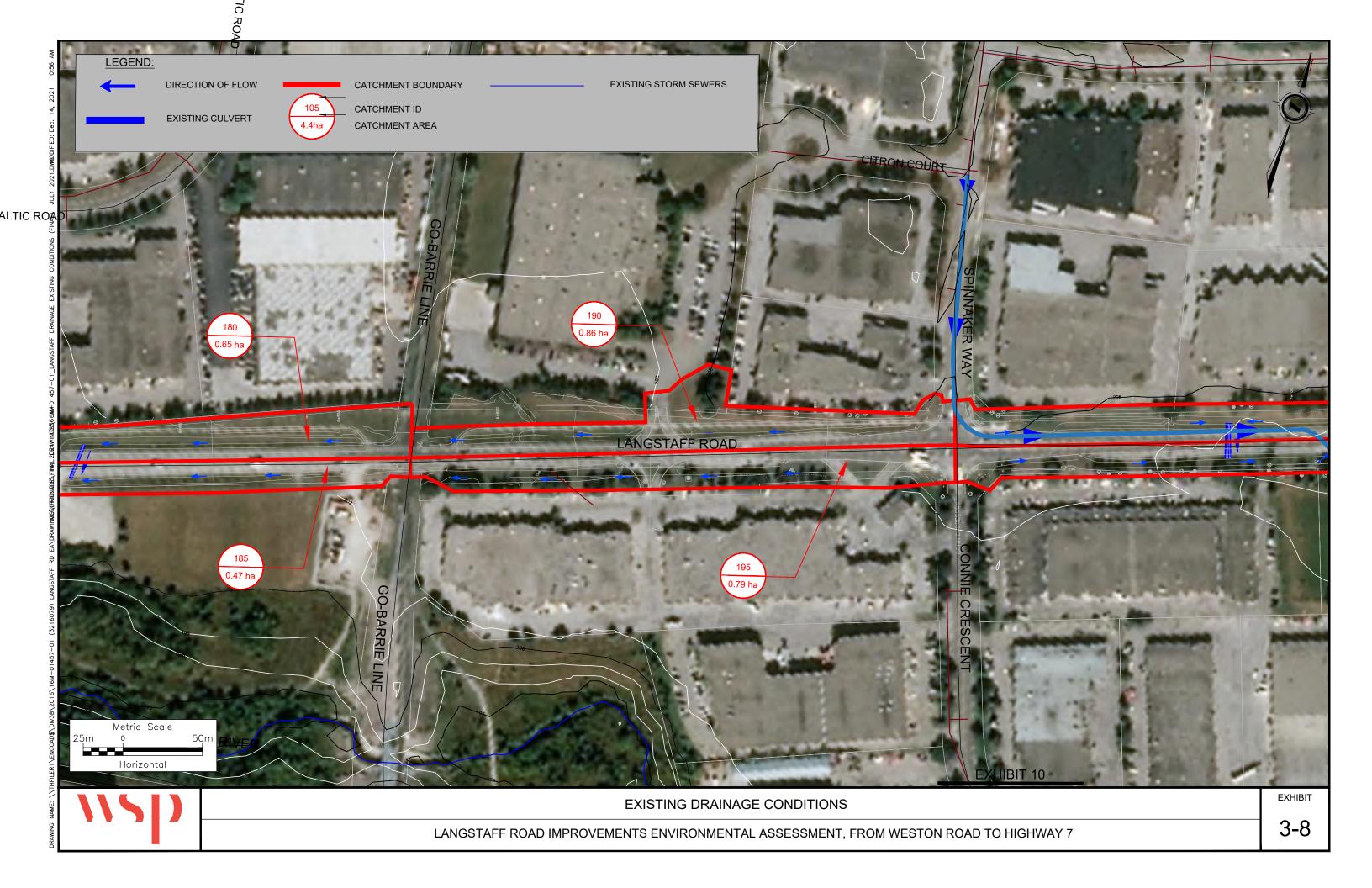


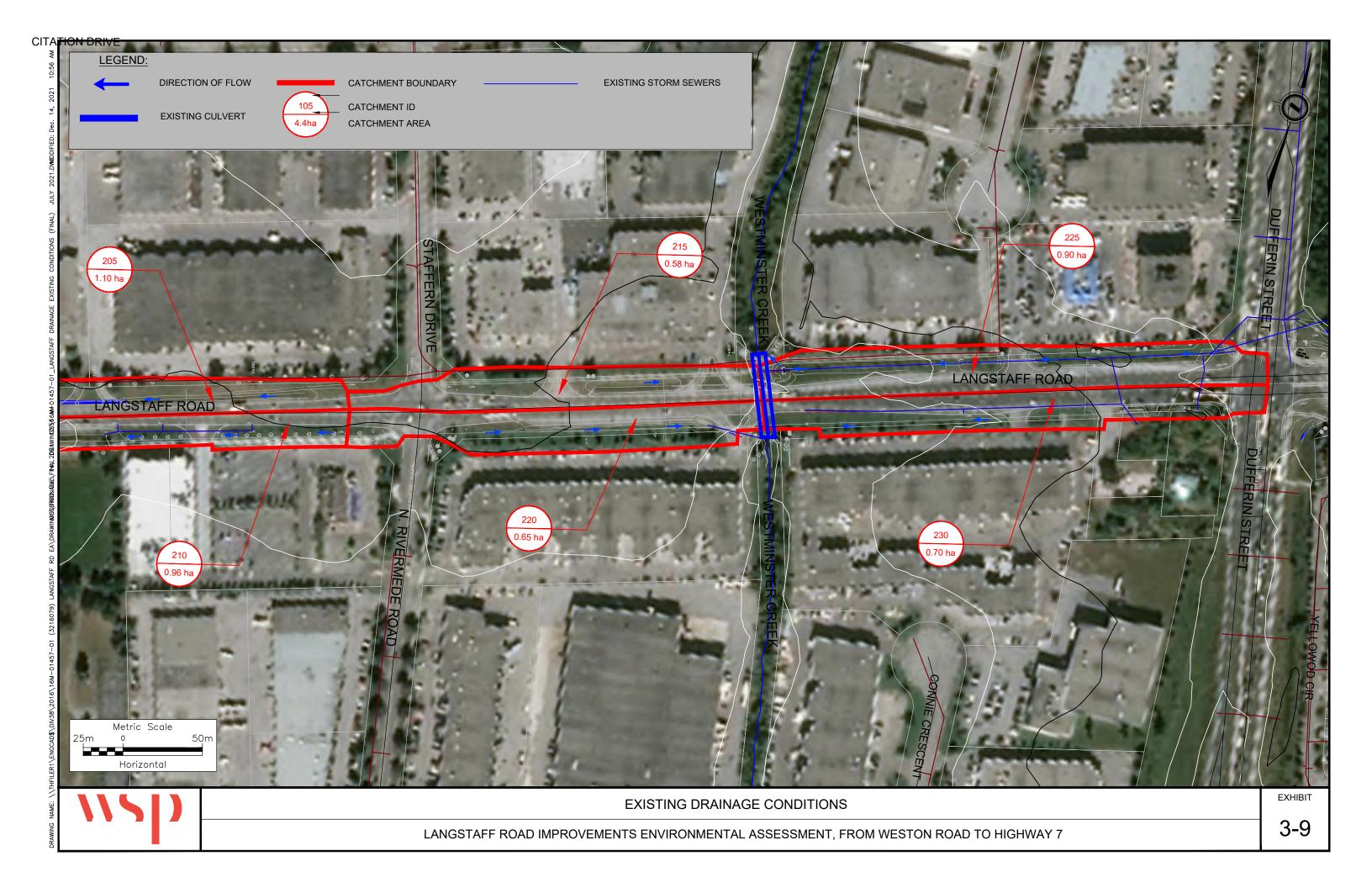


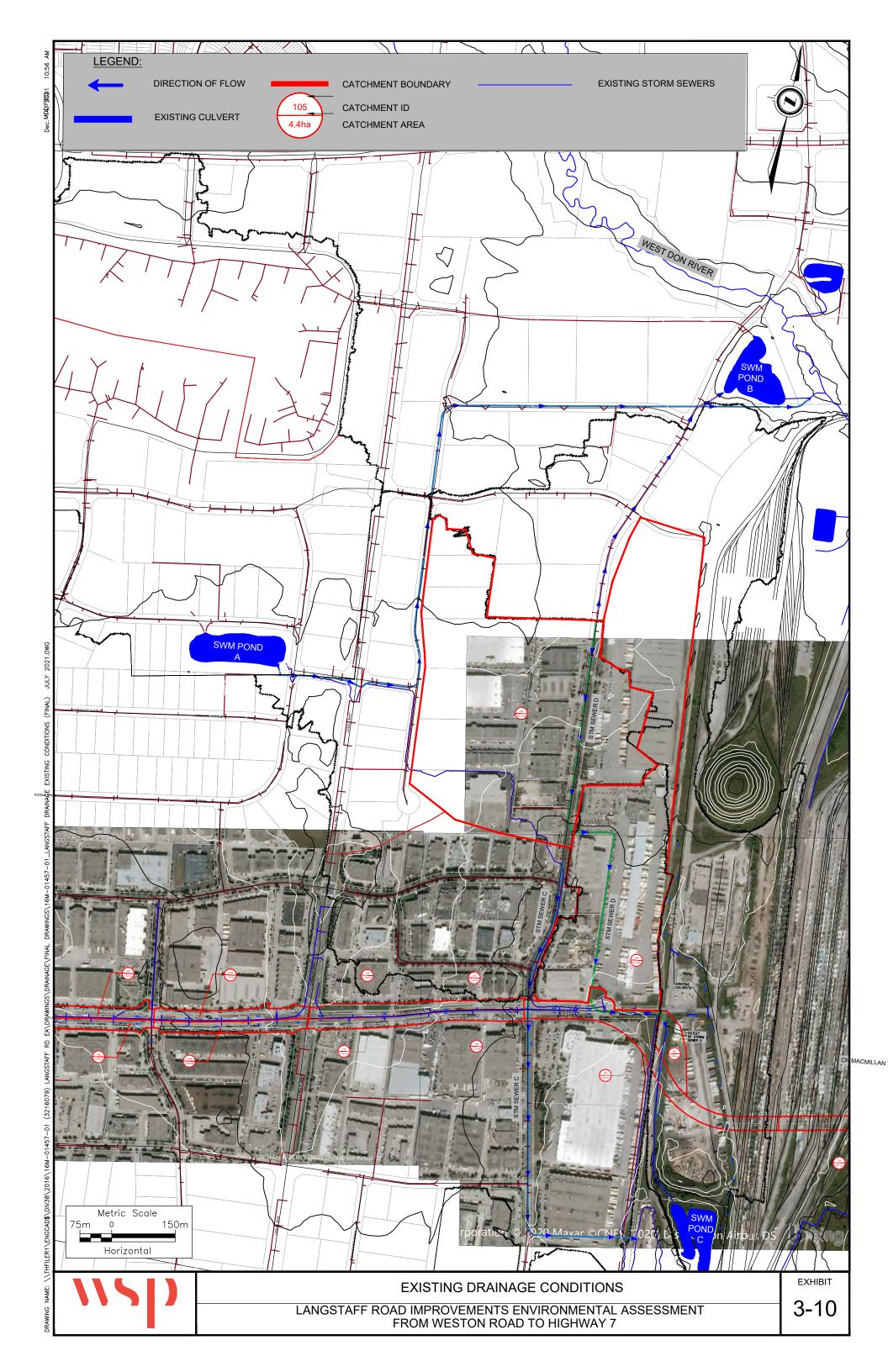


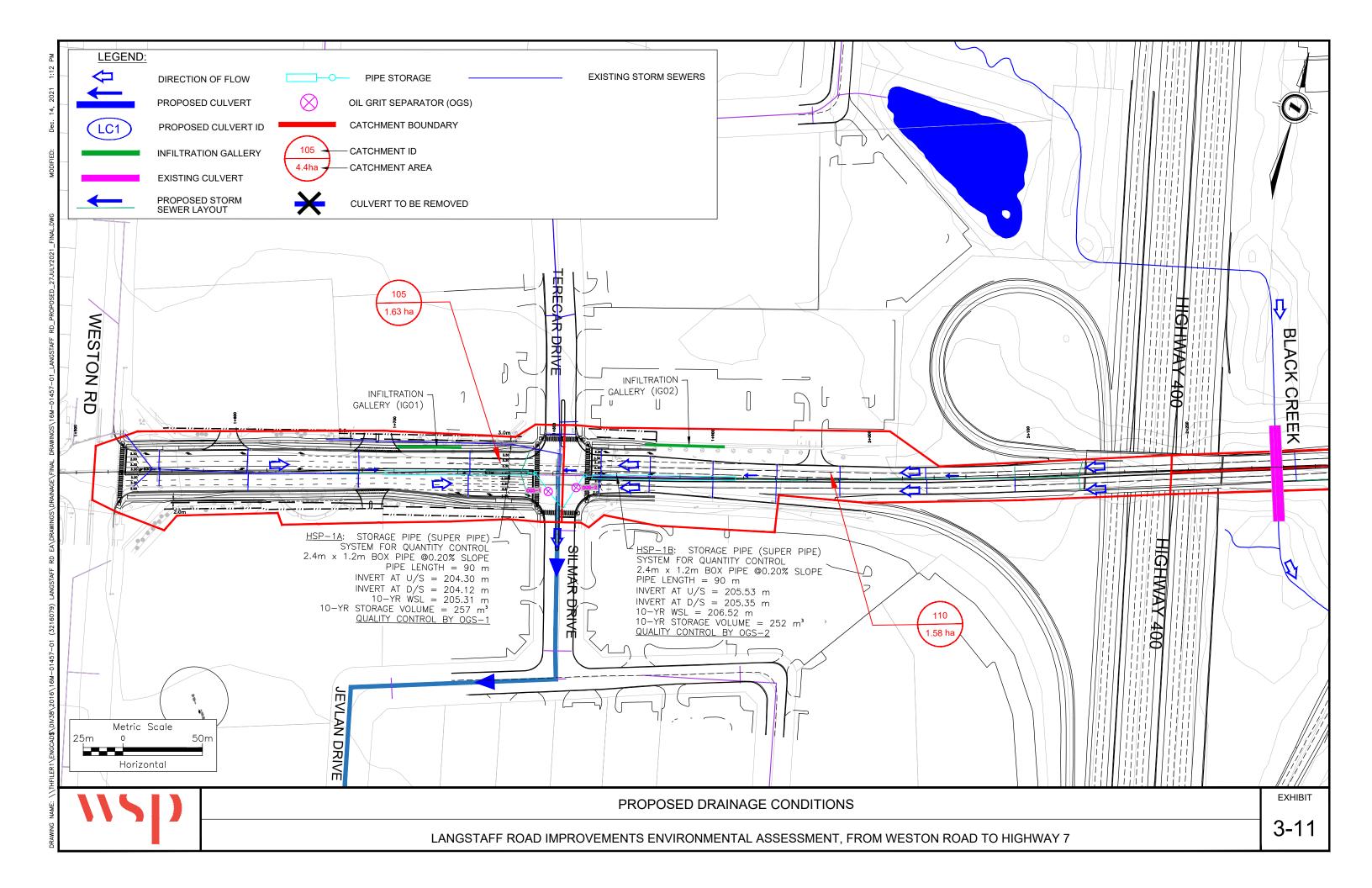


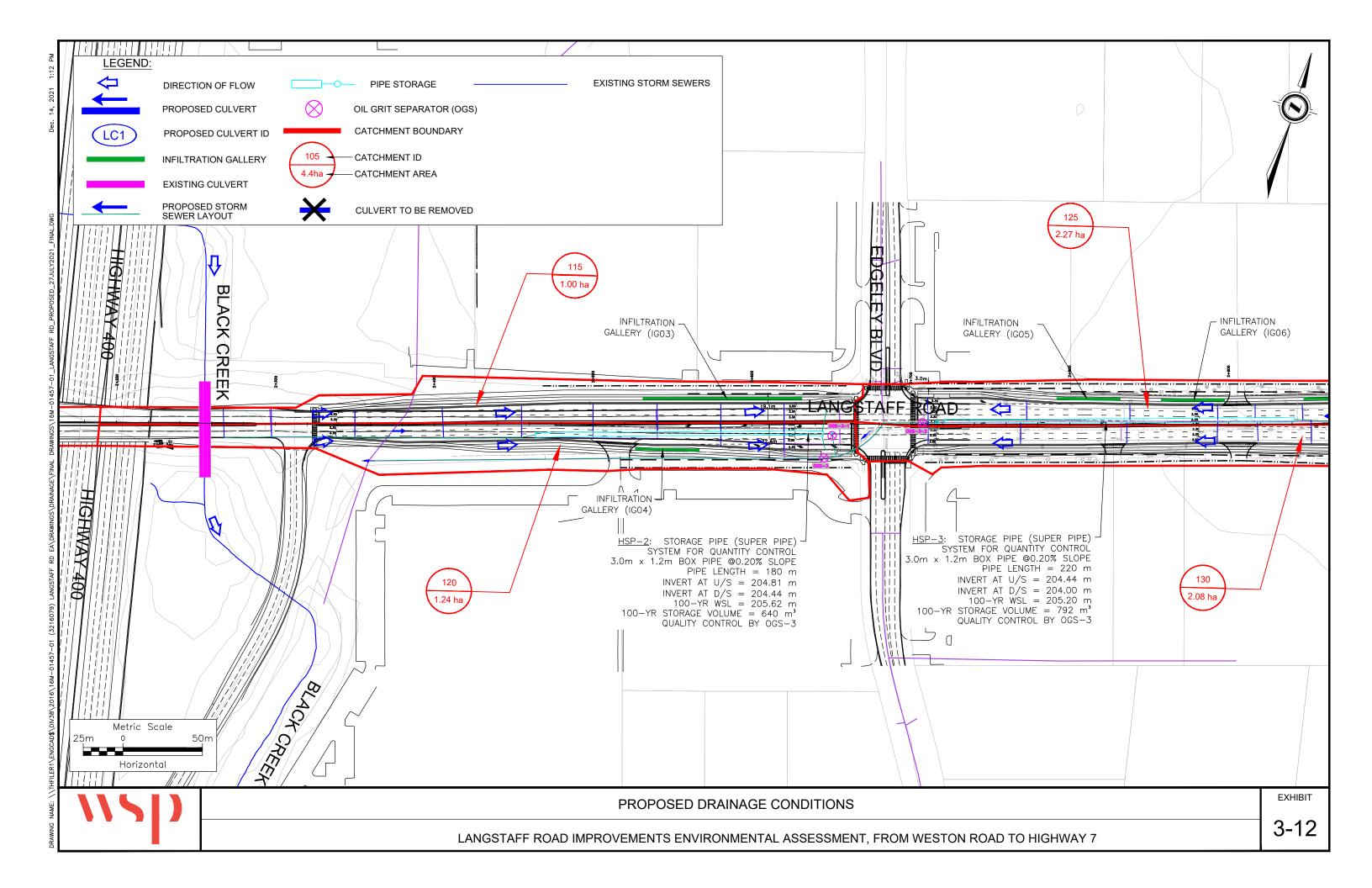


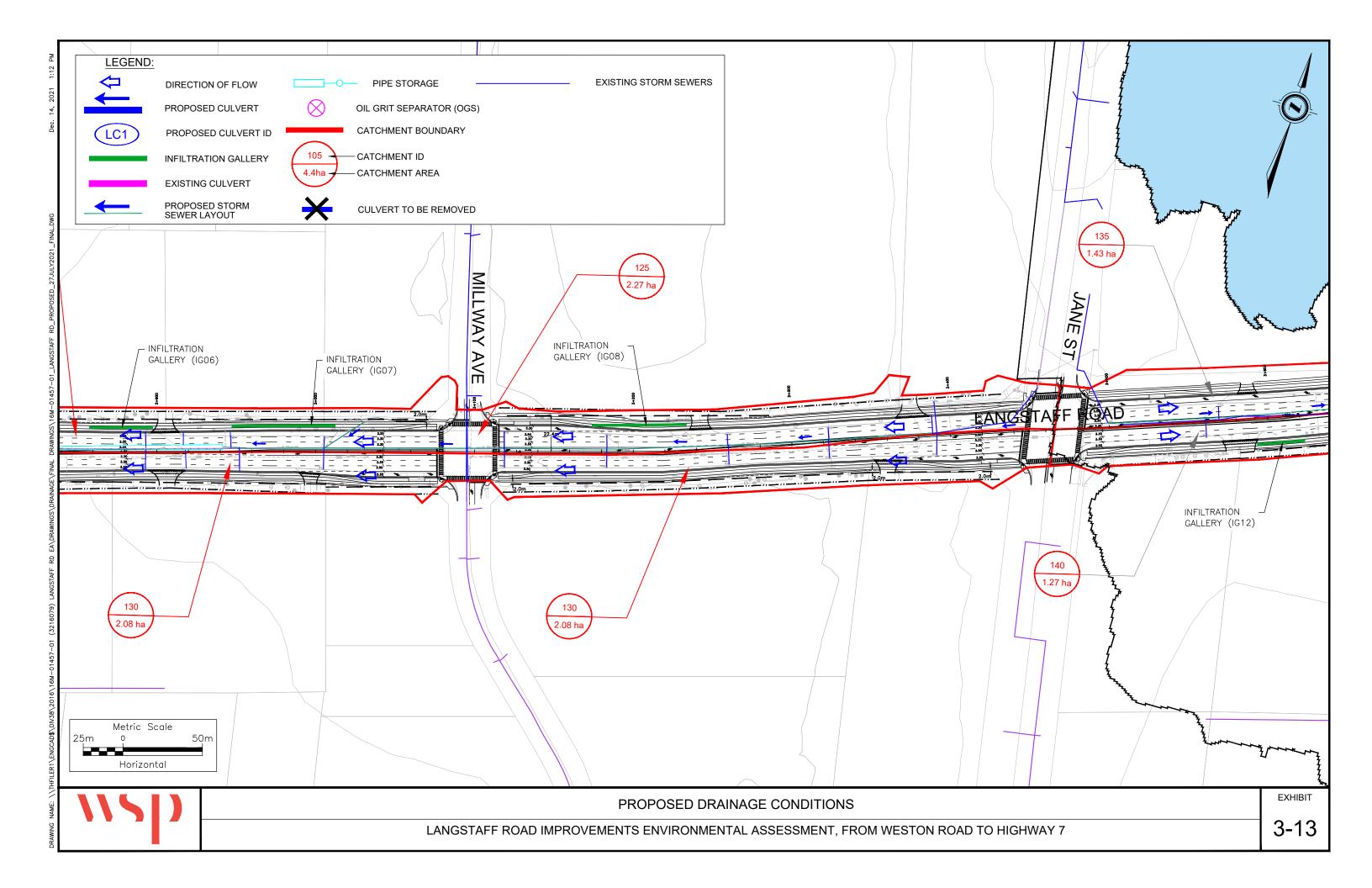


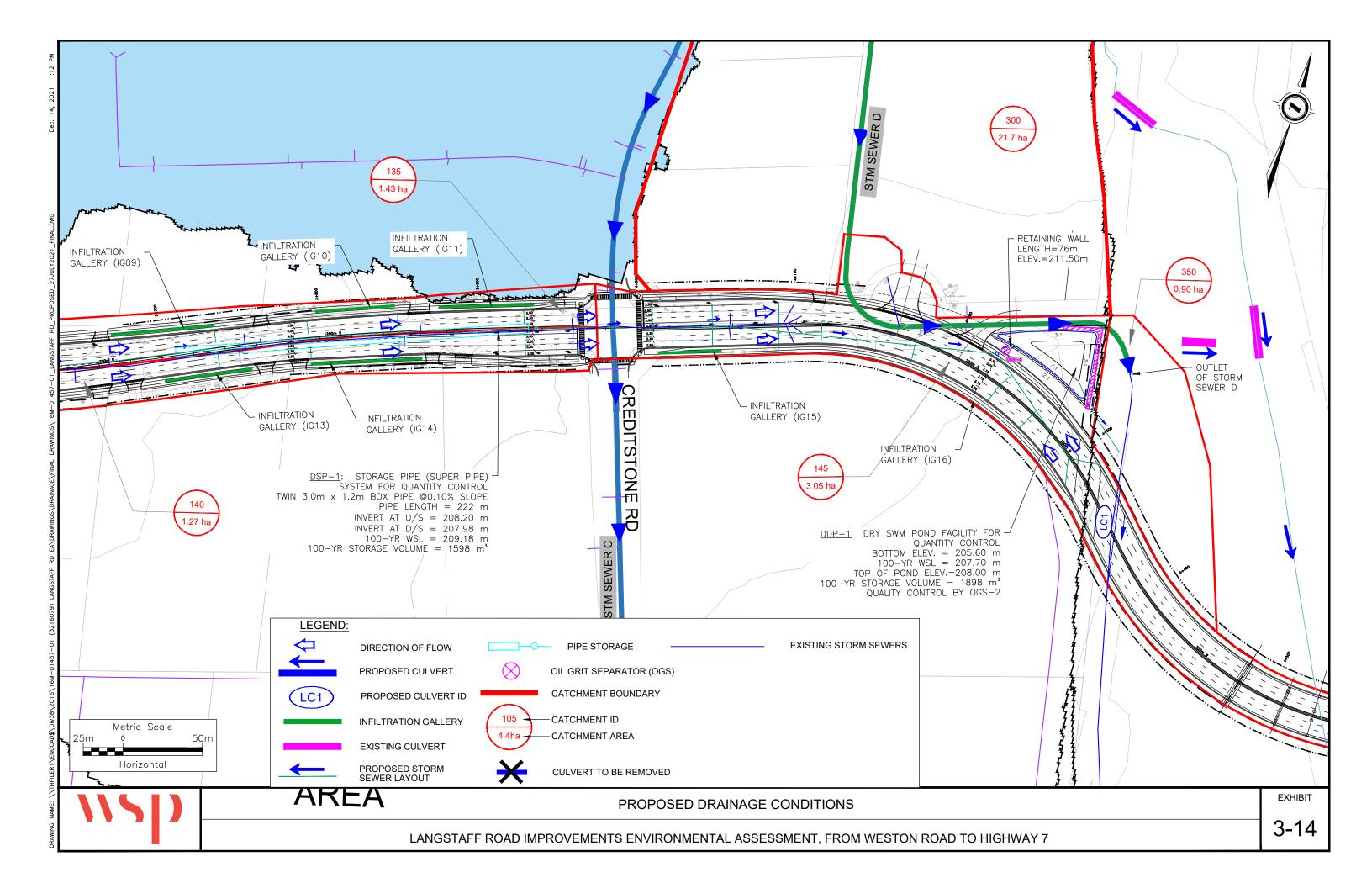


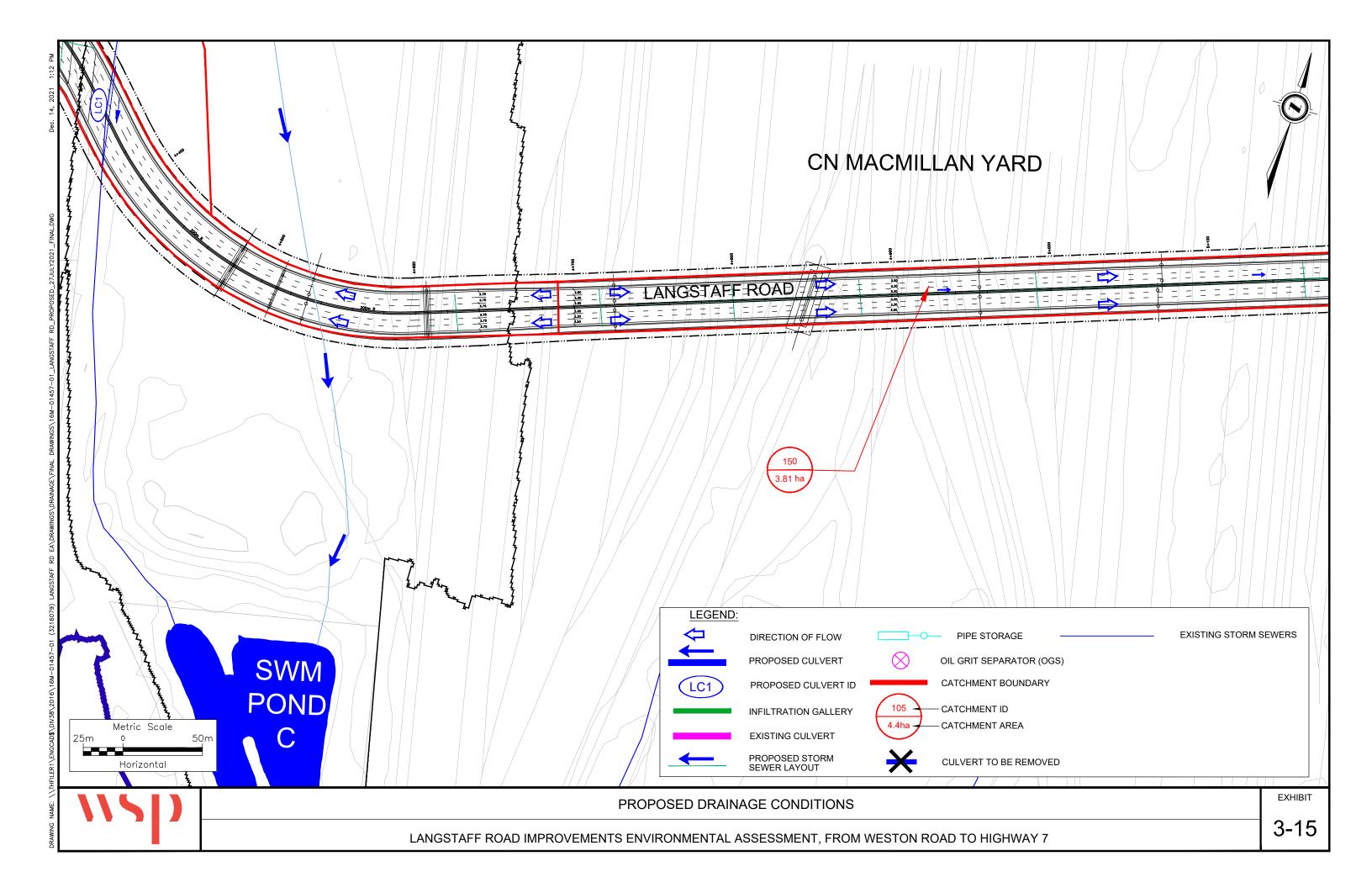


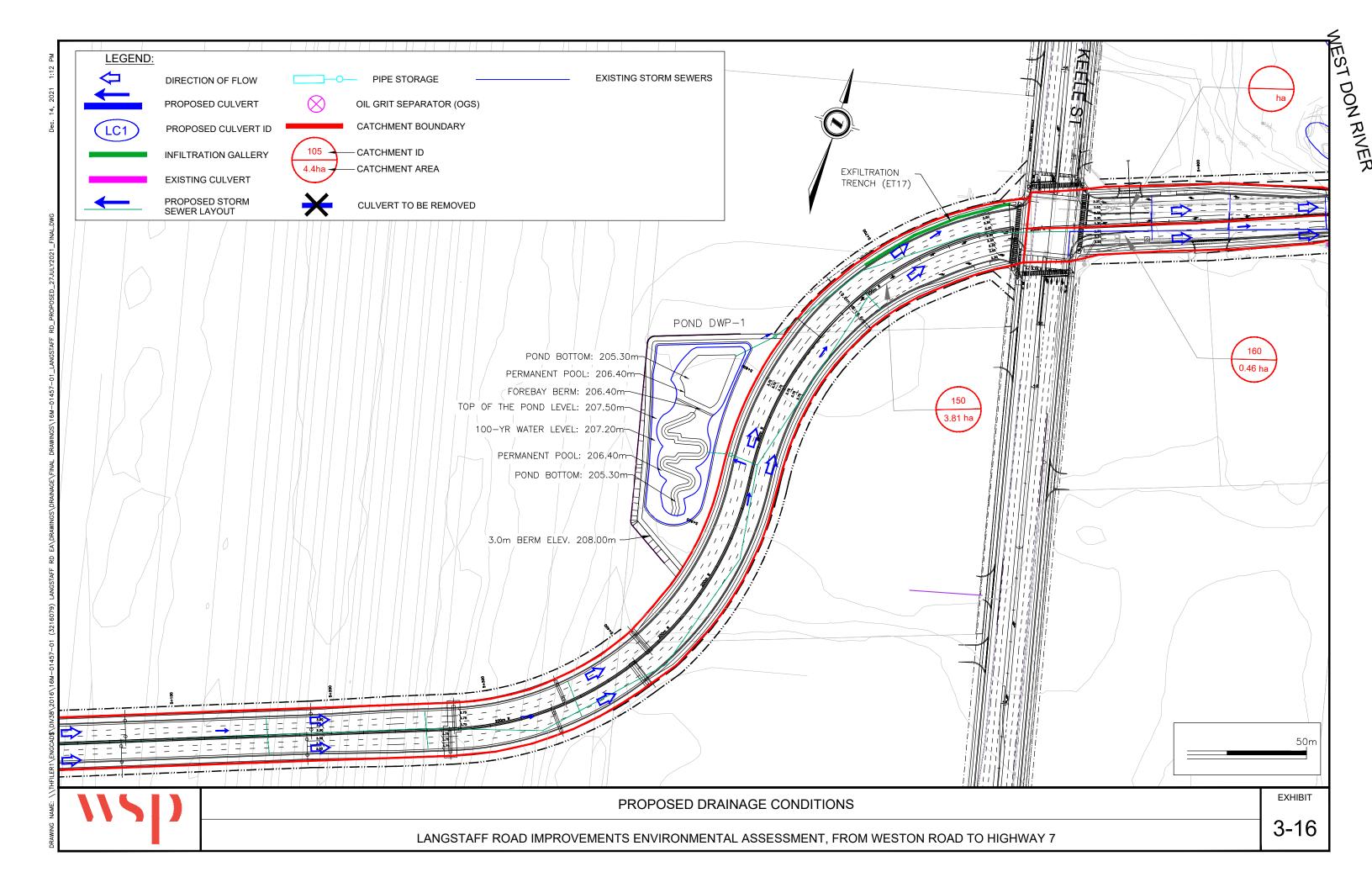


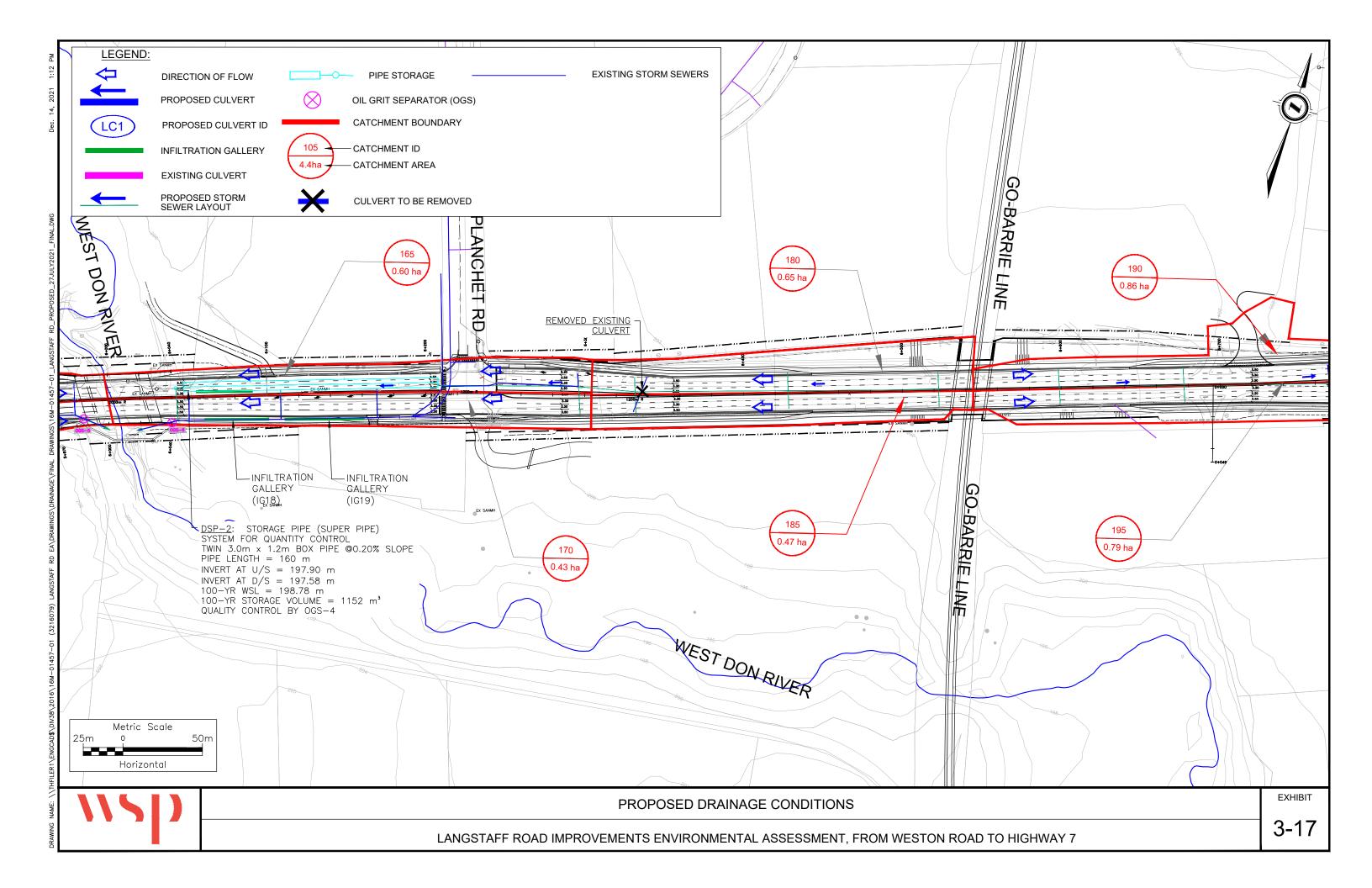


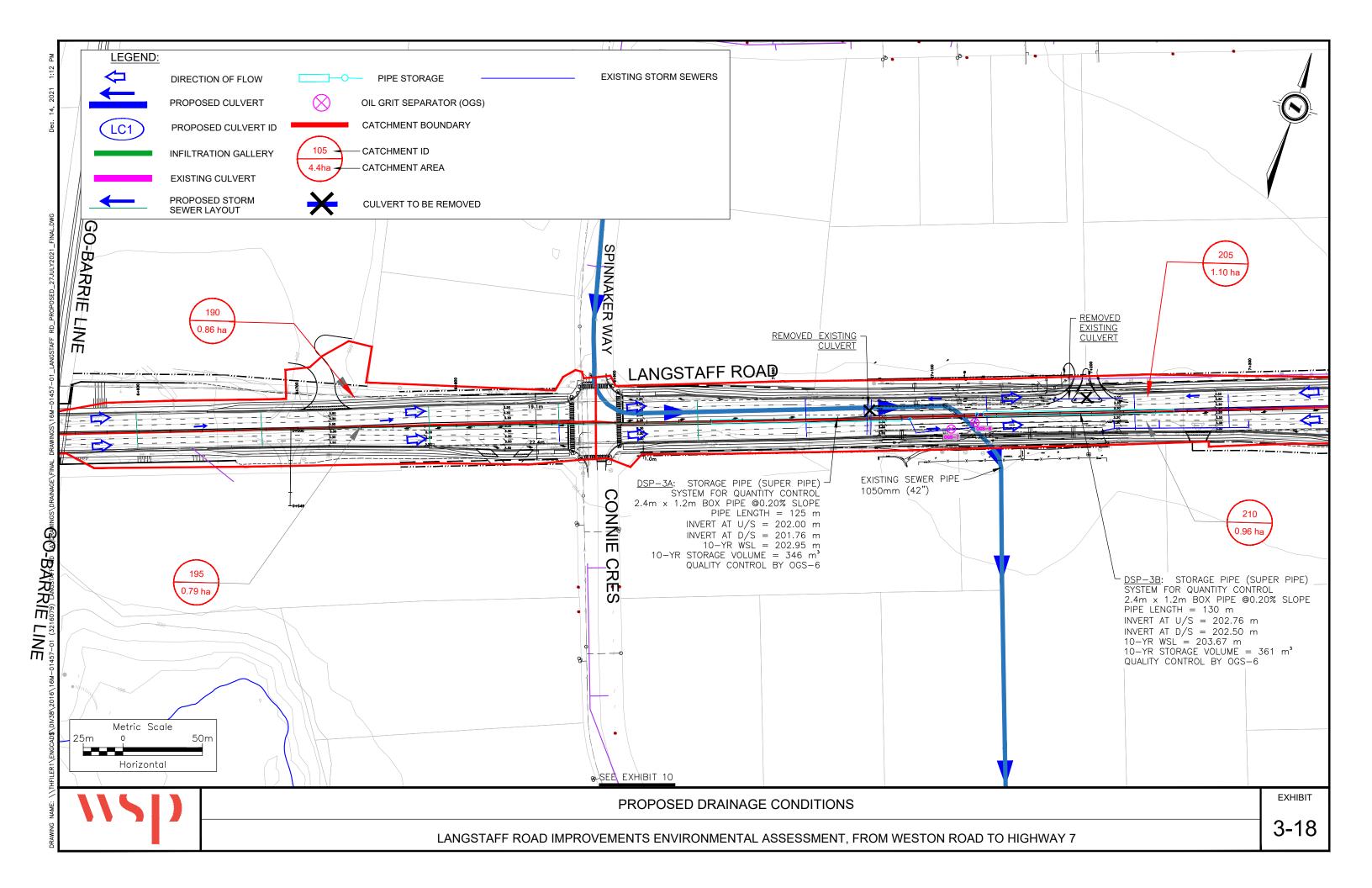


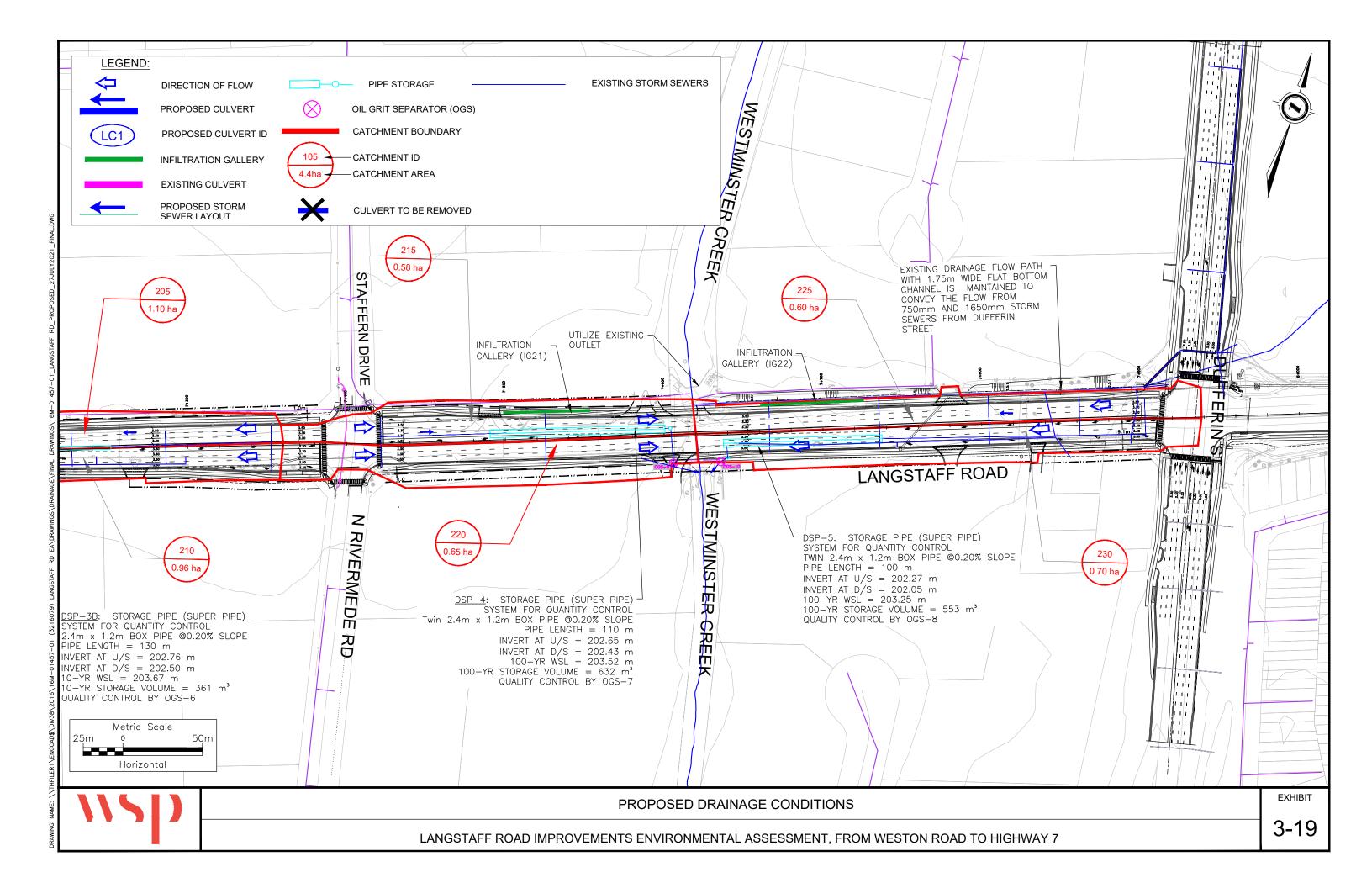


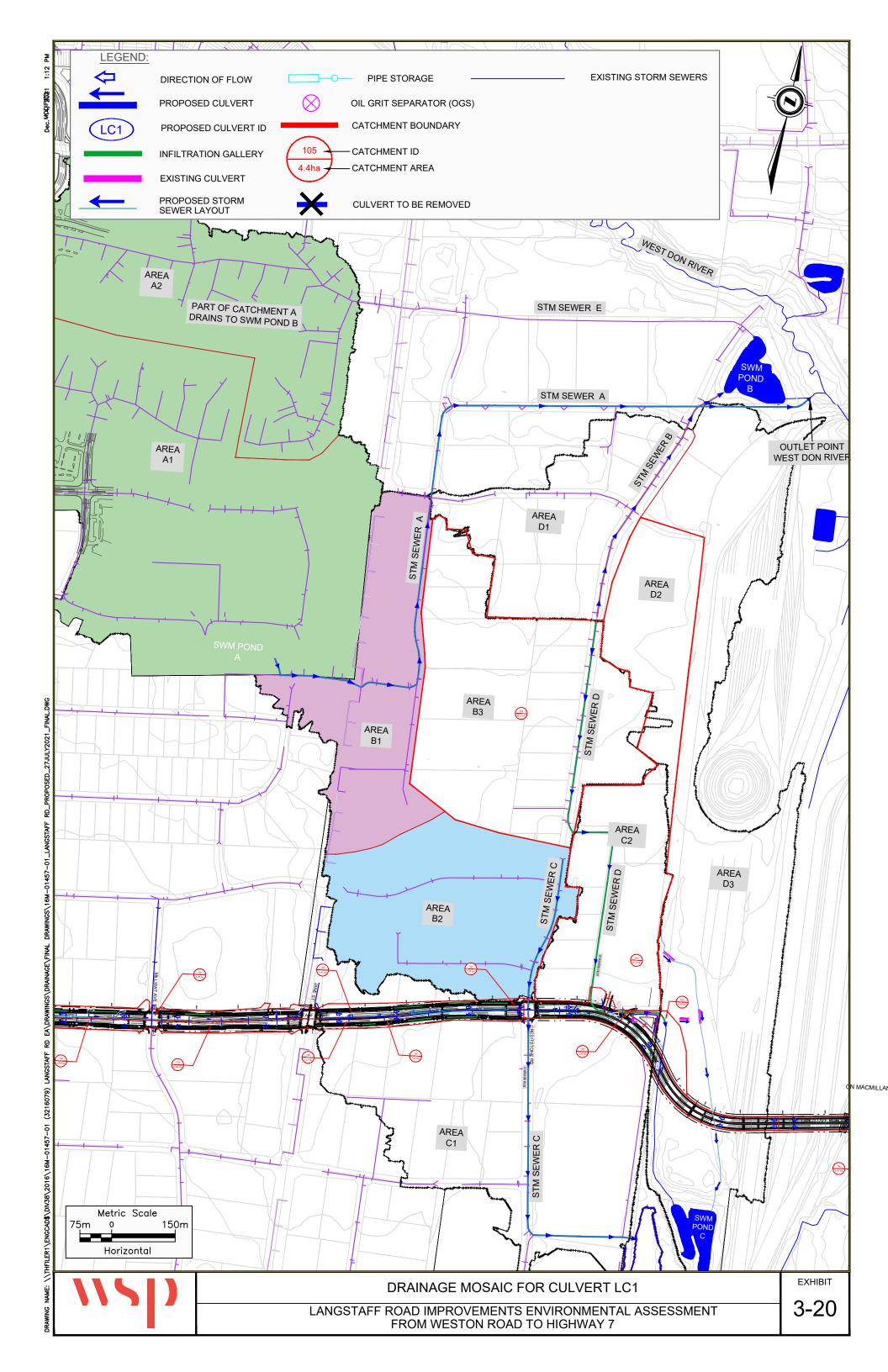


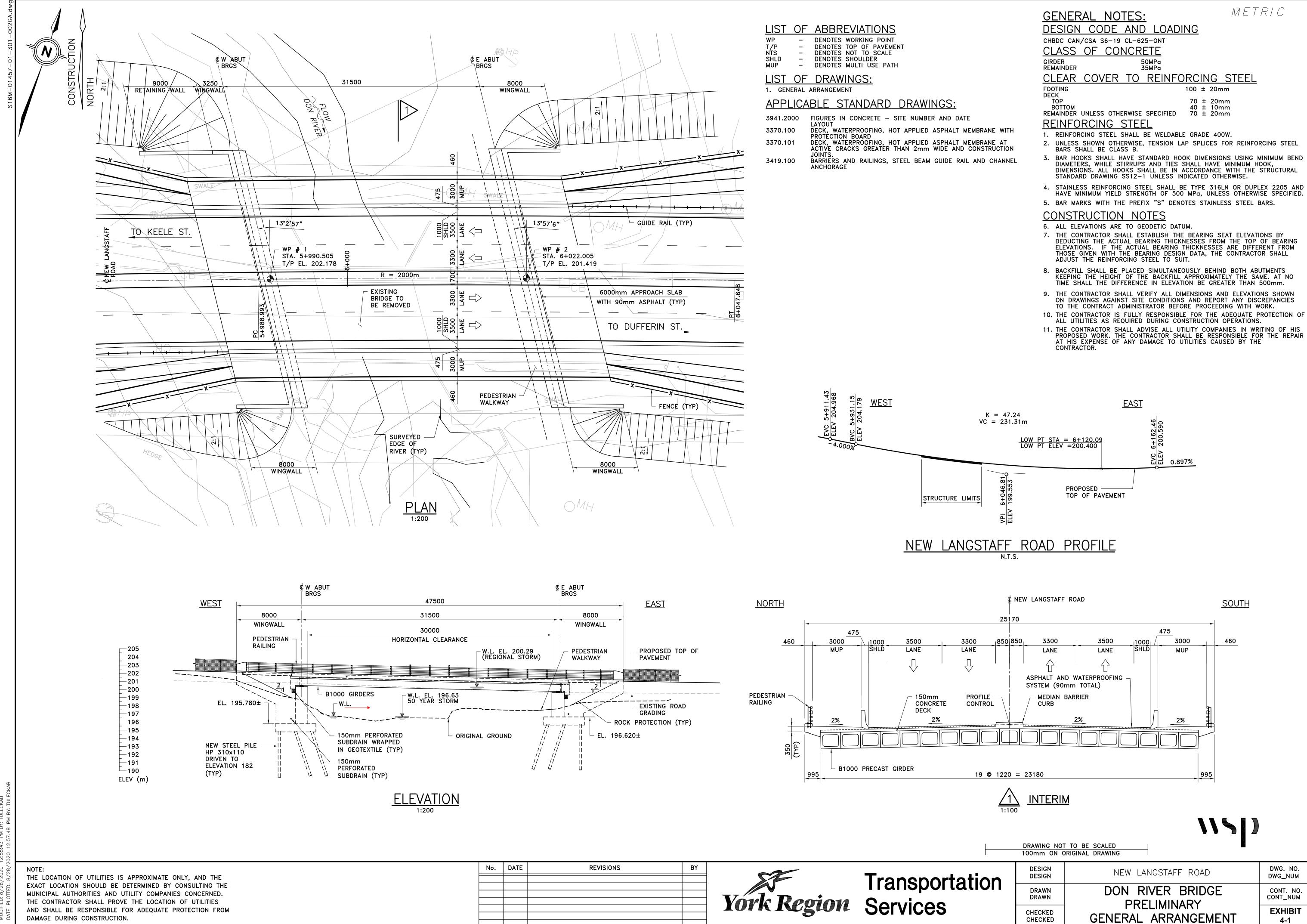




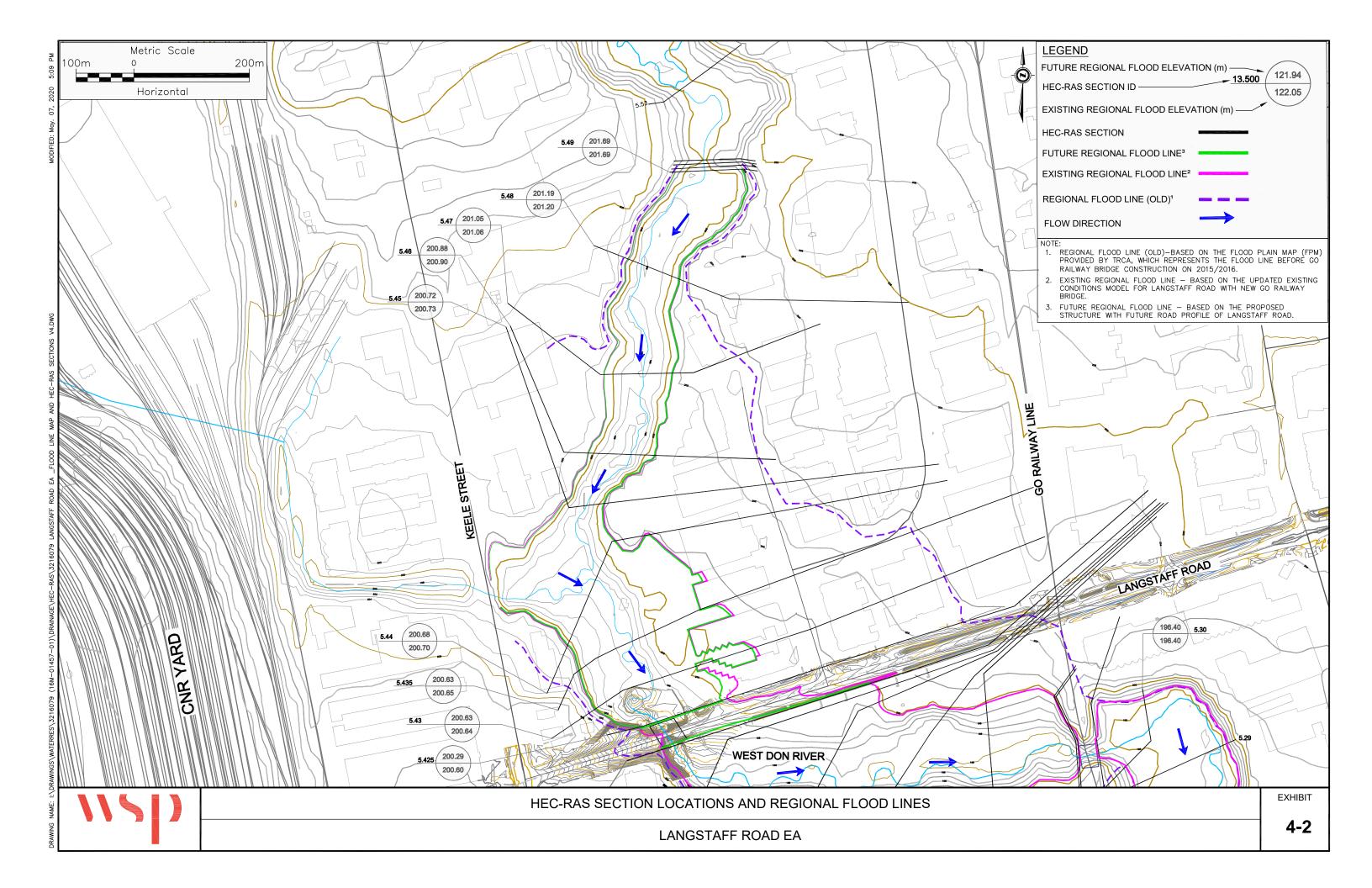


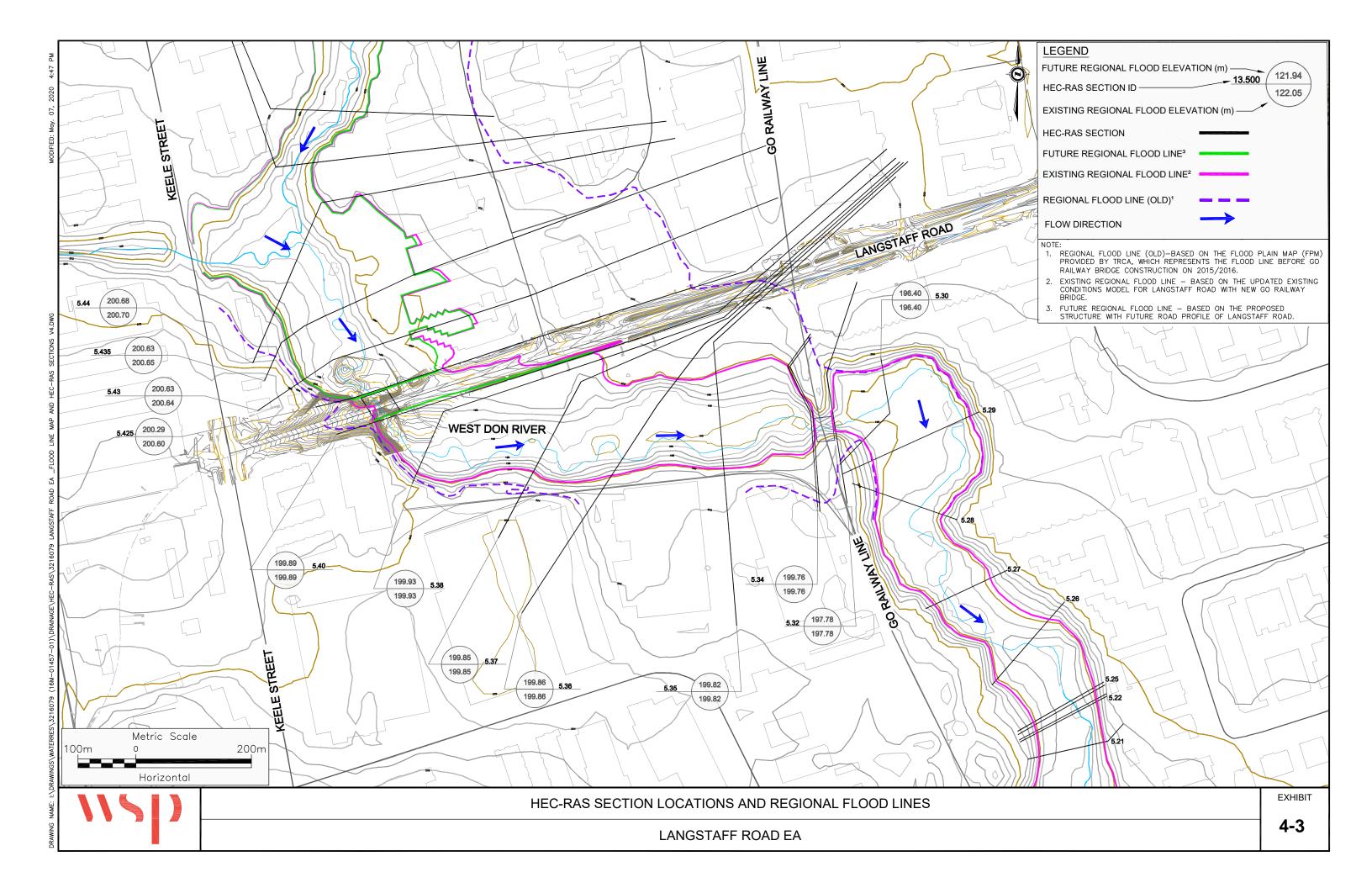


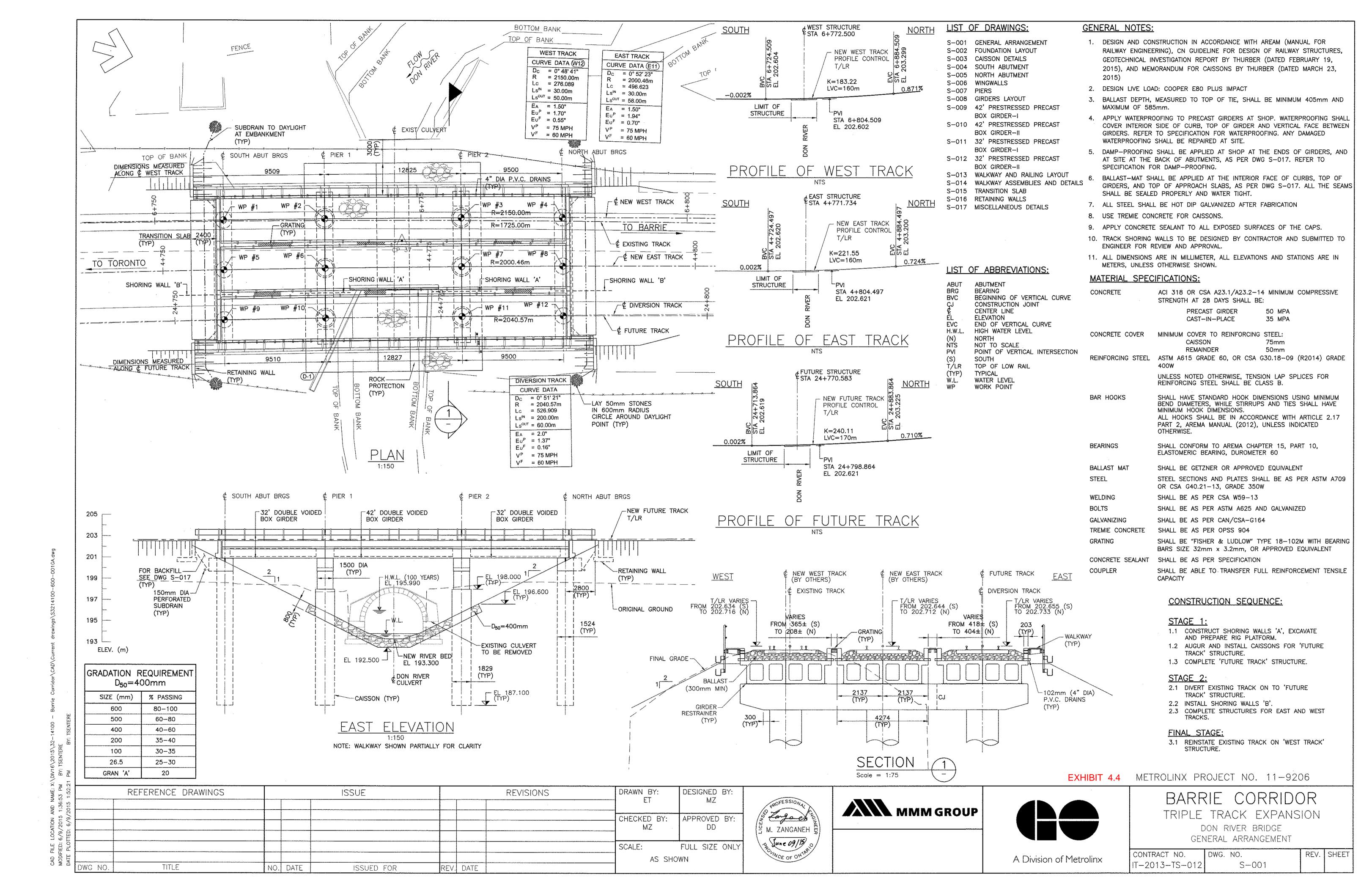




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# **APPENDIX**

A

Site Investigation Photographs



#### Photographic Inventory, May 2, 2018 (Photo 1 to 12)



Photo 1: Black Creek Culvert, Downstream View



Photo 2: Black Creek Culvert, Upstream View





Photo 3: West Don River Bridge (Bowes Bridge), Upstream view

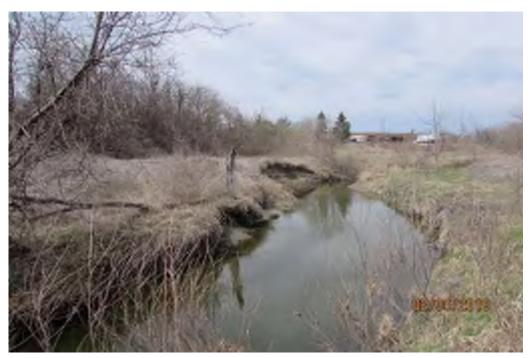


Photo 4: West Don River Channel, Upstream view from Langstaff Road





Photo 5: West Don River Bridge (Bowes Bridge), Downstream view



Photo 6: Storm Outlet on West Don River, East side on downstream of Bridge





Photo 7: Existing Drainage culvert CSP 500 mm near St. 6+340, Upstream view



Photo 8: Existing Drainage culvert CSP 500 mm near St. 6+340, Downstream view





Photo 9: Existing Drainage Culvert Twin CSP 900 mm near St. 7+060, Downstream view



Photo 10: Existing Drainage Culvert Twin CSP 900 mm near St. 7+060, Upstream view







Photo 11: Westminster Creek Culvert, Upstream view



Photo 12: Westminster Creek Culvert, Upstream view



## Photographic Inventory, June 16, 2021 (Photo 13 to 24)



Photo 13: Looking east from Langstaff Road toward CN Property Yard



Photo 14: Looking East toward CNR Property and Road







Photo 15: Looking North from Langstaff Road toward CNR Railway Line (West Side Ditch)



Photo 16: Looking North from Langstaff Road toward CNR Railway Line (East Side Ditch)





Photo 17: Outlet of 1650 mm diameter storm Sewer that crosses Langstaff Road and discharges to a ditch downstream of Langstaff Road in CN Property (Inlet Channel to Existing SWM Pond C)



Photo 18: Close view of 1650 mm diameter Storm Sewer Outlet





Photo 19: Downstream Channel of 1650 mm diameter Outlet, which drains to Existing SWM Pond C



Photo 20: Location of Drainage Features in the Vicinity of CNR Yard







Photo 21 Culvert C1 Upstream View



Photo 22: Culvert C2 Upstream View



## Langstaff Road EA



Photo 23: Culvert C3 Downstream View



Photo 24: Culvert C4 Downstream view

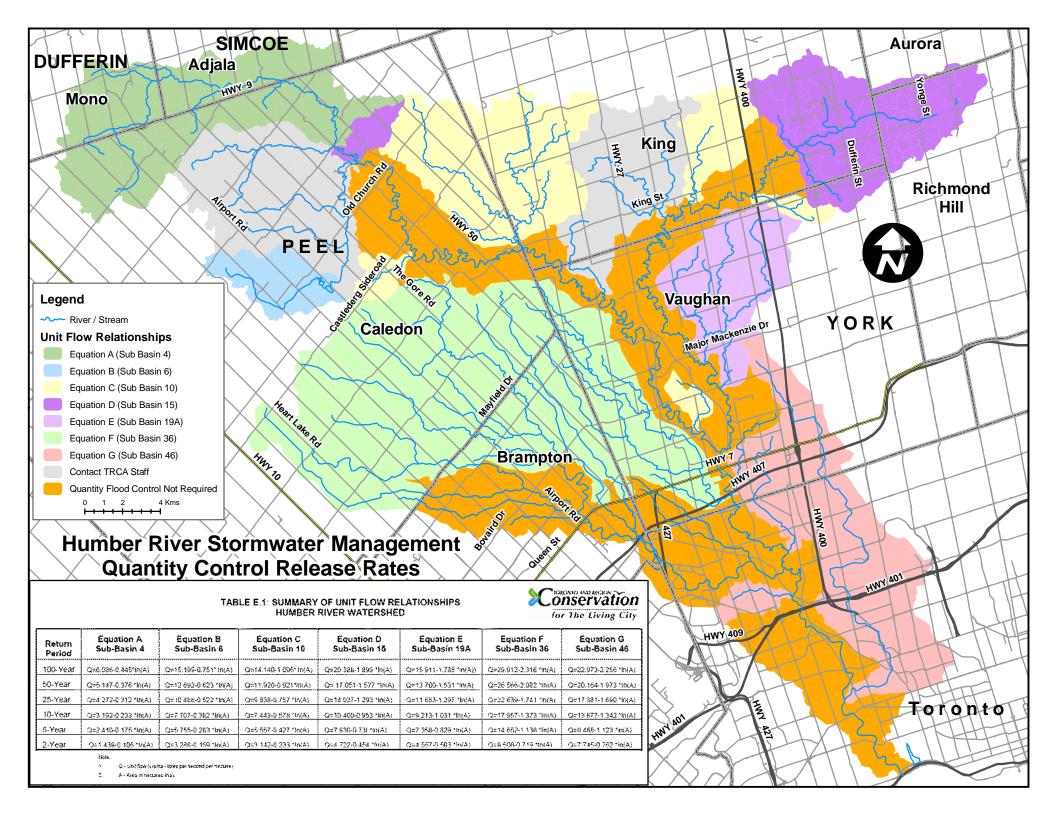
## **APPENDIX**

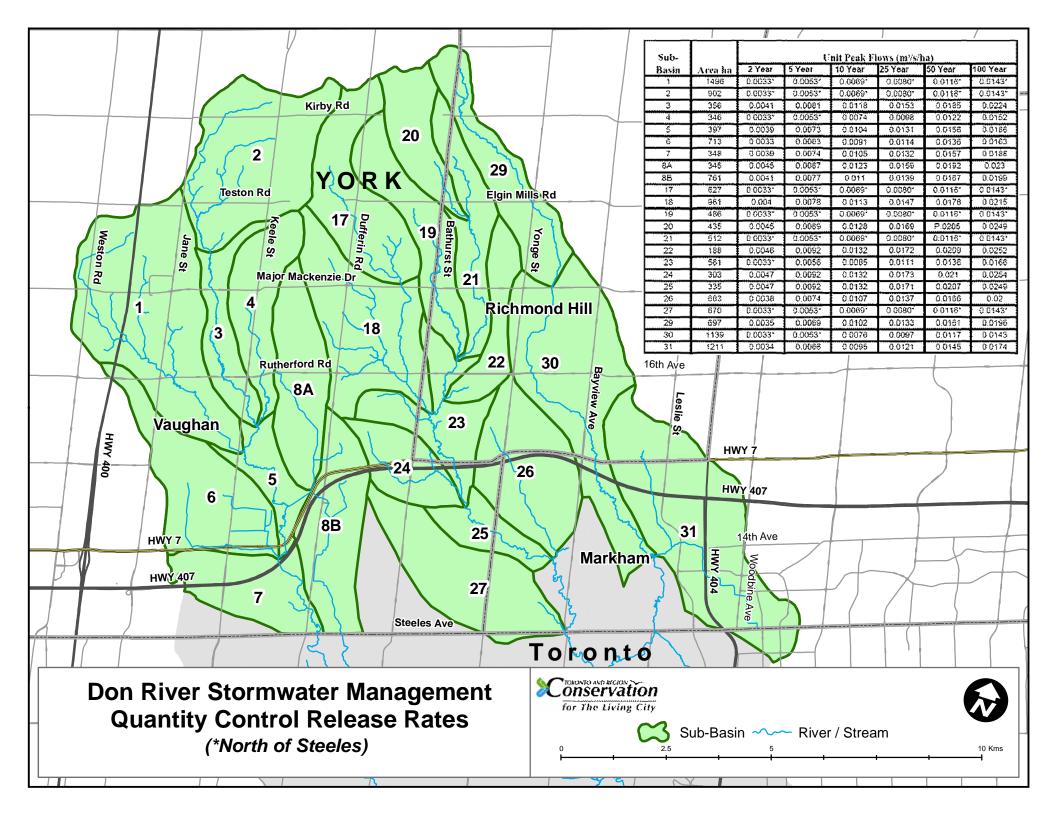
B

**Hydrologic Assessments** 

## York Region Langstaff Road EA

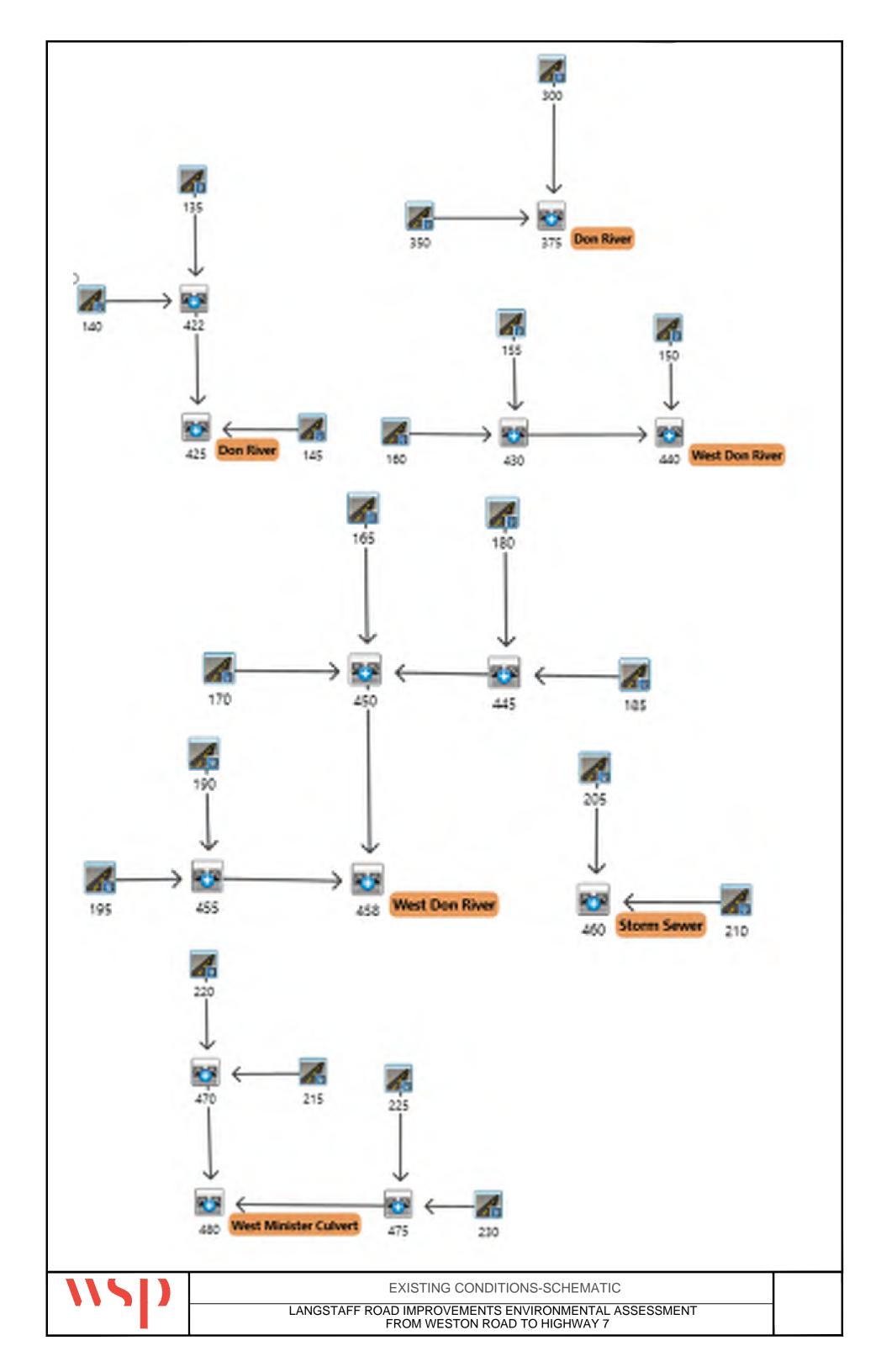
## Unit Flow Rate of Humber River and Don River Watershed





## York Region Langstaff Road EA

# **Existing Conditions Hydrologic Summary**



## **Summary of Existing Conditions Hydrologic Modelling Parameters**

## 16M-01457-01 Langstaff Rd EA

| Sub-         | IUH      | Drainage     |        | • | viousne        | ess |       | SCS             |      | straction        |      | ning's           | Time to         | Number                  |    | Length           |        | lope              | CN            |
|--------------|----------|--------------|--------|---|----------------|-----|-------|-----------------|------|------------------|------|------------------|-----------------|-------------------------|----|------------------|--------|-------------------|---------------|
| Catchment ID | Class    | Area<br>(ha) | Direct |   | (%)<br>ndirect | =   | Total | Curve<br>Number |      | m)<br>Impervious |      | n'<br>Impervious | Peak<br>(hours) | of Linear<br>Reservoirs |    | m)<br>Impervious | (····· | (%)<br>Impervious | CN<br>AMC III |
| 105          | Standard | 1.63         | 61     | + | 0              | =   | 61    | 86              | 5.0  | 2.0              | 0.25 | 0.013            | n/a             | n/a                     | 25 | 650              | 2.0    | 1.0               |               |
| 110          | Standard | 1.58         | 57     | + | 0              | =   | 57    | 85              | 5.0  | 2.0              | 0.25 | 0.013            | n/a             | n/a                     | 25 | 650              | 2.0    | 1.0               |               |
| 115          | Standard | 1.00         | 46     | + | 0              | =   | 46    | 83              | 5.0  | 2.0              | 0.25 | 0.013            | n/a             | n/a                     | 17 | 475              | 2.0    | 1.0               |               |
| 120          | Standard | 1.24         | 57     | + | 0              | =   | 57    | 83              | 5.0  | 2.0              | 0.25 | 0.013            | n/a             | n/a                     | 17 | 475              | 2.0    | 1.0               |               |
| 125          | Standard | 2.27         | 53     | + | 0              | =   | 53    | 83              | 5.0  | 2.0              | 0.25 | 0.013            | n/a             | n/a                     | 20 | 800              | 2.0    | 1.0               |               |
| 130          | Standard | 2.08         | 51     | + | 0              | =   | 51    | 83              | 5.0  | 2.0              | 0.25 | 0.013            | n/a             | n/a                     | 20 | 800              | 2.0    | 1.0               |               |
| 135          | Standard | 1.43         | 39     | + | 0              | =   | 39    | 84              | 5.0  | 2.0              | 0.25 | 0.013            | n/a             | n/a                     | 30 | 503              | 2.0    | 1.0               |               |
| 140          | Standard | 1.27         | 52     | + | 0              | =   | 52    | 83              | 5.0  | 2.0              | 0.25 | 0.013            | n/a             | n/a                     | 25 | 503              | 2.0    | 1.0               |               |
| 145          | Standard | 3.05         | 62     | + | 0              | =   | 62    | 86              | 5.0  | 2.0              | 0.25 | 0.013            | n/a             | n/a                     | 40 | 531              | 2.0    | 1.0               |               |
| 150          | Standard | 3.81         | 94     | + | 0              | =   | 94    | 88              | 5.0  | 2.0              | 0.25 | 0.013            | n/a             | n/a                     | 40 | 150              | 2.0    | 1.0               |               |
| 155          | Standard | 0.56         | 45     | + | 0              | =   | 45    | 87              | 5.0  | 2.0              | 0.29 | 0.013            | n/a             | n/a                     | 25 | 260              | 2.0    | 1.0               |               |
| 160          | Standard | 0.43         | 56     | + | 0              | =   | 56    | 89              | 5.0  | 2.0              | 0.25 | 0.013            | n/a             | n/a                     | 20 | 260              | 2.0    | 1.0               |               |
| 165          | Standard | 0.60         | 40     | + | 0              | =   | 40    | 83              | 5.0  | 2.0              | 0.25 | 0.013            | n/a             | n/a                     | 20 | 250              | 2.0    | 1.0               |               |
| 170          | Standard | 0.43         | 57     | + | 0              | =   | 57    | 89              | 5.0  | 2.0              | 0.25 | 0.013            | n/a             | n/a                     | 20 | 250              | 2.0    | 1.0               |               |
| 180          | Standard | 0.65         | 33     | + | 0              | =   | 33    | 83              | 5.0  | 2.0              | 0.25 | 0.013            | n/a             | n/a                     | 40 | 66               | 2.0    | 1.0               |               |
| 185          | Standard | 0.47         | 48     | + | 0              | =   | 48    | 79              | 5.0  | 2.0              | 0.35 | 0.013            | n/a             | n/a                     | 20 | 240              | 2.0    | 1.0               |               |
| 190          | Standard | 0.86         | 42     | + | 0              | =   | 42    | 83              | 5.0  | 2.0              | 0.25 | 0.013            | n/a             | n/a                     | 50 | 340              | 2.0    | 1.0               |               |
| 195          | Standard | 0.79         | 42     | + | 0              | =   | 42    | 83              | 5.0  | 2.0              | 0.25 | 0.013            | n/a             | n/a                     | 20 | 340              | 2.0    | 1.0               |               |
| 205          | Standard | 1.11         | 38     | + | 0              | =   | 38    | 83              | 5.0  | 2.0              | 0.25 | 0.013            | n/a             | n/a                     | 20 | 470              | 2.0    | 1.0               |               |
| 210          | Standard | 0.96         | 44     | + | 0              | =   | 44    | 83              | 5.0  | 2.0              | 0.25 | 0.013            | n/a             | n/a                     | 20 | 470              | 2.0    | 1.0               |               |
| 215          | Standard | 0.58         | 57     | + | 0              | =   | 57    | 83              | 5.0  | 2.0              | 0.25 | 0.013            | n/a             | n/a                     | 30 | 260              | 2.0    | 1.0               |               |
| 220          | Standard | 0.65         | 46     | + | 0              | =   | 46    | 83              | 5.0  | 2.0              | 0.25 | 0.013            | n/a             | n/a                     | 20 | 260              | 2.0    | 1.0               |               |
| 225          | Standard | 0.90         | 53     | + | 0              | =   | 53    | 83              | 5.0  | 2.0              | 0.25 | 0.013            | n/a             | n/a                     | 25 | 320              | 2.0    | 1.0               |               |
| 230          | Standard | 0.70         | 57     | + | 0              | =   | 57    | 81              | 5.0  | 2.0              | 0.29 | 0.013            | n/a             | n/a                     | 25 | 320              | 2.0    | 1.0               |               |
| 235          | Standard | 0.66         | 67     | + | 0              | =   | 67    | 83              | 5.0  | 2.0              | 0.25 | 0.013            | n/a             | n/a                     | 20 | 320              | 2.0    | 1.0               |               |
| 240          | Standard | 0.72         | 67     | + | 0              | =   | 67    | 83              | 5.0  | 2.0              | 0.25 | 0.013            | n/a             | n/a                     | 20 | 320              | 2.0    | 1.0               |               |
| 350          | Standard | 0.90         | 70     | + | 0              | =   | 70    | 79              | 5.0  | 2.0              | 0.25 | 0.013            | n/a             | n/a                     | 40 | 258              | 2.0    | 1.0               |               |
|              |          |              |        |   |                |     |       |                 |      |                  |      |                  |                 |                         |    |                  |        |                   |               |
| Total/Ave    |          | 41.33        | 63     | + | 0              | =   | 63    | 83              | 5.00 |                  |      |                  |                 |                         |    |                  |        |                   | <u> </u>      |

# Humber River Watershed Visual OTTHYMO Summary - Existing

| ** SIMULATION:Run 02 | **     |
|----------------------|--------|
| *************        | ****** |

| READ STORM       | Filenam | ata\    | Local\Te |        | D<br>92-0edff20f5fb | 5\f5bec23e |
|------------------|---------|---------|----------|--------|---------------------|------------|
| Ptotal= 42.00 mm | Comment | s: 2Y12 |          |        |                     |            |
|                  |         |         |          |        |                     |            |
| TIME             | RAIN    | TIME    | RAIN     | ' TIME | RAIN   TIM          | E RAIN     |
| hrs              | mm/hr   | hrs     | mm/hr    | ' hrs  | mm/hr hr            | s mm/hr    |
| 0.25             | 0.00    | 3.50    | 7.14     | 6.75   | 2.94   10.00        | 0.42       |
| 0.50             | 0.42    | 3.75    | 7.14     | 7.00   | 2.94   10.25        | 0.42       |
| 0.75             | 0.42    | 4.00    | 7.14     | 7.25   | 2.94   10.50        | 0.42       |
| 1 00             | a 12 l  | 1 25    | 7 1/1    | j 7 50 | 1 68   10 75        | 0 12       |

| 0.75 | 0.42 | 4.00 | 7.14  | 7.25 | 2.94 | 10.50 | 0.42 |
|------|------|------|-------|------|------|-------|------|
| 1.00 | 0.42 | 4.25 | 7.14  | 7.50 | 1.68 | 10.75 | 0.42 |
| 1.25 | 0.42 | 4.50 | 19.32 | 7.75 | 1.68 | 11.00 | 0.42 |
| 1.50 | 0.42 | 4.75 | 19.32 | 8.00 | 1.68 | 11.25 | 0.42 |
| 1.75 | 0.42 | 5.00 | 19.32 | 8.25 | 1.68 | 11.50 | 0.42 |
| 2.00 | 0.42 | 5.25 | 19.32 | 8.50 | 0.84 | 11.75 | 0.42 |
| 2.25 | 0.42 | 5.50 | 5.46  | 8.75 | 0.84 | 12.00 | 0.42 |
| 2.50 | 2.52 | 5.75 | 5.46  | 9.00 | 0.84 | 12.25 | 0.42 |
| 2.75 | 2.52 | 6.00 | 5.46  | 9.25 | 0.84 | İ     |      |
| 3.00 | 2.52 | 6.25 | 5.46  | 9.50 | 0.42 | İ     |      |
| 3.25 | 2.52 | 6.50 | 2.94  | 9.75 | 0.42 | İ     |      |
|      |      |      |       |      |      |       |      |

| CALIB             |       |         |       |                |       |
|-------------------|-------|---------|-------|----------------|-------|
| STANDHYD ( 0110)  | Area  | (ha)=   | 1.58  |                |       |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 57.00 | Dir. Conn.(%)= | 57.00 |
|                   |       |         |       |                |       |
|                   |       | IMPERVI | OUS   | PERVIOUS (i)   |       |

|               |       | THE LIVETOUS | I LIVETOUS (I) |
|---------------|-------|--------------|----------------|
| Surface Area  | (ha)= | 0.90         | 0.68           |
| Dep. Storage  | (mm)= | 2.00         | 5.00           |
| Average Slope | (%)=  | 1.00         | 2.00           |
| Length        | (m)=  | 650.00       | 25.00          |
| Mannings n    | =     | 0.013        | 0.250          |
|               |       |              |                |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR/   | ANSFORME | HYETOGRA | APH   |      |       |
|-------|-------|-------|----------|----------|-------|------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME   | RAIN  | TIME | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs    | mm/hr | hrs  | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.52     | 6.250    | 5.46  | 9.33 | 0.42  |
| 0.167 | 0.00  | 3.250 | 2.52     | 6.333    | 2.94  | 9.42 | 0.42  |
| 0.250 | 0.00  | 3.333 | 7.14     | 6.417    | 2.94  | 9.50 | 0.42  |
| 0.333 | 0.42  | 3.417 | 7.14     | 6.500    | 2.94  | 9.58 | 0.42  |
| 0.417 | 0.42  | 3.500 | 7.14     | 6.583    | 2.94  | 9.67 | 0.42  |
| 0.500 | 0.42  | 3.583 | 7.14     | 6.667    | 2.94  | 9.75 | 0.42  |
| 0.583 | 0.42  | 3.667 | 7.14     | 6.750    | 2.94  | 9.83 | 0.42  |

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### ${\tt LangstaffRd\_EA\_Existing\_HumberWatershed}$

| STANDHYD ( 0105)  | Area  | (ha)=   | 1.63  |      |           |       |
|-------------------|-------|---------|-------|------|-----------|-------|
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 61.00 | Dir. | Conn.(%)= | 61.00 |
|                   |       |         |       |      |           |       |

|               |       | IMPERVIOUS | PERVIOUS (1) |
|---------------|-------|------------|--------------|
| Surface Area  | (ha)= | 0.99       | 0.64         |
| Dep. Storage  | (mm)= | 2.00       | 5.00         |
| Average Slope | (%)=  | 1.00       | 2.00         |
| Length        | (m)=  | 650.00     | 25.00        |
| Mannings n    | =     | 0.013      | 0.250        |
|               |       |            |              |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | D HYETOGRA | APH   |       |       |
|-------|-------|-------|----------|------------|-------|-------|-------|
| TIME  | RAIN  |       | RAIN     |            | RAIN  |       | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs      | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.52     | 6.250      | 5.46  | 9.33  | 0.42  |
| 0.167 | 0.00  | 3.250 | 2.52     | 6.333      | 2.94  | 9.42  | 0.42  |
| 0.250 | 0.00  | 3.333 | 7.14     | 6.417      | 2.94  | 9.50  | 0.42  |
| 0.333 | 0.42  | 3.417 | 7.14     | 6.500      | 2.94  | 9.58  | 0.42  |
| 0.417 | 0.42  | 3.500 | 7.14     | 6.583      | 2.94  | 9.67  | 0.42  |
| 0.500 | 0.42  | 3.583 | 7.14     | 6.667      | 2.94  | 9.75  | 0.42  |
| 0.583 | 0.42  | 3.667 | 7.14     |            | 2.94  | 9.83  | 0.42  |
| 0.667 | 0.42  | 3.750 | 7.14     |            | 2.94  | 9.92  | 0.42  |
| 0.750 | 0.42  | 3.833 | 7.14     |            | 2.94  | 10.00 | 0.42  |
| 0.833 | 0.42  | 3.917 | 7.14     |            | 2.94  | 10.08 | 0.42  |
| 0.917 | 0.42  |       | 7.14     |            | 2.94  |       | 0.42  |
| 1.000 | 0.42  |       | 7.14     |            | 2.94  |       | 0.42  |
| 1.083 |       | 4.167 | 7.14     |            | 2.94  |       | 0.42  |
| 1.167 |       | 4.250 | 7.14     |            | 1.68  |       | 0.42  |
| 1.250 | 0.42  | 4.333 | 19.32    |            | 1.68  |       | 0.42  |
| 1.333 |       | 4.417 | 19.32    |            | 1.68  |       | 0.42  |
| 1.417 |       | 4.500 | 19.32    |            | 1.68  |       | 0.42  |
| 1.500 | 0.42  |       | 19.32    |            | 1.68  |       | 0.42  |
| 1.583 | 0.42  | 4.667 | 19.32    |            | 1.68  |       | 0.42  |
| 1.667 |       | 4.750 | 19.32    |            | 1.68  |       | 0.42  |
| 1.750 | 0.42  |       | 19.32    |            | 1.68  |       | 0.42  |
| 1.833 | 0.42  | 4.917 | 19.32    |            | 1.68  |       | 0.42  |
| 1.917 | 0.42  | 5.000 | 19.32    |            | 1.68  |       | 0.42  |
| 2.000 | 0.42  | 5.083 |          | 8.167      | 1.68  |       | 0.42  |
| 2.083 | 0.42  | 5.167 | 19.32    |            | 1.68  |       | 0.42  |
| 2.167 | 0.42  | 5.250 | 19.32    |            | 0.84  |       | 0.42  |
| 2.250 | 0.42  | 5.333 |          | 8.417      | 0.84  |       | 0.42  |
| 2.333 | 2.52  | 5.417 | 5.46     |            | 0.84  | 11.58 | 0.42  |
| 2.417 | 2.52  | 5.500 | 5.46     |            | 0.84  | 11.67 | 0.42  |
| 2.500 | 2.52  | 5.583 |          | 8.667      | 0.84  | 11.75 | 0.42  |
| 2.583 | 2.52  | 5.667 | 5.46     |            | 0.84  | 11.83 | 0.42  |
| 2.667 | 2.52  | 5.750 | 5.46     |            | 0.84  | 11.92 | 0.42  |
| 2.750 | 2.52  | 5.833 | 5.46     |            | 0.84  |       | 0.42  |
| 2.833 | 2.52  | 5.917 |          | 9.000      | 0.84  |       | 0.42  |
| 2.917 | 2.52  | 6.000 | 5.46     |            | 0.84  |       | 0.42  |
| 3.000 | 2.52  | 6.083 | 5.46     |            | 0.84  |       | 0.42  |
| 3.083 | 2.52  | 6.167 | 5.46     | 9.250      | 0.84  |       |       |
|       |       |       | Page     | 3          |       |       |       |

|  | Langs                        | taffRd E                          | A Exist             | ing Humberk             | latersh | ed               |      |
|--|------------------------------|-----------------------------------|---------------------|-------------------------|---------|------------------|------|
| 0.667  | 0.42                         | 3.750                             | 7.14                | 6.833                   | 2.94    | 9.92             | 0.42 |
| 0.750  | 0.42                         | 3.833                             | 7.14                | 6.917                   | 2.94    | 10.00            | 0.42 |
| 0.833  | 0.42                         | 3.917                             | 7.14                | 7.000<br>7.083<br>7.167 | 2.94    | 10.08            | 0.42 |
| 0 917  | 0 42                         | 4 999                             | 7 14                | 7 083                   | 2 94    | 10 17            | 0 42 |
| 1 000  | 0.42                         | 4 083                             | 7 14                | 7 167                   | 2 94    | 10.27            | 0.42 |
| 1 000  | 0.42                         | 1 4.003                           | 7.14                | 7.107                   | 2.04    | 10.23            | 0.42 |
| 1.003  | 0.42                         | 4.107                             | 7.14                | 7.230                   | 1 60    | 10.33            | 0.42 |
| 1.107  | 0.42                         | 4.230                             | 10 22               | 7.250<br>7.333<br>7.417 | 1.00    | 10.42            | 0.42 |
| 1.250  | 0.42                         | 4.333                             | 19.32               | 7.417                   | 1.00    | 10.58            | 0.42 |
| 1.333  | 0.42                         | 4.417                             | 19.32               | 7.500<br>7.583<br>7.667 | 1.00    |                  |      |
| 1.41/  | 0.42                         | 4.500                             | 19.32               | 7.583                   | 1.68    | 10.67<br>  10.75 | 0.42 |
| 1.500  | 0.42                         | 4.583                             | 19.32               | 7.667                   | 1.68    | 10.75            |      |
| 1.583  | 0.42                         | 4.667                             | 19.32               | 7.750<br>7.833<br>7.917 | 1.68    |                  | 0.42 |
| 1.667  | 0.42                         | 4.750                             | 19.32               | 7.833                   | 1.68    | 10.92<br>  11.00 | 0.42 |
| 1.750  | 0.42                         | 4.833                             | 19.32               | 7.917                   | 1.68    |                  |      |
| 1.833  | 0.42                         | 4.917                             | 19.32               | 8.000<br>8.083<br>8.167 | 1.68    | 11.08            | 0.42 |
| 1.917  | 0.42                         | 5.000                             | 19.32               | 8.083                   | 1.68    | 11.17            | 0.42 |
| 2.000  | 0.42                         | 5.083                             | 19.32               | 8.167                   | 1.68    | 11.25            | 0.42 |
| 2.083  | 0.42                         | 5.167                             | 19.32               | 8.250<br>8.333<br>8.417 | 1.68    | 11.33            | 0.42 |
| 2.167  | 0.42                         | 5.250                             | 19.32               | 8.333                   | 0.84    | 11.42            | 0.42 |
| 2.250  | 0.42                         | 5.333                             | 5.46                | 8.417                   | 0.84    | 11.50            | 0.42 |
| 2.333  | 2.52                         | 5.417                             | 5.46                | 8.500                   | 0.84    | 11.58            | 0.42 |
| 2.417  | 2.52                         | 5.500                             | 5.46                | 8.583                   | 0.84    | 11.67            | 0.42 |
| 2.500  | 2.52                         | 5.583                             | 5.46                | 8.500<br>8.583<br>8.667 | 0.84    | 11.75            | 0.42 |
| 2 583  | 2 52                         | 5 667                             | 5 46                | 8 750                   | 0 84    | 11 83            | 0 42 |
| 2 667  | 2 52                         | 5 750                             | 5.46                | 8.750<br>8.833<br>8.917 | 0.01    | 1 11 92          | 0.12 |
| 2.007  | 2.52                         | 5 833                             | 5.46                | 8 917                   | 0.04    | 1 12 00          | 0.42 |
| 2.730  | 2.52                         | D 5.033                           | E 46                | 0.517                   | 0.04    | 12.00            | 0.42 |
| 2.033  | 2.52                         | 5.017                             | E 46                | 9.000<br>9.083<br>9.167 | 0.04    | 12.00            | 0.42 |
| 2.917  | 2.32                         | 0.000                             | 5.40                | 0.003                   | 0.04    | 12.17            | 0.42 |
| 3.000  | 2.52                         | 0.003                             | 5.40                | 9.250                   | 0.04    | 1 12.25          | 0.42 |
| 3.003  | 2.52                         | 0.10/                             | 5.46                | 9.250                   | 0.64    | 1                |      |
| Max.Eff.Inten.(mm/   | hr)=                         | 19.32                             |                     | 10.72                   |         |                  |      |
| over (m<br>Storage Coeff. (m<br>Unit Hyd. Tpeak (m                                       | in)                          | 15.00                             |                     | 30.00                   |         |                  |      |
| Storage Coeff. (m  | in)=                         | 15.16                             | (11)                | 28.16 (11)              |         |                  |      |
| Unit Hyd. Tpeak (m   | in)=                         | 15.00                             |                     | 30.00                   |         |                  |      |
| Unit Hyd. peak (c  | ms)=                         | 0.07                              |                     | 0.04                    |         |                  |      |
|  |                              |                                   |                     |                         |         | TALS*            |      |
| PEAK FLOW (c   |                              | 0.05                              |                     | 0.01                    |         | .060 (iii        | )    |
|  | rs)=                         | 5.25                              |                     | 5.50                    |         | 5.25             |      |
| RUNOFF VOLUME (  | mm)=                         | 40.00<br>42.00                    |                     | 16.73                   | 2       | 9.98             |      |
| TOTAL RAINFALL (   | mm)=                         | 42.00                             |                     | 42.00                   | 4.      | 2.00             |      |
| RUNOFF COEFFICIENT   | =                            | 0.95                              |                     | 0.40                    |         | 0.71             |      |
| (i) CN PROCEDURE<br>CN* = 85.<br>(ii) TIME STEP (D<br>THAN THE STO<br>(iii) PEAK FLOW DO | 0 Ia<br>T) SHOUI<br>RAGE COI | = Dep. S<br>LD BE SMA<br>FFICIENT | Storage<br>ALLER OF | (Above)<br>R EQUAL      |         |                  |      |
| CALIB  |                              |                                   |                     |                         |         |                  |      |

### ${\tt LangstaffRd\_EA\_Existing\_HumberWatershed}$

| Max.Eff.Inten.( | mm/hr)=<br>(min) | 19.32<br>15.00 | 11.18<br>30.00 |             |
|-----------------|------------------|----------------|----------------|-------------|
| Storage Coeff.  |                  | 15.16 (ii)     | 27.95 (ii)     |             |
| Unit Hyd. Tpeak | (min)=           | 15.00          | 30.00          |             |
| Unit Hyd. peak  | (cms)=           | 0.07           | 0.04           |             |
|                 |                  |                |                | *TOTALS*    |
| PEAK FLOW       | (cms)=           | 0.05           | 0.01           | 0.065 (iii) |
| TIME TO PEAK    | (hrs)=           | 5.25           | 5.50           | 5.25        |
| RUNOFF VOLUME   | (mm)=            | 40.00          | 17.47          | 31.20       |
| TOTAL RAINFALL  | (mm)=            | 42.00          | 42.00          | 42.00       |
| RUNOFF COEFFICI | ENT =            | 0.95           | 0.42           | 0.74        |
|                 |                  |                |                |             |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 86.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0400) |      |       |       |      |  |
|-----------------|------|-------|-------|------|--|
| 1 + 2 = 3       | AREA | OPEAK | TPEAK | R.V. |  |

1 + 2 = 3 | AREA OPEAK (ha) (cms) | ID1= 1 ( 0105): 1.63 0.065 | 1D2= 2 ( 0110): 1.58 0.069 | ID = 3 ( 0400): 3.21 0.125 AREA QPEAK TPEAK R.V. (ha) (cms) (hrs) (mm) 1.63 0.065 5.25 31.20 1.58 0.060 5.25 29.98 5.25

| NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY. Area (ha)= 2.27 Total Imp(%)= 53.00 Dir. Conn.(%)= 53.00 IMPERVIOUS PERVIOUS (i)
1.20 1.07
2.00 5.00
1.00 2.00
800.00 20.00
0.013 0.250 Surface Area Dep. Storage Average Slope Length Mannings n (ha)= (mm)= (%)= (m)=

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | IRA   | ANSFURITE | J RIETUUK! | 4PH   |      |      |
|-------|-------|-------|-----------|------------|-------|------|------|
| TIME  | RAIN  | TIME  | RAIN      | ' TIME     | RAIN  | TIME | RAI  |
| hrs   | mm/hr | hrs   | mm/hr     | ' hrs      | mm/hr | hrs  | mm/h |
| 0.083 |       |       |           | 6.250      |       |      |      |
| 0.167 | 0.00  | 3.250 | 2.52      | 6.333      | 2.94  | 9.42 | 0.42 |
|       |       |       |           |            |       |      |      |

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|                    | Lange | taffRd F | Λ Evist | ing Humberv | latarch | od         |      |
|--------------------|-------|----------|---------|-------------|---------|------------|------|
| 0.250              |       | 3.333    |         | 6.417       | 2.94    |            | 0.42 |
| 0.333              | 0.42  |          | 7.14    |             | 2.94    |            | 0.42 |
| 0.417              | 0.42  |          | 7.14    |             | 2.94    |            | 0.42 |
| 0.500              | 0.42  |          | 7.14    |             | 2.94    |            | 0.42 |
| 0.583              | 0.42  |          | 7.14    |             | 2.94    |            | 0.42 |
| 0.667              | 0.42  |          | 7.14    |             | 2.94    |            | 0.42 |
| 0.750              |       | 3.833    | 7.14    |             | 2.94    |            | 0.42 |
|                    |       |          |         |             |         |            | 0.42 |
| 0.833              |       | 3.917    | 7.14    |             | 2.94    |            |      |
| 0.917              |       | 4.000    | 7.14    |             | 2.94    |            | 0.42 |
| 1.000              | 0.42  |          | 7.14    |             | 2.94    |            | 0.42 |
| 1.083              |       | 4.167    | 7.14    |             | 2.94    |            | 0.42 |
| 1.167              |       | 4.250    | 7.14    |             | 1.68    |            | 0.42 |
| 1.250              |       | 4.333    | 19.32   |             | 1.68    |            | 0.42 |
| 1.333              |       | 4.417    | 19.32   |             | 1.68    |            | 0.42 |
| 1.417              |       | 4.500    | 19.32   |             | 1.68    |            | 0.42 |
| 1.500              |       | 4.583    | 19.32   |             | 1.68    |            | 0.42 |
| 1.583              |       | 4.667    | 19.32   |             | 1.68    |            | 0.42 |
| 1.667              | 0.42  |          | 19.32   |             | 1.68    |            | 0.42 |
| 1.750              |       | 4.833    |         | 7.917       | 1.68    |            | 0.42 |
| 1.833              |       | 4.917    | 19.32   |             | 1.68    |            | 0.42 |
| 1.917              | 0.42  | 5.000    | 19.32   | 8.083       | 1.68    | 11.17      | 0.42 |
| 2.000              | 0.42  | 5.083    | 19.32   | 8.167       | 1.68    | 11.25      | 0.42 |
| 2.083              | 0.42  | 5.167    | 19.32   | 8.250       | 1.68    | 11.33      | 0.42 |
| 2.167              | 0.42  | 5.250    | 19.32   | 8.333       | 0.84    | 11.42      | 0.42 |
| 2.250              | 0.42  | 5.333    | 5.46    | 8.417       | 0.84    | 11.50      | 0.42 |
| 2.333              | 2.52  | 5.417    | 5.46    | 8.500       | 0.84    | 11.58      | 0.42 |
| 2.417              | 2.52  | 5.500    | 5.46    | 8.583       | 0.84    | 11.67      | 0.42 |
| 2.500              | 2.52  | 5.583    | 5.46    | 8.667       | 0.84    | 11.75      | 0.42 |
| 2.583              | 2.52  | 5.667    | 5.46    | 8.750       | 0.84    | 11.83      | 0.42 |
| 2.667              | 2.52  | 5.750    | 5.46    | 8.833       | 0.84    | 11.92      | 0.42 |
| 2.750              | 2.52  | 5.833    | 5.46    | 8.917       | 0.84    | 12.00      | 0.42 |
| 2.833              | 2.52  | 5.917    | 5.46    | 9.000       | 0.84    | 12.08      | 0.42 |
| 2.917              |       | 6.000    | 5.46    |             | 0.84    |            | 0.42 |
| 3.000              | 2.52  |          | 5.46    |             | 0.84    |            | 0.42 |
| 3.083              |       | 6.167    | 5.46    |             | 0.84    |            |      |
| M F.C. T (         | (1)   | 40.33    |         | 0.07        |         |            |      |
| Max.Eff.Inten.(mm/ |       | 19.32    |         | 9.87        |         |            |      |
| over (r            |       | 15.00    |         | 30.00       |         |            |      |
|                    | nin)= | 17.17    | (11)    | 28.93 (ii)  |         |            |      |
| Unit Hyd. Tpeak (r |       | 15.00    |         | 30.00       |         |            |      |
| Unit Hyd. peak (d  | cms)= | 0.07     |         | 0.04        | *****   | TALS*      |      |
| PEAK FLOW (        | ems)= | 0.06     |         | 0.02        |         | .081 (iii) |      |
|                    | nrs)= | 5.25     |         | 5.50        |         | 5.25       |      |
|                    | (mm)= | 40.00    |         | 15.38       |         | 8.42       |      |
|                    | (mm)= | 42.00    |         | 42.00       |         | 2.00       |      |
| RUNOFF COEFFICIENT |       | 0.95     |         | 0.37        |         | 2.68       |      |
| NONOTT COEFFICIENT | -     | 0.55     |         | 0.57        | ,       |            |      |

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| 2.750 2.55<br>2.833 2.55<br>2.917 2.55<br>3.000 2.55<br>3.083 2.55  | 2   5.833   | 6   8.917   0.84<br>6   9.000   0.84<br>6   9.083   0.84<br>6   9.167   0.84<br>6   9.250   0.84 | 12.00   0.42   12.08   0.42   12.17   0.42   12.25   0.42 |  |  |  |  |  |  |
|---|---|--|---|--|--|--|--|--|--|
| <pre>Max.Eff.Inten.(mm/hr)=</pre>   | 19.32<br>15.00<br>17.17 (ii)<br>15.00<br>0.07         | 30.00<br>28.93 (ii)<br>30.00<br>0.04   | OTALS*  |  |  |  |  |  |  |
| PEAK FLOW (cms)= TIME TO PEAK (hrs)= RUNOFF VOLUME (mm)= TOTAL RAINFALL (mm)= RUNOFF COEFFICIENT =  | 0.06<br>5.25<br>40.00<br>42.00<br>0.95                | 0.02<br>5.50<br>15.38<br>42.00<br>0.37   | 0.072 (iii)<br>5.25<br>27.93<br>42.00<br>0.66             |  |  |  |  |  |  |
| (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  CN* = 83.0 Ia = Dep. Storage (Above)  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  THAN THE STORAGE COEFICIENT.  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY. |   |  |   |  |  |  |  |  |  |
| ADD HYD ( 0405) <br>  1 + 2 = 3  <br>   | AREA QPEAK<br>(ha) (cms)<br>2.27 0.081<br>2.08 0.072  | TPEAK R.V.<br>(hrs) (mm)<br>5.25 28.42<br>5.25 27.93   |   |  |  |  |  |  |  |
| ID = 3 ( 0405):  NOTE: PEAK FLOWS DO NO   | 4.35 0.153  | 5.25 28.19   |   |  |  |  |  |  |  |
| CALIB   | (ha)= 1.24  |  |   |  |  |  |  |  |  |
|   | IMPERVIOUS<br>0.71<br>2.00<br>1.00<br>475.00<br>0.013 | PERVIOUS (i)<br>0.53<br>5.00<br>2.00<br>17.00<br>0.250   |   |  |  |  |  |  |  |
| NOTE: RAINFALL WAS  |   |  | TEP.  |  |  |  |  |  |  |

 $LangstaffRd\_EA\_Existing\_HumberWatershed \\ (iii) \ PEAK \ FLOW \ DOES \ NOT \ INCLUDE \ BASEFLOW \ IF \ ANY.$ 

| CALIB             |         |          |        |                |       |
|-------------------|---------|----------|--------|----------------|-------|
| STANDHYD ( 0130)  | Area    | (ha)=    | 2.08   |                |       |
| ID= 1 DT= 5.0 min | Total   | Imp(%)=  | 51.00  | Dir. Conn.(%)= | 51.00 |
| ·                 |         |          |        |                |       |
|                   |         | IMPERVI  | OUS    | PERVIOUS (i)   |       |
| Surface Area      | (ha)=   | 1.0      | 6      | 1.02           |       |
| Dep. Storage      | (mm)=   | 2.0      | 0      | 5.00           |       |
| Average Slope     | (%)=    | 1.0      | 0      | 2.00           |       |
| Length            | (m)=    | 800.0    | 0      | 20.00          |       |
| Mannings n        | ` =     | 0.01     | 3      | 0.250          |       |
|                   |         |          |        |                |       |
| NOTE: RAINF       | ALL WAS | TRANSFOR | MED TO | 5.0 MIN. TIME  | STEP. |

|       | TRANSFORMED HYETOGRAPH |       |       |        |       |       |       |  |  |  |  |
|-------|------------------------|-------|-------|--------|-------|-------|-------|--|--|--|--|
| TIME  | RAIN                   | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |  |  |  |
| hrs   | mm/hr                  | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |  |  |  |
| 0.083 | 0.00                   | 3.167 | 2.52  | 6.250  | 5.46  | 9.33  | 0.42  |  |  |  |  |
| 0.167 | 0.00                   | 3.250 | 2.52  | 6.333  | 2.94  | 9.42  | 0.42  |  |  |  |  |
| 0.250 | 0.00                   | 3.333 | 7.14  | 6.417  | 2.94  | 9.50  | 0.42  |  |  |  |  |
| 0.333 | 0.42                   | 3.417 | 7.14  | 6.500  | 2.94  | 9.58  | 0.42  |  |  |  |  |
| 0.417 | 0.42                   | 3.500 | 7.14  | 6.583  | 2.94  | 9.67  | 0.42  |  |  |  |  |
| 0.500 | 0.42                   | 3.583 | 7.14  | 6.667  | 2.94  | 9.75  | 0.42  |  |  |  |  |
| 0.583 | 0.42                   | 3.667 | 7.14  | 6.750  | 2.94  | 9.83  | 0.42  |  |  |  |  |
| 0.667 | 0.42                   | 3.750 | 7.14  | 6.833  | 2.94  | 9.92  | 0.42  |  |  |  |  |
| 0.750 | 0.42                   | 3.833 | 7.14  | 6.917  | 2.94  | 10.00 | 0.42  |  |  |  |  |
| 0.833 | 0.42                   | 3.917 | 7.14  | 7.000  | 2.94  | 10.08 | 0.42  |  |  |  |  |
| 0.917 | 0.42                   | 4.000 | 7.14  | 7.083  | 2.94  | 10.17 | 0.42  |  |  |  |  |
| 1.000 | 0.42                   | 4.083 | 7.14  | 7.167  | 2.94  | 10.25 | 0.42  |  |  |  |  |
| 1.083 | 0.42                   | 4.167 | 7.14  | 7.250  | 2.94  | 10.33 | 0.42  |  |  |  |  |
| 1.167 | 0.42                   | 4.250 | 7.14  | 7.333  | 1.68  | 10.42 | 0.42  |  |  |  |  |
| 1.250 | 0.42                   | 4.333 | 19.32 | 7.417  | 1.68  | 10.50 | 0.42  |  |  |  |  |
| 1.333 | 0.42                   | 4.417 | 19.32 | 7.500  | 1.68  | 10.58 | 0.42  |  |  |  |  |
| 1.417 | 0.42                   | 4.500 | 19.32 | 7.583  | 1.68  | 10.67 | 0.42  |  |  |  |  |
| 1.500 | 0.42                   | 4.583 | 19.32 | 7.667  | 1.68  | 10.75 | 0.42  |  |  |  |  |
| 1.583 | 0.42                   | 4.667 | 19.32 | 7.750  | 1.68  | 10.83 | 0.42  |  |  |  |  |
| 1.667 | 0.42                   | 4.750 | 19.32 | 7.833  | 1.68  | 10.92 | 0.42  |  |  |  |  |
| 1.750 | 0.42                   | 4.833 | 19.32 | 7.917  | 1.68  | 11.00 | 0.42  |  |  |  |  |
| 1.833 | 0.42                   | 4.917 | 19.32 | 8.000  | 1.68  | 11.08 | 0.42  |  |  |  |  |
| 1.917 | 0.42                   | 5.000 | 19.32 | 8.083  | 1.68  | 11.17 | 0.42  |  |  |  |  |
| 2.000 | 0.42                   | 5.083 | 19.32 | 8.167  | 1.68  | 11.25 | 0.42  |  |  |  |  |
| 2.083 | 0.42                   | 5.167 | 19.32 | 8.250  | 1.68  | 11.33 | 0.42  |  |  |  |  |
| 2.167 | 0.42                   | 5.250 | 19.32 | 8.333  | 0.84  | 11.42 | 0.42  |  |  |  |  |
| 2.250 | 0.42                   | 5.333 | 5.46  | 8.417  | 0.84  | 11.50 | 0.42  |  |  |  |  |
| 2.333 | 2.52                   | 5.417 | 5.46  | 8.500  | 0.84  | 11.58 | 0.42  |  |  |  |  |
| 2.417 | 2.52                   | 5.500 | 5.46  | 8.583  | 0.84  | 11.67 | 0.42  |  |  |  |  |
| 2.500 | 2.52                   | 5.583 | 5.46  | 8.667  | 0.84  | 11.75 | 0.42  |  |  |  |  |
| 2.583 | 2.52                   | 5.667 | 5.46  | 8.750  | 0.84  | 11.83 | 0.42  |  |  |  |  |
| 2.667 | 2.52                   | 5.750 | 5.46  | 8.833  | 0.84  | 11.92 | 0.42  |  |  |  |  |

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| LangstaffRd EA Existing HumberWatershed |              |                |              |                |       |            |       |  |  |  |
|---|--------------|----------------|--------------|----------------|-------|------------|-------|--|--|--|
|   | 201183       |                |              | D HYETOGRA     |       |            |       |  |  |  |
| TIME                                    | RAIN         | I TIME         | RAIN         |                | RAIN  |            | RAIN  |  |  |  |
| hrs                                     | mm/hr        |                |              | l' hrs         | mm/hr |            | mm/hr |  |  |  |
| 0.083                                   | 0.00         | 3.167          |              | 6.250          | 5.46  |            | 0.42  |  |  |  |
| 0.167                                   | 0.00         |                |              | 6.333          | 2.94  |            | 0.42  |  |  |  |
| 0.167                                   | 0.00         |                | 7.14         |                | 2.94  |            | 0.42  |  |  |  |
|   |              |                |              |                | 2.94  |            |       |  |  |  |
| 0.333                                   | 0.42         |                |              | 6.500          |       |            | 0.42  |  |  |  |
| 0.417                                   | 0.42         | 3.500          |              | 6.583          | 2.94  |            | 0.42  |  |  |  |
| 0.500                                   | 0.42         |                | 7.14<br>7.14 |                | 2.94  |            | 0.42  |  |  |  |
| 0.583<br>0.667                          | 0.42<br>0.42 | 3.667<br>3.750 | 7.14         | 6.750          | 2.94  | 9.83       | 0.42  |  |  |  |
| 0.750                                   | 0.42         |                | 7.14         |                | 2.94  |            | 0.42  |  |  |  |
|   |              |                |              |                |       |            |       |  |  |  |
| 0.833                                   | 0.42         |                | 7.14         | 7.000          | 2.94  |            | 0.42  |  |  |  |
| 0.917                                   | 0.42         |                | 7.14         | 7.083<br>7.167 | 2.94  |            | 0.42  |  |  |  |
| 1.000                                   | 0.42         |                | 7.14         |                |       |            | 0.42  |  |  |  |
| 1.083                                   | 0.42         |                | 7.14         | 7.250          | 2.94  |            | 0.42  |  |  |  |
| 1.167                                   | 0.42         |                | 7.14         | 7.333          | 1.68  |            | 0.42  |  |  |  |
| 1.250                                   | 0.42         |                | 19.32        | 7.417          | 1.68  |            | 0.42  |  |  |  |
| 1.333                                   |              | 4.417          | 19.32        |                | 1.68  |            | 0.42  |  |  |  |
| 1.417                                   | 0.42         |                | 19.32        |                | 1.68  |            | 0.42  |  |  |  |
| 1.500                                   | 0.42         |                | 19.32        |                | 1.68  |            | 0.42  |  |  |  |
| 1.583                                   |              | 4.667          | 19.32        |                | 1.68  |            | 0.42  |  |  |  |
| 1.667                                   | 0.42         |                | 19.32        | 7.833          | 1.68  |            | 0.42  |  |  |  |
| 1.750                                   | 0.42         |                | 19.32        | 7.917          | 1.68  |            | 0.42  |  |  |  |
| 1.833                                   |              | 4.917          | 19.32        |                | 1.68  |            | 0.42  |  |  |  |
| 1.917                                   | 0.42         |                | 19.32        |                | 1.68  |            | 0.42  |  |  |  |
| 2.000                                   | 0.42         |                | 19.32        |                | 1.68  |            | 0.42  |  |  |  |
| 2.083                                   | 0.42         | 5.167          | 19.32        | 8.250          | 1.68  |            | 0.42  |  |  |  |
| 2.167                                   | 0.42         |                | 19.32        |                | 0.84  |            | 0.42  |  |  |  |
| 2.250                                   | 0.42         |                | 5.46         |                | 0.84  |            | 0.42  |  |  |  |
| 2.333                                   | 2.52         | 5.417          | 5.46         |                | 0.84  |            | 0.42  |  |  |  |
| 2.417                                   | 2.52         | 5.500          | 5.46         |                | 0.84  |            | 0.42  |  |  |  |
| 2.500                                   | 2.52         |                | 5.46         |                | 0.84  |            | 0.42  |  |  |  |
| 2.583                                   | 2.52         | 5.667          | 5.46         |                | 0.84  |            | 0.42  |  |  |  |
| 2.667                                   | 2.52         | 5.750          | 5.46         |                | 0.84  |            | 0.42  |  |  |  |
| 2.750                                   | 2.52         |                | 5.46         |                | 0.84  |            | 0.42  |  |  |  |
| 2.833                                   | 2.52         | 5.917          | 5.46         |                | 0.84  |            | 0.42  |  |  |  |
| 2.917                                   | 2.52         | 6.000          | 5.46         |                | 0.84  |            | 0.42  |  |  |  |
| 3.000                                   | 2.52         | 6.083          | 5.46         |                | 0.84  |            | 0.42  |  |  |  |
| 3.083                                   | 2.52         | 6.167          | 5.46         | 9.250          | 0.84  |            |       |  |  |  |
|   |              |                |              |                |       |            |       |  |  |  |
| Max.Eff.Inten.(mm                       |              | 19.32          |              | 9.87           |       |            |       |  |  |  |
| over (                                  |              | 15.00          |              | 25.00          |       |            |       |  |  |  |
|   | min)=        | 12.56          |              | 23.22 (ii)     |       |            |       |  |  |  |
| Unit Hyd. Tpeak (                       |              | 15.00          |              | 25.00          |       |            |       |  |  |  |
| Unit Hyd. peak (                        | cms)=        | 0.08           |              | 0.05           |       |            |       |  |  |  |
|   |              |                |              |                |       | TALS*      |       |  |  |  |
|   | cms)=        | 0.04           |              | 0.01           |       | .048 (iii) |       |  |  |  |
|   | hrs)=        | 5.25           |              | 5.42           |       | 5.25       |       |  |  |  |
| RUNOFF VOLUME                           | (mm)=        | 40.00          |              | 15.38          |       | .40        |       |  |  |  |
| TOTAL RAINFALL                          | (mm)=        | 42.00          |              | 42.00          |       | 2.00       |       |  |  |  |
| RUNOFF COEFFICIEN                       | T =          | 0.95           |              | 0.37           | 6     | 9.70       |       |  |  |  |
|   |              |                |              |                |       |            |       |  |  |  |

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 83.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COFFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB | CALIB | STANDHYD ( 0115)| |ID= 1 DT= 5.0 min | Area (ha)= 1.00 Total Imp(%)= 46.00 Dir. Conn.(%)= 46.00 IMPERVIOUS PERVIOUS (i) (ha)= (mm)= (%)= (m)= 0.54 5.00 2.00 Surface Area 0.46 2.00 Dep. Storage Average Slope Length Mannings n 1.00 17.00 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | D HYETOGR | APH   |       |       |
|-------|-------|-------|----------|-----------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME    | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs     | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.52     | 6.250     | 5.46  | 9.33  | 0.42  |
| 0.167 | 0.00  | 3.250 | 2.52     | 6.333     | 2.94  | 9.42  | 0.42  |
| 0.250 | 0.00  | 3.333 | 7.14     | 6.417     | 2.94  | 9.50  | 0.42  |
| 0.333 | 0.42  | 3.417 | 7.14     | 6.500     | 2.94  | 9.58  | 0.42  |
| 0.417 | 0.42  | 3.500 | 7.14     | 6.583     | 2.94  | 9.67  | 0.42  |
| 0.500 | 0.42  | 3.583 | 7.14     | 6.667     | 2.94  | 9.75  | 0.42  |
| 0.583 | 0.42  | 3.667 | 7.14     | 6.750     | 2.94  | 9.83  | 0.42  |
| 0.667 | 0.42  | 3.750 | 7.14     | 6.833     | 2.94  | 9.92  | 0.42  |
| 0.750 | 0.42  | 3.833 | 7.14     | 6.917     | 2.94  | 10.00 | 0.42  |
| 0.833 | 0.42  | 3.917 | 7.14     | 7.000     | 2.94  | 10.08 | 0.42  |
| 0.917 | 0.42  | 4.000 | 7.14     | 7.083     | 2.94  | 10.17 | 0.42  |
| 1.000 | 0.42  | 4.083 | 7.14     | 7.167     | 2.94  | 10.25 | 0.42  |
| 1.083 | 0.42  | 4.167 | 7.14     | 7.250     | 2.94  | 10.33 | 0.42  |
| 1.167 | 0.42  | 4.250 | 7.14     | 7.333     | 1.68  | 10.42 | 0.42  |
| 1.250 | 0.42  | 4.333 | 19.32    | 7.417     | 1.68  | 10.50 | 0.42  |
| 1.333 | 0.42  | 4.417 | 19.32    | 7.500     | 1.68  | 10.58 | 0.42  |
| 1.417 | 0.42  | 4.500 | 19.32    | 7.583     | 1.68  | 10.67 | 0.42  |
| 1.500 | 0.42  | 4.583 | 19.32    | 7.667     | 1.68  | 10.75 | 0.42  |
| 1.583 | 0.42  | 4.667 | 19.32    | 7.750     | 1.68  | 10.83 | 0.42  |
| 1.667 | 0.42  | 4.750 | 19.32    | 7.833     | 1.68  | 10.92 | 0.42  |
| 1.750 | 0.42  | 4.833 | 19.32    | 7.917     | 1.68  | 11.00 | 0.42  |
| 1.833 | 0.42  | 4.917 | 19.32    | 8.000     | 1.68  | 11.08 | 0.42  |
| 1.917 | 0.42  | 5.000 | 19.32    | 8.083     | 1.68  | 11.17 | 0.42  |
| 2.000 | 0.42  | 5.083 | 19.32    | 8.167     | 1.68  | 11.25 | 0.42  |
| 2.083 | 0.42  | 5.167 | 19.32    | 8.250     | 1.68  | 11.33 | 0.42  |
| 2.167 | 0.42  | 5.250 | 19.32    | 8.333     | 0.84  | 11.42 | 0.42  |
| 2.250 | 0.42  | 5.333 | 5.46     | 8.417     | 0.84  | 11.50 | 0.42  |

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| ******            | ******         | **           |          |           |          |                |        |
|-------------------|----------------|--------------|----------|-----------|----------|----------------|--------|
|                   |                |              |          |           |          |                |        |
| READ STORM        | Filenar        | ne: C:\U     | sers\rav | .zhao\App | D        |                |        |
|                   |                |              | Local\Te |           |          |                |        |
| i                 |                |              |          | e-4ce0-8b | 92-0edff | 20f5fb5\       | 4ca76b |
| Ptotal= 54.38 mm  | Comment        | s: 5Y12      |          |           |          |                |        |
|                   |                |              |          |           |          |                |        |
| TIM               |                |              | RAIN     |           | RAIN     |                | RA:    |
| hr                |                | hrs          |          | ' hrs     |          |                |        |
|                   | 9.00           |              |          |           |          | 10.00          |        |
|                   | 0.54           |              |          |           |          | 10.25          |        |
|                   | 5 0.54         |              |          |           |          | 10.50          |        |
|                   | 0.54           |              |          |           |          | 10.75          |        |
|                   | 0.54           |              |          | 7.75      |          | 11.00          |        |
|                   | 0.54           |              |          | 8.00      |          | 11.25          |        |
|                   | 0.54           |              |          | 8.25      |          | 11.50          |        |
|                   | 0.54           |              |          | 8.50      |          | 11.75<br>12.00 |        |
|                   | 9.54<br>0 3.26 |              |          |           |          | 12.25          |        |
|                   | 5 3.26         |              |          |           |          |                | 0.5    |
| 3.6               | 0 3.26         | 6 25         | 7.07     | 9.50      | 0.54     |                |        |
|                   | 5 3.26         |              |          | 9.75      |          |                |        |
| 3.2               | 3.20           | 0.50         | 3.01     | 1 3173    | 0.54     |                |        |
|                   |                |              |          |           |          |                |        |
|                   |                |              |          |           |          |                |        |
|                   |                |              |          |           |          |                |        |
| CALIB             |                |              |          |           |          |                |        |
| STANDHYD ( 0110)  | Area           | (ha)=        | 1.58     |           |          |                |        |
| ID= 1 DT= 5.0 min | Total In       | np(%)=       | 57.00    | Dir. Conn | .(%)= 5  | 7.00           |        |
|                   |                |              |          |           |          |                |        |
|                   |                | [MPERVIO     |          | RVIOUS (i | )        |                |        |
| Surface Area      |                | 0.90         |          | 0.68      |          |                |        |
| Dep. Storage      | (mm)=          | 2.00<br>1.00 |          | 5.00      |          |                |        |
| Average Slope     | (%)=           | 1.00         |          | 2.00      |          |                |        |

(m)=

0.013

Mannings n

LangstaffRd\_EA\_Existing\_HumberWatershed NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| NOTE: | RAINFAL | L WAS TI | RANSFORME | D TO     | 5.0 MIN.  | TIME STE | Р.    |       |
|-------|---------|----------|-----------|----------|-----------|----------|-------|-------|
|       |         |          | TRA       | ANSFORME | D HYFTOGR | APH      |       |       |
|       | TIME    | RAIN     | l TIME    | RAIN     | l' TIME   | RAIN     | TIME  | RAIN  |
|       | hrs     | mm/hr    | hrs       | mm/hr    | i' hrs    | mm/hr    | i hrs | mm/hr |
|       | 0.083   | 0.00     | 3.167     | 3.26     | 6.250     | 7.07     | 9.33  | 0.54  |
|       | 0.167   | 0.00     | 3.250     | 3.26     | 6.333     | 3.81     | 9.42  | 0.54  |
|       | 0.250   | 0.00     | 3.333     | 9.25     | 6.417     | 3.81     | 9.50  | 0.54  |
|       | 0.333   | 0.54     | 3.417     | 9.25     | 6.500     | 3.81     | 9.58  | 0.54  |
|       | 0.417   | 0.54     | 3.500     | 9.25     | 6.583     | 3.81     | 9.67  | 0.54  |
|       |         |          |           | Page     | 11        |          |       |       |

0.250

```
Natershed
0.84 | 11.58
0.84 | 11.67
0.84 | 11.75
0.84 | 11.83
0.84 | 11.92
0.84 | 12.00
0.84 | 12.08
0.84 | 12.17
0.84 | 12.25
                                    2.333
                                                                                                                                                                           0.42
                                   2.417
2.500
2.583
2.667
2.750
2.833
                                                                                                                                    0.84
0.84
0.84
0.84
0.84
0.84
0.84
                                                                                                                                                                          0.42
0.42
0.42
0.42
0.42
0.42
0.42
                                    2.917
                                    3.000
                                    3.083
         Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                                           19.32
15.00
12.56 (ii)
15.00
0.08
                                                                                                           9.87
25.00
23.22 (ii)
25.00
                                                                                                             0.05
                                                                                                                                           *TOTALS*
                                                                                                                                             0.035 (iii)
5.25
26.69
42.00
0.64
         PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                                             0.02
5.25
40.00
42.00
0.95
                                                                                                           0.01
5.42
15.38
42.00
0.37
          (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN* = 83.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
| ADD HYD ( 0410)|
| 1 + 2 = 3 |
                                                                   AREA
(ha)
1.00
1.24
                                                                                   QPEAK
(cms)
0.035
0.048
                                                                                                           TPEAK
(hrs)
5.25
5.25
                                                                                                                             R.V.
(mm)
26.69
29.40
           ID1= 1 ( 0115):
+ ID2= 2 ( 0120):
               ID = 3 ( 0410):
                                                                  2.24
                                                                                                          5.25
                                                                                                                              28.19
                                                                                 0.083
          NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
  ADD HYD ( 0420)|
1 + 2 = 3 |
                                                                                   QPEAK
(cms)
0.153
0.083
                                                                                                                             R.V.
(mm)
28.19
                                                                   AREA
                                                                   (ha)
4.35
                                                                                                           (hrs)
5.25
            ID1= 1 ( 0405):
+ ID2= 2 ( 0410):
                                                                   2.24
                                                                                                           5.25
                                                                                                                              28.19
                 ID = 3 ( 0420):
                                                                   6.59
                                                                                    0.236
                                                                                                           5.25
                                                                                                                              28.19
```

| Langs 0.500 0.54   0.583 0.54   0.667 0.54   0.676 0.54   0.759 0.54   0.790 0.54   0.833 0.54   0.917 0.54   1.080 0.54   1.083 0.54   1.167 0.54   1.159 0.54   1.333 0.54   1.159 0.54   1.333 0.54   1.583 0.54   1.583 0.54   1.583 0.54   1.583 0.54   1.583 0.54   1.250 0.54   1.250 0.54   1.583 0.54   1.583 0.54   1.583 0.54   1.583 0.54   1.250 0.54   1.250 0.54   1.250 0.54   1.583 0.54   1.583 0.54   1.583 0.54   1.917 0.54 |          |         |             |        |              |      |
|--|----------|---------|-------------|--------|--------------|------|
| Langs  | taffRd_E | A_Exist | ing_HumberW | atersh | ed           |      |
| 0.500 0.54   | 3.583    | 9.25    | 6.66/       | 3.81   | 9.75         | 0.54 |
| 0.583 0.54   | 3.66/    | 9.25    | 6.750       | 3.81   | 9.83         | 0.54 |
| 0.00/ 0.54   | 3./50    | 9.25    | 0.033       | 2.01   | 9.92         | 0.54 |
| 0.750 0.54   | 2 017    | 0.25    | 7 000       | 2 01   | 10.00        | 0.54 |
| 0.033 0.34   | 4 000    | 0.25    | 7.000       | 2 01   | 10.00        | 0.54 |
| 1 000 0 54   | 4.000    | 9.25    | 7.063       | 3 81   | 10.17        | 0.54 |
| 1 000 0.54   | 4.003    | 9 25    | 7.107       | 3 81   | 10.23        | 0.54 |
| 1 167 0 54   | 4 250    | 9 25    | 7.230       | 2 18   | 10.33        | 0.54 |
| 1 250 0 54   | 4 333    | 25 02   | 7 417       | 2 18   | 10.50        | 0.54 |
| 1.333 0.54   | 4.417    | 25.02   | 7.500       | 2.18   | 10.58        | 0.54 |
| 1.417 0.54   | 4.500    | 25.02   | 7.583       | 2.18   | 10.67        | 0.54 |
| 1.500 0.54   | 4.583    | 25.02   | 7.667       | 2.18   | 10.75        | 0.54 |
| 1.583 0.54   | 4.667    | 25.02   | 7.750       | 2.18   | 10.83        | 0.54 |
| 1.667 0.54   | 4.750    | 25.02   | 7.833       | 2.18   | 10.92        | 0.54 |
| 1.750 0.54   | 4.833    | 25.02   | 7.917       | 2.18   | 11.00        | 0.54 |
| 1.833 0.54   | 4.917    | 25.02   | 8.000       | 2.18   | 11.08        | 0.54 |
| 1.917 0.54   | 5.000    | 25.02   | 8.083       | 2.18   | 11.17        | 0.54 |
| 2.000 0.54   | 5.083    | 25.02   | 8.167       | 2.18   | 11.25        | 0.54 |
| 2.083 0.54   | 5.167    | 25.02   | 8.250       | 2.18   | 11.33        | 0.54 |
| 2.167 0.54   | 5.250    | 25.02   | 8.333       | 1.09   | 11.42        | 0.54 |
| 2.250 0.54   | 5.333    | 7.07    | 8.417       | 1.09   | 11.50        | 0.54 |
| 2.333 3.26   | 5.417    | 7.07    | 8.500       | 1.09   | 11.58        | 0.54 |
| 2.417 3.26   | 5.500    | 7.07    | 8.583       | 1.09   | 11.67        | 0.54 |
| 2.500 3.26   | 5.583    | 7.07    | 8.667       | 1.09   | 11.75        | 0.54 |
| 2.583 3.26   | 5.667    | 7.07    | 8.750       | 1.09   | 11.83        | 0.54 |
| 2.667 3.26   | 5.750    | 7.07    | 8.833       | 1.09   | 11.92        | 0.54 |
| 2.750 3.26   | 5.833    | 7.07    | 8.917       | 1.09   | 12.00        | 0.54 |
| 2.833 3.26   | 5.917    | 7.07    | 9.000       | 1.09   | 12.08        | 0.54 |
| 2.91/ 3.26   | 6.000    | 7.07    | 9.083       | 1.09   | 12.1/        | 0.54 |
| 3.000 3.26   | 6.083    | 7.07    | 9.16/       | 1.09   | 12.25        | 0.54 |
| 3.083 3.26   | 6.16/    | 7.07    | 9.250       | 1.09   | l            |      |
| Max.Eff.Inten.(mm/hr)=<br>over (min)<br>Storage Coeff. (min)=<br>Unit Hyd. Tpeak (min)=<br>Unit Hyd. peak (cms)=   | 25.02    |         | 16.14       |        |              |      |
| over (min)   | 15.00    |         | 25.00       |        |              |      |
| Storage Coeff. (min)=  | 13.67    | (ii)    | 24.71 (ii)  |        |              |      |
| Unit Hyd. Tpeak (min)=   | 15.00    |         | 25.00       |        |              |      |
| Unit Hyd. peak (cms)=  | 0.08     |         | 0.05        |        |              |      |
|  |          |         |             |        | TALS*        |      |
| PEAK FLOW (cms)=   | 0.06     |         | 0.02        | 0      | .084 (iii)   | )    |
| TIME TO PEAK (hrs)=  | 5.25     |         | 5.42        |        | 5.25         |      |
| RUNOFF VOLUME (mm)=  | 52.38    |         | 25.88       | 40     | 9.98         |      |
| PEAK FLOW (cms)=<br>TIME TO PEAK (hrs)=<br>RUNOFF VOLUME (mm)=<br>TOTAL RAINFALL (mm)=<br>RUNOFF COEFFICIENT =   | 54.38    |         | 54.38       | 54     | 9.98<br>4.38 |      |
| RUNOFF COEFFICIENT =   | 0.96     |         | 0.48        |        | 0.75         |      |
|  |          |         |             |        |              |      |
| (i) CN PROCEDURE SELECTE   | D FOR P  | FRVTOUS | LOSSES      |        |              |      |
| CN* = 85.0 Ia  |          |         |             |        |              |      |
| (ii) TIME STEP (DT) SHOUL  |          |         |             |        |              |      |
| THAN THE STORAGE COE   |          |         |             |        |              |      |
| (iii) PEAK FLOW DOES NOT I   |          |         | V IF ANY.   |        |              |      |
| • •  |          |         |             |        |              |      |
|  |          |         |             |        |              |      |

| CA   | LIB            |       |         |       |                |       |
|------|----------------|-------|---------|-------|----------------|-------|
| i st | ANDHYD ( 0105) | Area  | (ha)=   | 1.63  |                |       |
|      |                |       |         |       | D (9/)         |       |
| ID=  | 1 DT= 5.0 min  | lotal | Imp(%)= | 61.00 | Dir. Conn.(%)= | 61.00 |
|      |                |       |         |       |                |       |
|      |                |       | IMPERVI | OUS   | PERVIOUS (i)   |       |
|      | Surface Area   | (ha)= | 0.9     | 9     | 0.64           |       |
|      | Dep. Storage   | (mm)= | 2.0     | 0     | 5.00           |       |
|      | Average Slope  | (%)=  | 1.0     | 0     | 2.00           |       |
|      | Length         | (m)=  | 650.0   | 0     | 25.00          |       |
|      | Mannings n     | ` =   | 0.01    | 3     | 0.250          |       |
|      |                |       |         |       |                |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | i hrs | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.26     | 6.250   | 7.07  | 9.33  | 0.54  |
| 0.167 | 0.00  | 3.250 | 3.26     | 6.333   | 3.81  | 9.42  | 0.54  |
| 0.250 | 0.00  | 3.333 | 9.25     | 6.417   | 3.81  | 9.50  | 0.54  |
| 0.333 | 0.54  | 3.417 | 9.25     | 6.500   | 3.81  | 9.58  | 0.54  |
| 0.417 | 0.54  | 3.500 | 9.25     | 6.583   | 3.81  | 9.67  | 0.54  |
| 0.500 | 0.54  | 3.583 | 9.25     | 6.667   | 3.81  | 9.75  | 0.54  |
| 0.583 | 0.54  | 3.667 | 9.25     | 6.750   | 3.81  | 9.83  | 0.54  |
| 0.667 | 0.54  | 3.750 | 9.25     | 6.833   | 3.81  | 9.92  | 0.54  |
| 0.750 | 0.54  | 3.833 | 9.25     | 6.917   | 3.81  | 10.00 | 0.54  |
| 0.833 | 0.54  | 3.917 | 9.25     | 7.000   | 3.81  | 10.08 | 0.54  |
| 0.917 | 0.54  | 4.000 | 9.25     | 7.083   | 3.81  | 10.17 | 0.54  |
| 1.000 | 0.54  | 4.083 | 9.25     | 7.167   | 3.81  | 10.25 | 0.54  |
| 1.083 | 0.54  | 4.167 | 9.25     | 7.250   | 3.81  | 10.33 | 0.54  |
| 1.167 | 0.54  | 4.250 | 9.25     | 7.333   | 2.18  | 10.42 | 0.54  |
| 1.250 | 0.54  | 4.333 | 25.02    | 7.417   | 2.18  | 10.50 | 0.54  |
| 1.333 | 0.54  | 4.417 | 25.02    | 7.500   | 2.18  | 10.58 | 0.54  |
| 1.417 | 0.54  | 4.500 | 25.02    | 7.583   | 2.18  | 10.67 | 0.54  |
| 1.500 | 0.54  | 4.583 | 25.02    | 7.667   | 2.18  | 10.75 | 0.54  |
| 1.583 | 0.54  | 4.667 | 25.02    | 7.750   | 2.18  | 10.83 | 0.54  |
| 1.667 | 0.54  | 4.750 | 25.02    | 7.833   | 2.18  | 10.92 | 0.54  |
| 1.750 |       | 4.833 | 25.02    | 7.917   | 2.18  | 11.00 | 0.54  |
| 1.833 | 0.54  | 4.917 | 25.02    | 8.000   | 2.18  | 11.08 | 0.54  |
| 1.917 | 0.54  | 5.000 | 25.02    | 8.083   | 2.18  | 11.17 | 0.54  |
| 2.000 | 0.54  | 5.083 | 25.02    | 8.167   | 2.18  | 11.25 | 0.54  |
| 2.083 | 0.54  | 5.167 | 25.02    | 8.250   | 2.18  | 11.33 | 0.54  |
| 2.167 | 0.54  | 5.250 | 25.02    | 8.333   | 1.09  | 11.42 | 0.54  |
| 2.250 | 0.54  | 5.333 | 7.07     | 8.417   | 1.09  | 11.50 | 0.54  |
| 2.333 | 3.26  | 5.417 | 7.07     | 8.500   | 1.09  | 11.58 | 0.54  |
| 2.417 | 3.26  | 5.500 | 7.07     | 8.583   | 1.09  | 11.67 | 0.54  |
| 2.500 | 3.26  | 5.583 | 7.07     | 8.667   | 1.09  | 11.75 | 0.54  |
| 2.583 | 3.26  | 5.667 | 7.07     | 8.750   | 1.09  | 11.83 | 0.54  |
| 2.667 | 3.26  | 5.750 | 7.07     | 8.833   | 1.09  | 11.92 | 0.54  |
| 2.750 | 3.26  | 5.833 | 7.07     | 8.917   | 1.09  | 12.00 | 0.54  |
| 2.833 | 3.26  | 5.917 | 7.07     | 9.000   | 1.09  | 12.08 | 0.54  |
| 2.917 | 3.26  | 6.000 | 7.07     | 9.083   | 1.09  | 12.17 | 0.54  |
|       |       |       | Page     | 13      |       |       |       |
|       |       |       | _        |         |       |       |       |

|       | Langs | taffRd E | A Existi | ng Humbe | rWatersh | ed    |      |
|-------|-------|----------|----------|----------|----------|-------|------|
| 0.083 | 0.00  | 3.167    | 3.26     | 6.250    | 7.07     | 9.33  | 0.54 |
| 0.167 | 0.00  | 3.250    | 3.26     | 6.333    | 3.81     | 9.42  | 0.54 |
| 0.250 | 0.00  | 3.333    | 9.25     | 6.417    | 3.81     | 9.50  | 0.54 |
| 0.333 | 0.54  | 3.417    | 9.25     | 6.500    | 3.81     | 9.58  | 0.54 |
| 0.417 | 0.54  | 3.500    | 9.25     | 6.583    | 3.81     | 9.67  | 0.54 |
| 0.500 | 0.54  | 3.583    | 9.25     | 6.667    | 3.81     | 9.75  | 0.54 |
| 0.583 | 0.54  | 3.667    | 9.25     | 6.750    | 3.81     | 9.83  | 0.54 |
| 0.667 | 0.54  | 3.750    | 9.25     | 6.833    | 3.81     | 9.92  | 0.54 |
| 0.750 | 0.54  | 3.833    | 9.25     | 6.917    | 3.81     | 10.00 | 0.54 |
| 0.833 | 0.54  | 3.917    | 9.25     | 7.000    | 3.81     | 10.08 | 0.54 |
| 0.917 | 0.54  | 4.000    | 9.25     | 7.083    | 3.81     | 10.17 | 0.54 |
| 1.000 | 0.54  | 4.083    | 9.25     | 7.167    | 3.81     | 10.25 | 0.54 |
| 1.083 | 0.54  | 4.167    | 9.25     | 7.250    | 3.81     | 10.33 | 0.54 |
| 1.167 | 0.54  | 4.250    | 9.25     | 7.333    | 2.18     | 10.42 | 0.54 |
| 1.250 | 0.54  | 4.333    | 25.02    | 7.417    | 2.18     | 10.50 | 0.54 |
| 1.333 | 0.54  | 4.417    | 25.02    | 7.500    | 2.18     | 10.58 | 0.54 |
| 1.417 | 0.54  | 4.500    | 25.02    | 7.583    | 2.18     | 10.67 | 0.54 |
| 1.500 | 0.54  | 4.583    | 25.02    | 7.667    | 2.18     | 10.75 | 0.54 |
| 1.583 | 0.54  | 4.667    | 25.02    | 7.750    | 2.18     | 10.83 | 0.54 |
| 1.667 | 0.54  | 4.750    | 25.02    | 7.833    | 2.18     | 10.92 | 0.54 |
| 1.750 | 0.54  | 4.833    | 25.02    | 7.917    | 2.18     | 11.00 | 0.54 |
| 1.833 | 0.54  | 4.917    | 25.02    | 8.000    | 2.18     | 11.08 | 0.54 |
| 1.917 | 0.54  | 5.000    | 25.02    | 8.083    | 2.18     | 11.17 | 0.54 |
| 2.000 | 0.54  | 5.083    | 25.02    | 8.167    | 2.18     | 11.25 | 0.54 |
| 2.083 | 0.54  | 5.167    | 25.02    | 8.250    | 2.18     | 11.33 | 0.54 |
| 2.167 | 0.54  | 5.250    | 25.02    | 8.333    | 1.09     | 11.42 | 0.54 |
| 2.250 | 0.54  | 5.333    | 7.07     | 8.417    | 1.09     | 11.50 | 0.54 |
| 2.333 | 3.26  | 5.417    | 7.07     | 8.500    | 1.09     | 11.58 | 0.54 |
| 2.417 | 3.26  | 5.500    | 7.07     | 8.583    | 1.09     | 11.67 | 0.54 |
| 2.500 | 3.26  | 5.583    | 7.07     | 8.667    | 1.09     | 11.75 | 0.54 |
| 2.583 | 3.26  | 5.667    | 7.07     | 8.750    | 1.09     | 11.83 | 0.54 |
| 2.667 | 3.26  | 5.750    | 7.07     | 8.833    | 1.09     | 11.92 | 0.54 |
| 2.750 | 3.26  | 5.833    | 7.07     | 8.917    | 1.09     | 12.00 | 0.54 |
| 2.833 | 3.26  | 5.917    | 7.07     | 9.000    | 1.09     | 12.08 | 0.54 |
| 2.917 | 3.26  | 6.000    | 7.07     | 9.083    | 1.09     | 12.17 | 0.54 |
| 3.000 | 3.26  | 6.083    | 7.07     | 9.167    | 1.09     | 12.25 | 0.54 |
| 3.083 | 3.26  | 6.167    | 7.07     | 9.250    | 1.09     | l     |      |

| Max.Eff.Inten.(mm,<br>over (m |       | 25.02<br>15.00 | 15.31<br>30.00 |             |
|-------------------------------|-------|----------------|----------------|-------------|
| Storage Coeff. (r             | min)= | 15.48 (ii)     | 25.35 (ii)     |             |
| Unit Hyd. Tpeak (r            | min)= | 15.00          | 30.00          |             |
| Unit Hyd. peak (d             | cms)= | 0.07           | 0.04           |             |
|                               |       |                |                | *TOTALS*    |
| PEAK FLOW (d                  | cms)= | 0.08           | 0.03           | 0.112 (iii) |
| TIME TO PEAK (H               | nrs)= | 5.25           | 5.42           | 5.25        |
| RUNOFF VOLUME (               | (mm)= | 52.38          | 24.05          | 39.06       |
| TOTAL RAINFALL (              | (mm)= | 54.38          | 54.38          | 54.38       |
| RUNOFF COEFFICIENT            | Γ =   | 0.96           | 0.44           | 0.72        |

<sup>(</sup>i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  $CN^* = 83.0$  Ia = Dep. Storage (Above)

|  | 3 000  | 2 26                             | igstattko<br>s I 6 083                                   | _EA_EX1  | sting_Huml<br>7   9 167   | erwaters<br>1 A9               | snea<br>1   12 25 | а  |
|--|--|----------------------------------|--|--|---|--------------------------------|-------------------|----|
|  | 3.083  | 3.26                             | 6.167  | 7.0  | 7 9.250   | 1.09                           | 12.25             | ٠. |
|  |  |                                  |  |  |   |                                |                   |    |
| Max.Eff.In<br>Storage Co<br>Unit Hyd.<br>Unit Hyd.   | nten.(mm   | n/hr)=                           | 25.0   | 32   | 16.71   |                                |                   |    |
| Storage Co   | neff (   | (min)=                           | 13.6   | שי<br>7 (ii)   | 24 56 (   | ii)                            |                   |    |
| Unit Hvd.  | Tpeak (  | min)=                            | 15.0   | 90   | 25.00   | /                              |                   |    |
| Unit Hyd.  | peak (   | cms)=                            | 0.0  | 8  | 0.05  |                                |                   |    |
|  |  |                                  |  |  |   |                                | OTALS*            |    |
| PEAK FLOW  |  | (cms)=                           | 0.0  | 97   | 0.02  |                                | 0.090 (iii        | .) |
| PEAK FLOW<br>TIME TO PI<br>RUNOFF VOI<br>TOTAL RAII  | EAK (  | (hrs)=                           | 5.2  | 25   | 5.42  |                                | 5.25              |    |
| TOTAL PATE   | NEALL  | (mm)=                            | 54.3   | 88   | 26.88   |                                | 42.43<br>54.38    |    |
| RUNOFF COI   | FFFTCTFN   | (IIIII) =                        | 94.3   | 16   | 0 49  |                                | 0.78              |    |
|  |  |                                  | 3.3  | -  | 05  |                                |                   |    |
| /13 au   |  |                                  |  |  |   |                                |                   |    |
|  |  |                                  |  |  | S LOSSES:<br>e (Above   | ,                              |                   |    |
|  |  |                                  |  |  | OR EQUAL  | ,                              |                   |    |
|  |  |                                  | COEFFICIE  |  | OK EQUAL  |                                |                   |    |
| (iii) PEA  |  |                                  |  |  | OW IF ANY   |                                |                   |    |
| , ,  |  |                                  |  |  |   |                                |                   |    |
|  |  |                                  |  |  |   |                                |                   |    |
|  |  |                                  |  |  |   |                                |                   |    |
|  |  |                                  |  |  |   |                                |                   |    |
| ADD UVD / /  | 0400\  |                                  |  |  |   |                                |                   |    |
| ADD HYD ( (  | 0400) <br>3  |                                  | ΔRFΔ   | ΟΡΕΔΚ  | TPFAK   | R V                            |                   |    |
| ADD HYD ( 0<br>1 + 2 = 1   | 0400) <br>3  |                                  | AREA<br>(ha)   | QPEAK  | TPEAK<br>(hrs)  | R.V.                           |                   |    |
| ADD HYD ( ( 1 + 2 = :  | 0400) <br>3  <br>  | 5):                              | AREA<br>(ha)<br>1.63 @                                   | QPEAK<br>(cms)   | TPEAK<br>(hrs)<br>5.25  | R.V.<br>(mm)<br>42.43          |                   |    |
| 1 + 2 = 1<br>ID1= 1<br>+ ID2= 2  | 3  <br><br>( 0105<br>( 0116  | 5):<br>9):                       | AREA<br>(ha)<br>1.63 0                                   | QPEAK<br>(cms)<br>0.090  | TPEAK<br>(hrs)<br>5.25<br>5.25  | R.V.<br>(mm)<br>42.43<br>40.98 |                   |    |
| 1 + 2 = 1<br>ID1= 1<br>+ ID2= 2<br>======  | 3  <br><br>( 0105<br>( 0116  |                                  |  |  |   |                                |                   |    |
| 1 + 2 = 1<br>ID1= 1<br>+ ID2= 2<br>======  | 3  <br><br>( 0105<br>( 0116  |                                  |  |  | TPEAK<br>(hrs)<br>5.25<br>5.25  |                                |                   |    |
| 1 + 2 = 1<br>ID1= 1<br>+ ID2= 2<br>======  | ( 0105<br>( 0116<br>( 0406   | 9):                              | 3.21 0   | 174  | 5.25  | 41.71                          |                   |    |
| 1 + 2 = :  ID1= 1 + ID2= 2 ===== ID = 3  NOTE: PEA   | ( 0105<br>( 0116<br>( 0406<br>AK FLOWS   | 9):                              | 3.21 0   | 174  | 5.25  | 41.71                          |                   |    |
| 1 + 2 = 1<br>ID1= 1<br>+ ID2= 2<br>=====<br>ID = 3<br>NOTE: PE   | ( 0105<br>( 0116<br>( 0406<br>( 0406   | 9):<br>5 DO NOT                  | 3.21 0   | BASEFL   | 5.25<br>OWS IF AN   | 41.71<br>Y.                    |                   |    |
| 1 + 2 = 1<br>ID1= 1<br>+ ID2= 2<br>=====<br>ID = 3<br>NOTE: PE   | ( 0105<br>( 0116<br>( 0406<br>( 0406   | 9):<br>5 DO NOT                  | 3.21 0   | BASEFL   | 5.25<br>OWS IF AN   | 41.71<br>Y.                    |                   |    |
| 1 + 2 = 1<br>ID1= 1<br>+ ID2= 2<br>=====<br>ID = 3<br>NOTE: PE   | ( 0105<br>( 0116<br>( 0406<br>( 0406   | 9):<br>5 DO NOT                  | 3.21 0   | BASEFL   | 5.25<br>OWS IF AN   | 41.71<br>Y.                    | 53.00             |    |
| 1 + 2 = :  ID1= 1 + ID2= 2 ===== ID = 3  NOTE: PEA   | 3  <br>( 0105<br>( 0116<br><br>( 0406<br>AK FLOWS<br><br> <br>0125) <br>min  | Area                             | 3.21 @ INCLUDE (ha)= Imp(%)=                             | 2.27<br>53.00  | 5.25<br>OWS IF AN   | 41.71<br>Y.<br>                | 53.00             |    |
| 1 + 2 = :  ID1= 1 + ID2= 2 ===== ID = 3  NOTE: PE  CALIB STANDHYD ( (ID= 1 DT= 5.0)  | 3  <br>( 0105<br>( 0116<br>  | DO NOT                           | 3.21 @ INCLUDE (ha)= Imp(%)=                             | 2.27<br>53.00  | 5.25  OWS IF AN  Dir. Co  | 41.71<br>Y.<br>                | 53.00             |    |
| 1 + 2 = :  ID1= 1 + ID2= 2 ===== ID = 3  NOTE: PE  CALIB STANDHYD ( (ID= 1 DT= 5.0)  | 3  <br>( 0105<br>( 0116<br>  | DO NOT                           | 3.21 @ INCLUDE (ha)= Imp(%)=                             | 2.27<br>53.00  | 5.25  OWS IF AN  Dir. Co  | 41.71<br>Y.<br>                | 53.00             |    |
| 1 + 2 = :  ID1= 1 + ID2= 2 ===== ID = 3  NOTE: PE  CALIB STANDHYD ( (ID= 1 DT= 5.0)  | 3  <br>( 0105<br>( 0116<br>  | DO NOT                           | 3.21 @ INCLUDE (ha)= Imp(%)=                             | 2.27<br>53.00  | 5.25  OWS IF AN  Dir. Co  | 41.71<br>Y.<br>                | 53.00             |    |
| 1 + 2 = :  ID1= 1 + ID2= 2 ===== ID = 3  NOTE: PE  CALIB STANDHYD ( (ID= 1 DT= 5.0)  | 3  <br>( 0105<br>( 0116<br>  | DO NOT                           | 3.21 @ INCLUDE (ha)= Imp(%)=                             | 2.27<br>53.00  | 5.25  OWS IF AN  Dir. Co  | 41.71<br>Y.<br>                | 53.00             |    |
| 1 + 2 = 1<br>ID1= 1<br>+ ID2= 2<br>======<br>ID = 3<br>NOTE: PEA<br>CALIB<br>STANDHYD ( (ID= 1 DT= 5.0)                          | 3   ( 0105 ( 01105 ( 0 | Area Total (ha)= (mm)= (%)= (m)= | 3.21 @ INCLUDE  (ha)= Imp(%)=  IMPERVI 1.2 2.0 1.0 800.0 | 2.27<br>53.00<br>COUS<br>200<br>00                               | 5.25<br>OWS IF AN<br>Dir. Co<br>PERVIOUS<br>1.07<br>5.00<br>2.00<br>20.00 | 41.71<br>Y.<br>                | 53.00             |    |
| 1 + 2 = 1  ID1= 1 + ID2= 2  ID = 3  NOTE: PE  CALIB STANDHYD ( ID= 1 DT= 5.0  Surface Al Dep. Stor: Average S: Length Mannings I | 3  | Area Total  (ha)= (mm)= (%)= ==  | 3.21 @ (ha)= Imp(%)=  IMPERVI 1.2 2.0 1.0 800.0          | 2.27<br>53.00<br>COUS<br>2000<br>000<br>000<br>000<br>000<br>000 | 5.25<br>OWS IF AN<br>Dir. Co<br>PERVIOUS<br>1.07<br>5.00<br>2.00<br>20.00 | 41.71<br>Y.<br>                |                   |    |

|       | - | TRA  | ANSFORMED   | HYETOGR.                              | APH                     |  |                               |  |
|-------|---|------|-------------|---------------------------------------|-------------------------|--|-------------------------------|--|
| RAIN  | 1 | TIME | RAIN        | TIME                                  | RAIN                    | 1  | TIME                          | RAIN   |
| mm/hr | Ĺ | hrs  | mm/hr       | hrs                                   | mm/hr                   | Ĺ  | hrs                           | mm/hr  |
|       |   |      |             |                                       |                         |  |                               |  |
|       |   |      | Page 1      | 4                                     |                         |  |                               |  |
|       |   | RAIN | RAIN   TIME | RAIN   TIME RAIN   'mm/hr   hrs mm/hr | RAIN   TIME RAIN   TIME | RAIN   TIME RAIN   TIME RAIN mm/hr   hrs mm/hr   hrs mm/hr   hrs mm/hr | mm/hr   hrs mm/hr   hrs mm/hr | RAIN   TIME RAIN   TIME RAIN   TIME<br>mm/hr   hrs mm/hr   hrs mm/hr   hrs |

LangstaffRd\_EA\_Existing\_HumberWatershed

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COFFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |             |                   |       |
|-------------------|-------|-------------|-------------------|-------|
| STANDHYD ( 0130)  | Area  | (ha)= 2.    | 08                |       |
| ID= 1 DT= 5.0 min | Total | Imp(%)= 51. | 00 Dir. Conn.(%)= | 51.00 |
|                   |       |             |                   |       |
|                   |       | IMPERVIOUS  | PERVIOUS (i)      |       |
| Surface Area      | (ha)= | 1.06        | 1.02              |       |
| Dep. Storage      | (mm)= | 2.00        | 5.00              |       |
| Average Slope     | (%)=  | 1.00        | 2.00              |       |
| Length            | (m)=  | 800.00      | 20.00             |       |
| Mannings n        | =     | 0.013       | 0.250             |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR. | APH   |       |       |
|-------|-------|-------|----------|----------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME   | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs    | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.26     | 6.250    | 7.07  | 9.33  | 0.54  |
| 0.167 | 0.00  | 3.250 | 3.26     | 6.333    | 3.81  | 9.42  | 0.54  |
| 0.250 | 0.00  | 3.333 | 9.25     | 6.417    | 3.81  | 9.50  | 0.54  |
| 0.333 | 0.54  | 3.417 | 9.25     | 6.500    | 3.81  | 9.58  | 0.54  |
| 0.417 | 0.54  | 3.500 | 9.25     | 6.583    | 3.81  | 9.67  | 0.54  |
| 0.500 | 0.54  | 3.583 | 9.25     | 6.667    | 3.81  | 9.75  | 0.54  |
| 0.583 | 0.54  | 3.667 | 9.25     | 6.750    | 3.81  | 9.83  | 0.54  |
| 0.667 | 0.54  | 3.750 | 9.25     | 6.833    | 3.81  | 9.92  | 0.54  |
| 0.750 | 0.54  | 3.833 | 9.25     | 6.917    | 3.81  | 10.00 | 0.54  |
| 0.833 | 0.54  | 3.917 | 9.25     | 7.000    | 3.81  | 10.08 | 0.54  |
| 0.917 | 0.54  | 4.000 | 9.25     | 7.083    | 3.81  | 10.17 | 0.54  |
| 1.000 | 0.54  | 4.083 | 9.25     | 7.167    | 3.81  | 10.25 | 0.54  |
| 1.083 | 0.54  | 4.167 | 9.25     | 7.250    | 3.81  | 10.33 | 0.54  |
| 1.167 | 0.54  | 4.250 | 9.25     | 7.333    | 2.18  | 10.42 | 0.54  |
| 1.250 | 0.54  | 4.333 | 25.02    | 7.417    | 2.18  | 10.50 | 0.54  |
| 1.333 | 0.54  | 4.417 | 25.02    | 7.500    | 2.18  | 10.58 | 0.54  |
| 1.417 | 0.54  | 4.500 | 25.02    | 7.583    | 2.18  | 10.67 | 0.54  |
| 1.500 | 0.54  | 4.583 | 25.02    | 7.667    | 2.18  | 10.75 | 0.54  |
| 1.583 | 0.54  | 4.667 | 25.02    | 7.750    | 2.18  | 10.83 | 0.54  |
| 1.667 | 0.54  | 4.750 | 25.02    | 7.833    | 2.18  | 10.92 | 0.54  |
| 1.750 | 0.54  | 4.833 | 25.02    | 7.917    | 2.18  | 11.00 | 0.54  |
| 1.833 | 0.54  | 4.917 | 25.02    | 8.000    | 2.18  | 11.08 | 0.54  |
| 1.917 | 0.54  | 5.000 | 25.02    | 8.083    | 2.18  | 11.17 | 0.54  |
| 2.000 | 0.54  | 5.083 | 25.02    | 8.167    | 2.18  | 11.25 | 0.54  |
| 2.083 | 0.54  | 5.167 | 25.02    | 8.250    | 2.18  | 11.33 | 0.54  |
| 2.167 | 0.54  | 5.250 | 25.02    | 8.333    | 1.09  | 11.42 | 0.54  |
| 2.250 | 0.54  | 5.333 | 7.07     | 8.417    | 1.09  | 11.50 | 0.54  |
| 2.333 | 3.26  | 5.417 | 7.07     | 8.500    | 1.09  | 11.58 | 0.54  |
| 2.417 | 3.26  | 5.500 | 7.07     | 8.583    | 1.09  | 11.67 | 0.54  |
| 2.500 | 3.26  | 5.583 | 7.07     | 8.667    | 1.09  | 11.75 | 0.54  |

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|                  | Langs   | staffRd_E | A_Exist | ing_HumberW | latershed |          |
|------------------|---------|-----------|---------|-------------|-----------|----------|
| 2.58             | 3 3.26  | 5.667     | 7.07    | 8.750       | 1.09   11 | .83 0.54 |
| 2.66             | 7 3.26  | 5.750     | 7.07    | 8.833       | 1.09   11 | .92 0.54 |
| 2.750            | 0 3.26  | 5.833     | 7.07    | 8.917       | 1.09   12 | .00 0.54 |
| 2.83             | 3 3.26  | 5.917     | 7.07    | 9.000       | 1.09   12 | .08 0.54 |
| 2.91             | 7 3.26  | 6.000     | 7.07    | 9.083       | 1.09   12 | .17 0.54 |
| 3.000            | 0 3.26  | 6.083     | 7.07    | 9.167       | 1.09   12 | .25 0.54 |
| 3.08             | 3 3.26  | 6.167     | 7.07    | 9.250       | 1.09      |          |
|                  |         |           |         |             |           |          |
| Max.Eff.Inten.(r | mm/hr)= | 25.02     |         | 15.31       |           |          |
| over             | (min)   | 15.00     |         | 30.00       |           |          |
| Storage Coeff.   | (min)=  | 15.48     | (ii)    | 25.35 (ii)  |           |          |
| Unit Hyd. Tpeak  | (min)=  | 15.00     |         | 30.00       |           |          |
| Unit Hyd. peak   | (cms)=  | 0.07      |         | 0.04        |           |          |
|                  |         |           |         |             | *TOTALS   | *        |
| PEAK FLOW        | (cms)=  | 0.07      |         | 0.03        | 0.101     | (iii)    |
| TIME TO PEAK     | (hrs)=  | 5.25      |         | 5.42        | 5.25      |          |
| RUNOFF VOLUME    | (mm)=   | 52.38     |         | 24.05       | 38.49     |          |
| TOTAL RAINFALL   | (mm)=   | 54.38     |         | 54.38       | 54.38     |          |
| RUNOFF COEFFICIE | ENT =   | 0.96      |         | 0.44        | 0.71      |          |
|                  |         |           |         |             |           |          |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0405)   |      |       |       |       |
|-------------------|------|-------|-------|-------|
| 1 + 2 = 3         | AREA | QPEAK | TPEAK | R.V.  |
|                   | (ha) | (cms) | (hrs) | (mm)  |
| ID1= 1 ( 0125):   | 2.27 | 0.112 | 5.25  | 39.06 |
| + ID2= 2 ( 0130): | 2.08 | 0.101 | 5.25  | 38.49 |
|                   |      |       |       |       |
| ID = 3 ( 0405):   | 4.35 | 0.214 | 5.25  | 38.79 |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB  <br>STANDHYD ( 0120) | Area  | (ha)=    | 1.24  | -1 - (0)       |       |
|-----------------------------|-------|----------|-------|----------------|-------|
| ID= 1 DT= 5.0 min           | lotal | Imp(%)=  | 5/.00 | Dir. Conn.(%)= | 57.00 |
| ·                           |       |          |       |                |       |
|                             |       | IMPERVIO | US    | PERVIOUS (i)   |       |
| Surface Area                | (ha)= | 0.71     |       | 0.53           |       |
| Dep. Storage                | (mm)= | 2.00     |       | 5.00           |       |
| Average Slope               | (%)=  | 1.00     |       | 2.00           |       |
| Length                      | (m)=  | 475.00   |       | 17.00          |       |
| Mannings n                  | =     | 0.013    |       | 0.250          |       |
|                             |       |          |       |                |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

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(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 83.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COFFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB  <br>  STANDHYD ( 0115) | Area     | (ha)= 1.00     | )              |       |
|-------------------------------|----------|----------------|----------------|-------|
| ID= 1 DT= 5.0 min             | Total    | Imp(%) = 46.06 | Dir. Conn.(%)= | 46.00 |
|                               |          |                |                |       |
|                               |          | IMPERVIOUS     | PERVIOUS (i)   |       |
| Surface Area                  | (ha)=    | 0.46           | 0.54           |       |
| Dep. Storage                  | ( mm ) = | 2.00           | 5.00           |       |
| Average Slope                 | (%)=     | 1.00           | 2.00           |       |
| Length                        | (m)=     | 475.00         | 17.00          |       |
| Mannings n                    | ` =      | 0.013          | 0.250          |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TRA   | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.26     | 6.250   | 7.07  | 9.33  | 0.54  |
| 0.167 | 0.00  | 3.250 | 3.26     | 6.333   | 3.81  | 9.42  | 0.54  |
| 0.250 | 0.00  | 3.333 | 9.25     | 6.417   | 3.81  | 9.50  | 0.54  |
| 0.333 | 0.54  | 3.417 | 9.25     | 6.500   | 3.81  | 9.58  | 0.54  |
| 0.417 | 0.54  | 3.500 | 9.25     | 6.583   | 3.81  | 9.67  | 0.54  |
| 0.500 | 0.54  | 3.583 | 9.25     | 6.667   | 3.81  | 9.75  | 0.54  |
| 0.583 | 0.54  | 3.667 | 9.25     | 6.750   | 3.81  | 9.83  | 0.54  |
| 0.667 | 0.54  | 3.750 | 9.25     | 6.833   | 3.81  | 9.92  | 0.54  |
| 0.750 | 0.54  | 3.833 | 9.25     | 6.917   | 3.81  | 10.00 | 0.54  |
| 0.833 | 0.54  | 3.917 | 9.25     | 7.000   | 3.81  | 10.08 | 0.54  |
| 0.917 | 0.54  | 4.000 | 9.25     | 7.083   | 3.81  | 10.17 | 0.54  |
| 1.000 | 0.54  | 4.083 | 9.25     | 7.167   | 3.81  | 10.25 | 0.54  |
| 1.083 | 0.54  | 4.167 | 9.25     | 7.250   | 3.81  | 10.33 | 0.54  |
| 1.167 | 0.54  | 4.250 | 9.25     | 7.333   | 2.18  | 10.42 | 0.54  |
| 1.250 | 0.54  | 4.333 | 25.02    | 7.417   | 2.18  | 10.50 | 0.54  |
| 1.333 | 0.54  | 4.417 | 25.02    | 7.500   | 2.18  | 10.58 | 0.54  |
| 1.417 | 0.54  | 4.500 | 25.02    | 7.583   | 2.18  | 10.67 | 0.54  |
| 1.500 | 0.54  | 4.583 | 25.02    | 7.667   | 2.18  | 10.75 | 0.54  |
| 1.583 | 0.54  | 4.667 | 25.02    | 7.750   | 2.18  | 10.83 | 0.54  |
| 1.667 | 0.54  | 4.750 | 25.02    | 7.833   | 2.18  | 10.92 | 0.54  |
| 1.750 | 0.54  | 4.833 | 25.02    | 7.917   | 2.18  | 11.00 | 0.54  |
| 1.833 | 0.54  | 4.917 | 25.02    | 8.000   | 2.18  | 11.08 | 0.54  |
| 1.917 | 0.54  | 5.000 | 25.02    | 8.083   | 2.18  | 11.17 | 0.54  |
| 2.000 | 0.54  | 5.083 | 25.02    | 8.167   | 2.18  | 11.25 | 0.54  |
| 2.083 | 0.54  | 5.167 | 25.02    | 8.250   | 2.18  | 11.33 | 0.54  |

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### LangstaffRd\_EA\_Existing\_HumberWatershed

|                  |        | TR    | ANSFORME | D HYETOGRAI | РН    | -          |       |
|------------------|--------|-------|----------|-------------|-------|------------|-------|
| TIME             | RAIN   | TIME  | RAIN     | ' TIME      | RAIN  | TIME       | RAIN  |
| hrs              | mm/hr  | hrs   | mm/hr    | ' hrs       | mm/hr | hrs        | mm/hr |
| 0.083            | 0.00   | 3.167 | 3.26     | 6.250       | 7.07  | 9.33       | 0.54  |
| 0.167            | 0.00   | 3.250 | 3.26     | 6.333       | 3.81  | 9.42       | 0.54  |
| 0.250            | 0.00   | 3.333 | 9.25     | 6.417       | 3.81  | 9.50       | 0.54  |
| 0.333            | 0.54   | 3.417 | 9.25     | 6.500       | 3.81  | 9.58       | 0.54  |
| 0.417            | 0.54   | 3.500 | 9.25     | 6.583       | 3.81  | 9.67       | 0.54  |
| 0.500            | 0.54   | 3.583 | 9.25     | 6.667       | 3.81  | 9.75       | 0.54  |
| 0.583            | 0.54   | 3.667 | 9.25     | 6.750       | 3.81  | 9.83       | 0.54  |
| 0.667            |        |       | 9.25     | 6.833       | 3.81  | 9.92       | 0.54  |
| 0.750            | 0.54   | 3.833 | 9.25     | 6.917       | 3.81  | 10.00      | 0.54  |
| 0.833            |        |       | 9.25     | 7.000       | 3.81  | 10.08      | 0.54  |
| 0.917            |        |       | 9.25     | 7.083       | 3.81  | 10.17      | 0.54  |
| 1.000            |        |       | 9.25     | 7.167       | 3.81  | 10.25      | 0.54  |
| 1.083            | 0.54   | 4.167 | 9.25     | 7.250       | 3.81  | 10.33      | 0.54  |
| 1.167            |        | 4.250 | 9.25     | 7.333       | 2.18  | 10.42      | 0.54  |
| 1.250            |        | 4.333 | 25.02    | 7.417       | 2.18  |            | 0.54  |
| 1.333            |        |       | 25.02    | 7.500       | 2.18  | 10.58      | 0.54  |
| 1.417            |        | 4.500 | 25.02    | 7.583       | 2.18  | 10.67      | 0.54  |
| 1.500            | 0.54   | 4.583 | 25.02    | 7.667       | 2.18  | 10.75      | 0.54  |
| 1.583            |        | 4.667 | 25.02    | 7.750       | 2.18  |            | 0.54  |
| 1.667            | 0.54   | 4.750 | 25.02    | 7.833       | 2.18  | 10.92      | 0.54  |
| 1.750            |        |       | 25.02    | 7.917       | 2.18  |            | 0.54  |
| 1.833            |        | 4.917 | 25.02    | 8.000       | 2.18  | 11.08      | 0.54  |
| 1.917            |        |       | 25.02    | 8.083       | 2.18  | 11.17      | 0.54  |
| 2.000            |        |       | 25.02    | 8.167       | 2.18  |            | 0.54  |
| 2.083            |        |       | 25.02    | 8.250       | 2.18  |            | 0.54  |
| 2.167            |        | 5.250 | 25.02    | 8.333       | 1.09  |            | 0.54  |
| 2.250            |        |       | 7.07     | 8.417       | 1.09  | 11.50      | 0.54  |
| 2.333            |        | 5.417 | 7.07     | 8.500       | 1.09  | 11.58      | 0.54  |
| 2.417            |        |       | 7.07     | 8.583       | 1.09  |            | 0.54  |
| 2.500            |        |       | 7.07     | 8.667       | 1.09  |            | 0.54  |
| 2.583            |        | 5.667 | 7.07     | 8.750       | 1.09  | 11.83      | 0.54  |
| 2.667            |        |       | 7.07     | 8.833       | 1.09  | 11.92      | 0.54  |
| 2.750            |        | 5.833 | 7.07     | 8.917       | 1.09  |            | 0.54  |
| 2.833            |        |       | ,,       | 9.000       | 1.09  |            | 0.54  |
| 2.917            |        | 6.000 | 7.07     | 9.083       | 1.09  |            | 0.54  |
| 3.000            |        |       | 7.07     | 9.167       | 1.09  |            | 0.54  |
| 3.083            | 3.26   | 6.167 | 7.07     | 9.250       | 1.09  | l          |       |
| Max.Eff.Inten.(m | m/hr)= | 25.02 |          | 15.31       |       |            |       |
|                  | (min)  | 10.00 |          | 25.00       |       |            |       |
| Storage Coeff.   | (min)= | 11.33 | (ii)     | 20.27 (ii)  |       |            |       |
| Unit Hyd. Tpeak  |        | 10.00 | (/       | 25.00       |       |            |       |
| Unit Hyd. peak   | (cms)= | 0.10  |          | 0.05        |       |            |       |
| , ,              | /      |       |          |             | *T0   | TALS*      |       |
| PEAK FLOW        | (cms)= | 0.05  |          | 0.02        |       | .066 (iii) |       |
| TIME TO PEAK     | (hrs)= | 5.25  |          | 5.33        |       | 5.25       |       |
| RUNOFF VOLUME    | (mm)=  | 52.38 |          | 24.05       |       | 0.19       |       |
| TOTAL RAINFALL   | (mm)=  | 54.38 |          | 54.38       |       | 4.38       |       |
|                  |        |       |          |             |       |            |       |

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|            |         |         |       |       | ing_Humber |      |            |   |
|------------|---------|---------|-------|-------|------------|------|------------|---|
|            | 2.16    |         | 5.250 | 25.02 |            | 1.09 |            | - |
|            | 2.25    | 0.54    | 5.333 | 7.07  | 8.417      | 1.09 | 11.50      | - |
|            | 2.33    |         | 5.417 | 7.07  |            | 1.09 |            | - |
|            | 2.41    |         |       | 7.07  |            | 1.09 |            | - |
|            | 2.50    |         | 5.583 | 7.07  |            | 1.09 | 11.75      | - |
|            | 2.58    | 3 3.26  | 5.667 | 7.07  | 8.750      | 1.09 | 11.83      | - |
|            | 2.66    | 7 3.26  | 5.750 | 7.07  | 8.833      | 1.09 | 11.92      | - |
|            | 2.75    | 3.26    | 5.833 | 7.07  | 8.917      | 1.09 | 12.00      | - |
|            | 2.83    | 3 3.26  | 5.917 | 7.07  | 9.000      | 1.09 | 12.08      | - |
|            | 2.91    | 7 3.26  | 6.000 | 7.07  | 9.083      | 1.09 | 12.17      | - |
|            | 3.00    | 3.26    | 6.083 | 7.07  | 9.167      | 1.09 | 12.25      | - |
|            | 3.08    | 3 3.26  | 6.167 | 7.07  | 9.250      | 1.09 | I          |   |
| Max.Eff.Ir | nten.(ı | mm/hr)= | 25.02 |       | 15.31      |      |            |   |
|            | over    | (min)   | 10.00 |       | 25.00      |      |            |   |
| Storage Co | eff.    | (min)=  | 11.33 | (ii)  | 20.27 (ii) |      |            |   |
| Unit Hyd.  | Tpeak   | (min)=  | 10.00 |       | 25.00      |      |            |   |
| Unit Hyd.  | peak    | (cms)=  | 0.10  |       | 0.05       |      |            |   |
|            |         |         |       |       |            | *T0  | TALS*      |   |
| PEAK FLOW  |         | (cms)=  | 0.03  |       | 0.02       | 0    | .049 (iii) | j |
| TIME TO PE | AK      | (hrs)=  | 5.25  |       | 5.33       |      | 5.25       |   |
| RUNOFF VOI | UME     | (mm)=   | 52.38 |       | 24.05      | 3    | 7.07       |   |
| TOTAL RAIN | IFALL   | (mm)=   | 54.38 |       | 54.38      | 5-   | 4.38       |   |
| RUNOFF COE | FFICI   | ENT =   | 0.96  |       | 0.44       |      | 0.68       |   |

| DD HYD ( 0410)    |      |       |      |       |
|-------------------|------|-------|------|-------|
| 1 + 2 = 3         | AREA | QPEAK |      | R.V.  |
|                   |      | (cms) |      |       |
|                   |      | 0.049 |      |       |
| + ID2= 2 ( 0120): | 1.24 | 0.066 | 5.25 | 40.19 |
| ID = 3 ( 0410):   | 2.24 | 0.115 | 5.25 | 38.80 |

| ADD HYD ( 0420)   |        |       |         |       |
|-------------------|--------|-------|---------|-------|
| 1 + 2 = 3         | AREA   | QPEAK | TPEAK   | R.V.  |
|                   | (ha)   | (cms) | (hrs)   | (mm)  |
| ID1= 1 ( 0405):   | 4.35   | 0.214 | 5.25    | 38.79 |
| + ID2= 2 ( 0410): | 2.24   | 0.115 | 5.25    | 38.80 |
| ================  | ====== |       | ======= |       |

## LangstaffRd\_EA\_Existing\_HumberWatershed ID = 3 ( 0420): 6.59 0.329 5.25 38.79

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ***********          | *** |
|----------------------|-----|
| ** SIMULATION:Run 06 | **  |
| *************        | *** |

| READ STORM          | F:     | ilename:     | C:\Use | rs\ray.z | hao\AppD |        |            |        |
|---------------------|--------|--------------|--------|----------|----------|--------|------------|--------|
| i                   | İ      |              | ata\Lo | cal\Temp | \        |        |            |        |
| i                   | i      |              |        |          |          | -Redff | 20f5fb5\11 | 25e1d6 |
| Ptotal= 62.71 mr    | ni c   | omments:     |        |          |          |        |            |        |
| 1 COCA1- 02.71 IIII |        | Jillineires. | 10112  |          |          |        |            |        |
|                     |        |              |        |          |          |        |            |        |
|                     |        |              | TIME   | RAIN     | TIME     | RAIN   | TIME       | RAIN   |
|                     |        | n/hr         |        | mm/hr  ' | hrs      | mm/hr  | hrs        | mm/hr  |
| (                   | 9.25 6 | 0.00         | 3.50   | 10.66    | 6.75     | 4.39   | 10.00      | 0.63   |
|                     | 0.50   | 0.63         | 3.75   | 10.66    | 7.00     | 4.39   | 10.25      | 0.63   |
|                     | 3.75   | 0.63         | 4.00   | 10.66    | 7.25     | 4.39   | 10.50      | 0.63   |
| 1                   | 1.00 6 | 9.63 j       | 4.25   | 10.66 İ  | 7.50     | 2.51   | 10.75      | 0.63   |
| 1                   | 1.25   | 9.63 İ       | 4.50   | 28.84 İ  | 7.75     | 2.51 İ | 11.00      | 0.63   |
| 1                   | 1.50   | 9.63 İ       | 4.75   | 28.84 İ  | 8.00     | 2.51 İ | 11.25      | 0.63   |
|                     | 1.75   | 9.63 j       | 5.00   | 28.84    | 8.25     | 2.51   | 11.50      | 0.63   |
|                     | 2.00 ( | 9.63 j       | 5.25   | 28.84    | 8.50     | 1.25   | 11.75      | 0.63   |
|                     | 2.25   | 9.63 j       | 5.50   | 8.15     | 8.75     | 1.25   | 12.00      | 0.63   |
|                     | 2.50   | 3.76         | 5.75   | 8.15     | 9.00     | 1.25   | 12.25      | 0.63   |
|                     | 2.75   | 3.76         | 6.00   | 8.15     | 9.25     | 1.25   |            |        |
|                     | 3.00   | 3.76         | 6.25   | 8.15     | 9.50     | 0.63   |            |        |
| 3                   | 3.25   | 3.76 İ       | 6.50   | 4.39 İ   | 9.75     | 0.63 İ |            |        |

| CALIB             |          |         |       |                |       |
|-------------------|----------|---------|-------|----------------|-------|
| STANDHYD ( 0110)  | Area     | (ha)=   | 1.58  |                |       |
| ID= 1 DT= 5.0 min | Total    | Imp(%)= | 57.00 | Dir. Conn.(%)= | 57.00 |
|                   |          |         |       |                |       |
|                   |          | IMPERVI | OUS   | PERVIOUS (i)   |       |
| Surface Area      | (ha)=    | 0.9     | 0     | 0.68           |       |
| Dep. Storage      | (mm)=    | 2.0     | 0     | 5.00           |       |
| 4                 | ' / 0/ \ |         |       | 2 00           |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TRA   | ANSFORME | HYETOGRA | APH   |      |       |
|-------|-------|-------|----------|----------|-------|------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME   | RAIN  | TIME | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs    | mm/hr | hrs  | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.76     | 6.250    | 8.15  | 9.33 | 0.63  |
|       |       | 3.250 |          |          |       | 9.42 |       |
| 0.250 | 0.00  | 3.333 | 10.66    | 6.417    | 4.39  | 9.50 | 0.63  |

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### ${\tt LangstaffRd\_EA\_Existing\_HumberWatershed}$

| CALIB             |       |               |              |       |
|-------------------|-------|---------------|--------------|-------|
| STANDHYD ( 0105)  | Area  | (ha)= 1.63    |              |       |
| ID= 1 DT= 5.0 min |       | Imp(%)= 61.00 |              | 61.00 |
|                   |       |               |              |       |
|                   |       | IMPERVIOUS    | PERVIOUS (i) |       |
| Surface Area      | (ha)= | 0.99          | 0.64         |       |
| Dep. Storage      | (mm)= | 2.00          | 5.00         |       |
| Average Slope     | `(%)= | 1.00          | 2.00         |       |
| Length            | (m)=  | 650.00        | 25.00        |       |
| Mannings n        | =     | 0.013         | 0.250        |       |
|                   |       |               |              |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TIME  | RAIN         | TIME  |       | HYETOGRA         | RAIN |                | RAIN  |
|-------|--------------|-------|-------|------------------|------|----------------|-------|
| hrs   | mm/hr        | hrs   |       | l' hrs           |      | hrs            | mm/hr |
| 0.083 | 0.00         | 3.167 |       | 6.250            | 8.15 | 9.33           | 0.63  |
| 0.167 | 0.00         | 3.250 |       | 6.333            | 4.39 | 9.33           | 0.63  |
| 0.250 |              | 3.333 |       | 6.417            | 4.39 | 9.42           | 0.63  |
| 0.333 |              |       |       | 6.500            |      | 9.58           | 0.63  |
| 0.417 | 0.63<br>0.63 | 3.417 |       | 6.583            | 4.39 | 9.56           | 0.63  |
| 0.500 | 0.63         | 3.583 |       | 6.667            | 4.39 | 9.07           | 0.63  |
| 0.583 |              | 3.667 |       | 6.750            | 4.39 | 9.75           | 0.63  |
| 0.667 |              | 3.750 |       | 6.833            | 4.39 |                | 0.63  |
| 0.750 |              | 3.833 |       | 6.917            | 4.39 |                | 0.63  |
| 0.833 |              | 3.917 |       | 0.917<br>  7.000 |      |                | 0.63  |
| 0.917 | 0.63         |       | 10.66 |                  | 4.39 |                |       |
| 1.000 | 0.63         | 4.083 | 10.66 |                  | 4.39 |                | 0.63  |
|       |              | 4.063 | 10.66 |                  |      |                |       |
| 1.083 |              | 4.167 | 10.66 | 7.250<br>7.333   | 4.39 |                | 0.63  |
| 1.250 |              | 4.250 | 28.84 |                  | 2.51 |                | 0.63  |
| 1.333 |              | 4.333 | 28.84 | 7.417            | 2.51 |                | 0.63  |
| 1.333 |              | 4.417 | 28.84 |                  | 2.51 |                | 0.63  |
|       |              |       |       |                  | 2.51 |                | 0.63  |
| 1.500 | 0.63<br>0.63 | 4.583 | 28.84 |                  |      | 10.75<br>10.83 | 0.63  |
|       |              |       |       | 7.750            | 2.51 |                |       |
| 1.667 |              | 4.750 |       | 7.833            | 2.51 |                | 0.63  |
| 1.750 |              | 4.833 |       | 7.917            |      |                | 0.63  |
| 1.833 |              | 4.917 |       | 8.000            | 2.51 |                | 0.63  |
| 1.917 |              | 5.000 |       | 8.083            | 2.51 |                |       |
| 2.000 | 0.63         | 5.083 | 28.84 |                  | 2.51 |                |       |
| 2.083 | 0.63         | 5.167 | 28.84 | 8.250            | 2.51 | 11.33          | 0.63  |
| 2.167 | 0.63         | 5.250 |       | 8.333            | 1.25 | 11.42          | 0.63  |
| 2.250 | 0.63         | 5.333 |       | 8.417            | 1.25 | 11.50          | 0.63  |
| 2.333 |              | 5.417 | 8.15  | 8.500            | 1.25 | 11.58          | 0.63  |
| 2.417 |              | 5.500 | 8.15  | 8.583            | 1.25 | 11.67          | 0.63  |
| 2.500 | 3.76         | 5.583 | 8.15  | 8.667            | 1.25 |                |       |
| 2.583 | 3.76         | 5.667 | 8.15  | 8.750            | 1.25 |                | 0.63  |
| 2.667 |              | 5.750 | 8.15  | 8.833            | 1.25 | 11.92          | 0.63  |
| 2.750 | 3.76         | 5.833 | 8.15  | 8.917            | 1.25 | 12.00          | 0.63  |
|       |              |       | Page  | 23               |      |                |       |

| Lange                  | +>ffDd E | A Evict | ing HumberW | atonch | od                 |      |
|------------------------|----------|---------|-------------|--------|--------------------|------|
| 0.333 0.63             |          |         | 1 6.500     | 4.39   |                    | 0.63 |
| 0.417 0.63             |          | 10.66   |             | 4.39   |                    | 0.63 |
|                        | 3.583    | 10.66   |             | 4.39   |                    | 0.63 |
| 0.583 0.63             |          | 10.66   |             | 4.39   |                    | 0.63 |
|                        | 3.750    | 10.66   |             | 4.39   |                    | 0.63 |
|                        |          |         |             |        |                    |      |
| 0.750 0.63             | 3.833    | 10.66   |             | 4.39   |                    | 0.63 |
| 0.833 0.63             | 3.917    | 10.66   |             | 4.39   |                    | 0.63 |
|                        | 4.000    | 10.66   |             | 4.39   |                    | 0.63 |
| 1.000 0.63             | 4.083    | 10.66   |             | 4.39   |                    | 0.63 |
|                        | 4.167    | 10.66   |             | 4.39   |                    | 0.63 |
| 1.167 0.63             |          | 10.66   |             | 2.51   |                    | 0.63 |
|                        | 4.333    | 28.84   |             | 2.51   |                    | 0.63 |
|                        | 4.417    | 28.84   |             | 2.51   |                    | 0.63 |
|                        | 4.500    | 28.84   |             | 2.51   |                    | 0.63 |
|                        | 4.583    | 28.84   |             | 2.51   |                    | 0.63 |
|                        | 4.667    | 28.84   |             | 2.51   |                    | 0.63 |
|                        | 4.750    | 28.84   |             | 2.51   |                    | 0.63 |
|                        | 4.833    | 28.84   |             | 2.51   |                    | 0.63 |
|                        | 4.917    | 28.84   |             | 2.51   |                    | 0.63 |
| 1.917 0.63             | 5.000    | 28.84   |             | 2.51   |                    | 0.63 |
|                        | 5.083    | 28.84   |             | 2.51   |                    | 0.63 |
| 2.083 0.63             |          | 28.84   |             | 2.51   |                    | 0.63 |
| 2.167 0.63             |          | 28.84   |             | 1.25   |                    | 0.63 |
| 2.250 0.63             |          | 8.15    |             | 1.25   |                    | 0.63 |
|                        | 5.417    | 8.15    |             | 1.25   |                    | 0.63 |
| 2.417 3.76             |          | 8.15    |             | 1.25   |                    | 0.63 |
|                        | 5.583    | 8.15    |             | 1.25   |                    | 0.63 |
| 2.583 3.76             |          | 8.15    |             | 1.25   |                    | 0.63 |
| 2.667 3.76             | 5.750    | 8.15    |             | 1.25   |                    | 0.63 |
|                        | 5.833    | 8.15    |             | 1.25   |                    | 0.63 |
| 2.833 3.76             | 5.917    | 8.15    |             | 1.25   |                    | 0.63 |
| 2.917 3.76             | 6.000    | 8.15    |             | 1.25   |                    | 0.63 |
| 3.000 3.76             | 6.083    | 8.15    |             | 1.25   |                    | 0.63 |
| 3.083 3.76             | 6.167    | 8.15    | 9.250       | 1.25   | l                  |      |
| Max.Eff.Inten.(mm/hr)= | 28.84    |         | 19.93       |        |                    |      |
| over (min)             | 15.00    |         | 25.00       |        |                    |      |
| Storage Coeff. (min)=  | 12.91    | (ii)    | 23.06 (ii)  |        |                    |      |
| Unit Hyd. Tpeak (min)= | 15.00    |         | 25.00       |        |                    |      |
| Unit Hyd. peak (cms)=  | 0.08     |         | 0.05        | ****   | TALS*              |      |
| PEAK FLOW (cms)=       | 0.07     |         | 0.03        |        | .100 (iii)         |      |
| TIME TO PEAK (hrs)=    | 5.25     |         | 5.33        |        | .100 (111)<br>5.25 |      |
| RUNOFF VOLUME (mm)=    | 60.71    |         | 32.48       |        | 3.56               |      |
| TOTAL RAINFALL (mm)=   | 62.71    |         | 62.71       |        | 2.71               |      |
| RUNOFF COEFFICIENT =   | 0.97     |         | 0.52        |        | 2.71               |      |
| NUMUFF CUEFFICIENT =   | 0.9/     |         | 0.52        | ,      | 0.//               |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 85.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| LangstaffRd_EA_Existing_HumberWatershed |                  |         |       |                |              |      |  |
|---|------------------|---------|-------|----------------|--------------|------|--|
|   | 2.83             | 3 3.76  | 5.917 | 8.15   9.000   | 1.25   12.08 | 0.63 |  |
|   | 2.91             | 7 3.76  | 6.000 | 8.15 9.083     | 1.25   12.17 | 0.63 |  |
|   | 3.000            | 3.76    | 6.083 | 8.15   9.167   | 1.25   12.25 | 0.63 |  |
|   | 3.08             | 3.76    | 6.167 | 8.15   9.250   | 1.25         |      |  |
|   | Max.Eff.Inten.(r | nm/hr)= | 28.84 | 20.82          |              |      |  |
|   |                  | (min)   | 15.00 |                |              |      |  |
|   | Storage Coeff.   | (min)=  | 12.91 | (ii) 22.89 (ii | )            |      |  |
|   | Unit Hyd. Tpeak  | (min)=  | 15.00 | 25.00          |              |      |  |
|   | Unit Hyd. peak   | (cms)=  | 0.08  | 0.05           |              |      |  |
|   |                  |         |       |                | *TOTALS*     |      |  |
|   | PEAK FLOW        | (cms)=  | 0.08  | 0.03           | 0.107 (iii)  |      |  |
|   | TIME TO PEAK     | (hrs)=  | 5.25  | 5.33           | 5.25         |      |  |
|   | RUNOFF VOLUME    | (mm)=   | 60.71 | 33.62          | 50.14        |      |  |
|   | TOTAL RAINFALL   | (mm)=   | 62.71 | 62.71          | 62.71        |      |  |
|   | RUNOFF COEFFICIE | ENT =   | 0.97  | 0.54           | 0.80         |      |  |
|   |                  |         |       |                |              |      |  |

| ADD HYD ( 0400) |      |       |       |      |  |
|-----------------|------|-------|-------|------|--|
| 1 4 . 2 2 1     | 4054 | ODEAN | TDEAK | D 1/ |  |

R.V. (mm) 50.14 48.56 3.21 0.207 ID = 3 ( 0400): 5.25 49.36

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| STANDHYD ( 0125) <br> ID= 1 DT= 5.0 min | Area<br>Total | (ha)=<br>Imp(%)= | 2.27<br>53.00 | Dir. Conn.(%)= | 53.00 |
|---|---------------|------------------|---------------|----------------|-------|
|   |               | IMPERVI          | 0US           | PERVIOUS (i)   |       |
| Surface Area                            | (ha)=         | 1.2              | 0             | 1.07           |       |
| Dep. Storage                            | (mm)=         | 2.0              | 0             | 5.00           |       |
| Average Slope                           | (%)=          | 1.0              | 0             | 2.00           |       |
| Length                                  | (m)=          | 800.0            | 0             | 20.00          |       |
| Mannings n                              | =             | 0.01             | 3             | 0.250          |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

|                    | Lange | +>6604 5 | A Evict | ing_HumberW | latonch | od         |       |
|--------------------|-------|----------|---------|-------------|---------|------------|-------|
| TIME               | RAIN  | TIME     | RAIN    |             | RAIN    |            | RAIN  |
| hrs                | mm/hr | l hrs    | mm/hr   | l' hrs      | mm/hr   |            | mm/hr |
| 0.083              | 0.00  |          | 3.76    | 6.250       | 8.15    |            | 0.63  |
| 0.167              |       | 3.250    | 3.76    | 6.333       | 4.39    |            | 0.63  |
| 0.250              | 0.00  |          | 10.66   |             | 4.39    |            | 0.63  |
| 0.333              | 0.63  |          | 10.66   |             | 4.39    |            | 0.63  |
| 0.417              | 0.63  |          | 10.66   |             | 4.39    | 9.67       | 0.63  |
| 0.500              |       | 3.583    | 10.66   |             | 4.39    |            | 0.63  |
| 0.583              | 0.63  |          | 10.66   |             | 4.39    |            | 0.63  |
| 0.667              | 0.63  |          | 10.66   |             | 4.39    | 9.92       | 0.63  |
| 0.750              | 0.63  |          | 10.66   |             | 4.39    | 10.00      | 0.63  |
| 0.833              | 0.63  |          | 10.66   |             | 4.39    |            | 0.63  |
| 0.917              | 0.63  |          | 10.66   |             | 4.39    |            | 0.63  |
| 1.000              | 0.63  |          | 10.66   |             | 4.39    |            | 0.63  |
| 1.083              | 0.63  |          | 10.66   |             | 4.39    |            | 0.63  |
| 1.167              | 0.63  |          | 10.66   |             | 2.51    |            | 0.63  |
| 1.250              |       | 4.333    | 28.84   |             | 2.51    | 10.50      | 0.63  |
| 1.333              | 0.63  |          | 28.84   |             | 2.51    | 10.58      | 0.63  |
| 1.417              | 0.63  |          | 28.84   |             | 2.51    | 10.67      | 0.63  |
| 1.500              | 0.63  |          | 28.84   |             | 2.51    | 10.75      | 0.63  |
| 1.583              | 0.63  |          | 28.84   |             | 2.51    | 10.83      | 0.63  |
| 1,667              |       | 4.750    | 28.84   |             | 2.51    | 10.92      | 0.63  |
| 1.750              | 0.63  |          | 28.84   | 7.917       | 2.51    | 11.00      | 0.63  |
| 1.833              | 0.63  | 4.917    | 28.84   |             | 2.51    | 11.08      | 0.63  |
| 1.917              | 0.63  | 5.000    | 28.84   | 8.083       | 2.51    | 11.17      | 0.63  |
| 2.000              | 0.63  |          | 28.84   |             | 2.51    | 11.25      | 0.63  |
| 2.083              | 0.63  | 5.167    | 28.84   | 8.250       | 2.51    | 11.33      | 0.63  |
| 2.167              | 0.63  | 5.250    | 28.84   | 8.333       | 1.25    | 11.42      | 0.63  |
| 2.250              | 0.63  | 5.333    | 8.15    | 8.417       | 1.25    | 11.50      | 0.63  |
| 2.333              | 3.76  | 5.417    | 8.15    | 8.500       | 1.25    | 11.58      | 0.63  |
| 2.417              | 3.76  | 5.500    | 8.15    | 8.583       | 1.25    | 11.67      | 0.63  |
| 2.500              | 3.76  | 5.583    | 8.15    | 8.667       | 1.25    | 11.75      | 0.63  |
| 2.583              | 3.76  | 5.667    | 8.15    | 8.750       | 1.25    | 11.83      | 0.63  |
| 2.667              | 3.76  | 5.750    | 8.15    | 8.833       | 1.25    | 11.92      | 0.63  |
| 2.750              | 3.76  | 5.833    | 8.15    | 8.917       | 1.25    | 12.00      | 0.63  |
| 2.833              | 3.76  | 5.917    | 8.15    | 9.000       | 1.25    | 12.08      | 0.63  |
| 2.917              |       | 6.000    | 8.15    | 9.083       | 1.25    | 12.17      | 0.63  |
| 3.000              |       | 6.083    | 8.15    | 9.167       | 1.25    |            | 0.63  |
| 3.083              | 3.76  | 6.167    | 8.15    | 9.250       | 1.25    |            |       |
| Max.Eff.Inten.(mm/ |       | 28.84    |         | 19.01       |         |            |       |
| over (m            |       | 15.00    |         | 25.00       |         |            |       |
|                    | in)=  | 14.63    | (ii)    | 23.67 (ii)  |         |            |       |
| Unit Hyd. Tpeak (m |       | 15.00    |         | 25.00       |         |            |       |
| Unit Hyd. peak (c  | ms)=  | 0.08     |         | 0.05        | *T01    | ΓALS*      |       |
| PEAK FLOW (c       | ms)=  | 0.09     |         | 0.04        |         | .136 (iii) |       |
|                    | rs)=  | 5.25     |         | 5.42        |         | 5.25       |       |
|                    | mm)=  | 60.71    |         | 30.35       |         | 5.43       |       |
|                    | mm)=  | 62.71    |         | 62.71       |         | 2.71       |       |
| RUNOFF COEFFICIENT | ´=    | 0.97     |         | 0.48        |         | 3.74       |       |
|                    |       |          |         |             |         |            |       |

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| Lar 2.417 3.7 2.590 3.7 2.583 3.7 2.583 3.7 2.750 3.7 2.750 3.7 2.833 3.7 2.917 3.7 3.000 3.7 3.083 3.7       | RStaffRd_EA_Exist<br>6   5.500  | ing_HumberWate<br>  8.583   1.2<br>  8.667   1.2<br>  8.750   1.2<br>  8.833   1.2<br>  8.917   1.2<br>  9.000   1.2<br>  9.083   1.2<br>  9.167   1.2 | rshed  15   11.67                             |
|---|---|--|---|
| Max.Eff.Inten.(mm/hr)= over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)=          | 28.84<br>15.00<br>14.63 (ii)<br>15.00<br>0.08                                 | 19.01<br>25.00<br>23.67 (ii)<br>25.00<br>0.05  | *TOTALS*                                      |
| PEAK FLOW (cms)= TIME TO PEAK (hrs)= RUNOFF VOLUME (mm)= TOTAL RAINFALL (mm)= RUNOFF COEFFICIENT =            | 0.08<br>5.25<br>60.71<br>62.71<br>0.97  | 0.04<br>5.42<br>30.35<br>62.71<br>0.48   | 0.123 (iii)<br>5.25<br>45.83<br>62.71<br>0.73 |
| (i) CN PROCEDURE SELE<br>CN* = 83.0<br>(ii) TIME STEP (DT) SHI<br>THAN THE STORAGE<br>(iii) PEAK FLOW DOES NO | Ia = Dep. Storage<br>DULD BE SMALLER OF<br>COEFFICIENT.<br>T INCLUDE BASEFLOR | (Above)<br>R EQUAL   |   |
| ADD HYD ( 0405) <br>  1 + 2 = 3  <br>  ID1= 1 ( 0125):<br>+ ID2= 2 ( 0130):                                   | AREA QPEAK<br>(ha) (cms)<br>2.27 0.136<br>2.08 0.123                          | TPEAK R.V. (hrs) (mm) 5.25 46.43 5.25 45.83  | i   |
| ID = 3 ( 0405):  NOTE: PEAK FLOWS DO NO   | 4.35 0.259<br>T INCLUDE BASEFLO   | 5.25 46.14<br>NS IF ANY.   | -   |
| CALIB   |   |  | - 57.00                                       |
|   | IMPERVIOUS PI<br>0.71<br>2.00<br>1.00<br>475.00<br>0.013                      | ERVIOUS (i)<br>0.53<br>5.00<br>2.00<br>17.00<br>0.250  |   |

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- LangstaffRd\_EA\_Existing\_HumberWatershed

  (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COEFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |         |      |         |           |       |
|-------------------|-------|---------|------|---------|-----------|-------|
| STANDHYD ( 0130)  | Area  | (ha)=   | 2.08 |         |           |       |
| ID= 1 DT= 5.0 min |       | Imp(%)= |      | Dir.    | Conn.(%)= | 51.00 |
|                   |       |         |      |         |           |       |
|                   |       | IMPERVI | OUS  | PERVIOL | JS (i)    |       |
| Surface Area      | (ha)= | 1.0     | 6    | 1.02    | ! ` ′     |       |
| Dep. Storage      | (mm)= | 2.0     | 0    | 5.00    | )         |       |
| Average Slope     | (%)=  | 1.0     | 0    | 2.00    | )         |       |
| Length            | (m)=  | 800.0   | 0    | 20.00   | )         |       |
| Mannings n        | ` ′=  | 0.01    | 3    | 0.250   | )         |       |

|       | TRANSFORMED HYETOGRAPH |       |       |        |       |       |       |  |  |  |  |
|-------|------------------------|-------|-------|--------|-------|-------|-------|--|--|--|--|
| TIME  | RAIN                   | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |  |  |  |
| hrs   | mm/hr                  | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |  |  |  |
| 0.083 | 0.00                   | 3.167 | 3.76  | 6.250  | 8.15  |       | 0.63  |  |  |  |  |
| 0.167 | 0.00                   | 3.250 | 3.76  | 6.333  | 4.39  | 9.42  | 0.63  |  |  |  |  |
| 0.250 | 0.00                   | 3.333 | 10.66 | 6.417  | 4.39  | 9.50  | 0.63  |  |  |  |  |
| 0.333 | 0.63                   | 3.417 | 10.66 | 6.500  | 4.39  |       | 0.63  |  |  |  |  |
| 0.417 | 0.63                   | 3.500 | 10.66 | 6.583  | 4.39  |       | 0.63  |  |  |  |  |
| 0.500 | 0.63                   | 3.583 | 10.66 | 6.667  | 4.39  | 9.75  | 0.63  |  |  |  |  |
| 0.583 | 0.63                   | 3.667 | 10.66 | 6.750  | 4.39  |       | 0.63  |  |  |  |  |
| 0.667 | 0.63                   | 3.750 | 10.66 | 6.833  | 4.39  | 9.92  | 0.63  |  |  |  |  |
| 0.750 | 0.63                   | 3.833 | 10.66 | 6.917  | 4.39  | 10.00 | 0.63  |  |  |  |  |
| 0.833 | 0.63                   | 3.917 | 10.66 | 7.000  | 4.39  |       | 0.63  |  |  |  |  |
| 0.917 | 0.63                   | 4.000 | 10.66 | 7.083  | 4.39  | 10.17 | 0.63  |  |  |  |  |
| 1.000 | 0.63                   | 4.083 | 10.66 | 7.167  | 4.39  | 10.25 | 0.63  |  |  |  |  |
| 1.083 | 0.63                   |       | 10.66 | 7.250  | 4.39  |       | 0.63  |  |  |  |  |
| 1.167 | 0.63                   | 4.250 | 10.66 | 7.333  | 2.51  | 10.42 | 0.63  |  |  |  |  |
| 1.250 | 0.63                   | 4.333 | 28.84 | 7.417  | 2.51  | 10.50 | 0.63  |  |  |  |  |
| 1.333 | 0.63                   | 4.417 | 28.84 | 7.500  | 2.51  | 10.58 | 0.63  |  |  |  |  |
| 1.417 | 0.63                   | 4.500 | 28.84 | 7.583  | 2.51  | 10.67 | 0.63  |  |  |  |  |
| 1.500 | 0.63                   | 4.583 | 28.84 | 7.667  | 2.51  | 10.75 | 0.63  |  |  |  |  |
| 1.583 | 0.63                   | 4.667 | 28.84 | 7.750  | 2.51  | 10.83 | 0.63  |  |  |  |  |
| 1.667 | 0.63                   | 4.750 | 28.84 | 7.833  | 2.51  | 10.92 | 0.63  |  |  |  |  |
| 1.750 | 0.63                   | 4.833 | 28.84 | 7.917  | 2.51  | 11.00 | 0.63  |  |  |  |  |
| 1.833 | 0.63                   | 4.917 | 28.84 | 8.000  | 2.51  | 11.08 | 0.63  |  |  |  |  |
| 1.917 | 0.63                   | 5.000 | 28.84 | 8.083  | 2.51  | 11.17 | 0.63  |  |  |  |  |
| 2.000 | 0.63                   | 5.083 | 28.84 | 8.167  | 2.51  | 11.25 | 0.63  |  |  |  |  |
| 2.083 | 0.63                   | 5.167 | 28.84 | 8.250  | 2.51  | 11.33 | 0.63  |  |  |  |  |
| 2.167 | 0.63                   | 5.250 | 28.84 | 8.333  | 1.25  | 11.42 | 0.63  |  |  |  |  |
| 2.250 | 0.63                   | 5.333 | 8.15  | 8.417  | 1.25  | 11.50 | 0.63  |  |  |  |  |
| 2.333 | 3.76                   | 5.417 | 8.15  | 8.500  | 1.25  | 11.58 | 0.63  |  |  |  |  |

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### ${\tt LangstaffRd\_EA\_Existing\_HumberWatershed}$

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|     | NOTE:    | KAINI | ALL WAS II | MANSFURM     | טו עב         | D. WIIN. I       | THE 211       | · .        |       |
|-----|----------|-------|------------|--------------|---------------|------------------|---------------|------------|-------|
|     |          |       |            |              |               |                  |               |            |       |
|     |          |       |            | то.          | NCFORM        | D INCETOCOA      |               |            |       |
|     |          | TIME  | RAIN       |              |               | D HYETOGRA       |               |            | RAIN  |
|     |          |       |            |              | RAIN<br>mm/hr |                  | RAIN          |            | mm/hr |
|     |          | hrs   |            | hrs<br>3.167 |               | ' hrs<br>  6.250 | mm/hr<br>8.15 |            |       |
|     |          | 0.083 |            |              | 3.76          |                  |               |            | 0.63  |
|     |          | 0.16  |            | 3.250        | 3.76          |                  | 4.39          |            | 0.63  |
|     |          | 0.25  |            |              | 10.66         |                  | 4.39          |            | 0.63  |
|     |          | 0.33  |            | 3.417        | 10.66         |                  | 4.39          |            | 0.63  |
|     |          | 0.41  |            | 3.500        | 10.66         |                  | 4.39          |            | 0.63  |
|     |          | 0.500 |            | 3.583        |               | 6.667            | 4.39          |            | 0.63  |
|     |          | 0.583 |            |              | 10.66         |                  | 4.39          |            | 0.63  |
|     |          | 0.66  |            | 3.750        |               | 6.833            | 4.39          |            | 0.63  |
|     |          | 0.75  |            | 3.833        | 10.66         |                  | 4.39          |            | 0.63  |
|     |          | 0.83  |            | 3.917        | 10.66         |                  | 4.39          |            | 0.63  |
|     |          | 0.91  |            | 4.000        | 10.66         |                  | 4.39          |            | 0.63  |
|     |          | 1.000 |            | 4.083        | 10.66         |                  | 4.39          |            | 0.63  |
|     |          | 1.08  |            | 4.167        | 10.66         |                  | 4.39          |            | 0.63  |
|     |          | 1.16  |            | 4.250        | 10.66         |                  | 2.51          |            | 0.63  |
|     |          | 1.250 |            | 4.333        | 28.84         |                  | 2.51          |            | 0.63  |
|     |          | 1.33  |            | 4.417        | 28.84         |                  | 2.51          |            | 0.63  |
|     |          | 1.41  |            | 4.500        | 28.84         |                  | 2.51          |            | 0.63  |
|     |          | 1.500 |            | 4.583        | 28.84         |                  |               | 10.75      | 0.63  |
|     |          | 1.58  |            | 4.667        | 28.84         |                  | 2.51          |            | 0.63  |
|     |          | 1.66  |            | 4.750        | 28.84         |                  | 2.51          |            | 0.63  |
|     |          | 1.75  |            | 4.833        | 28.84         |                  | 2.51          |            | 0.63  |
|     |          | 1.83  |            | 4.917        | 28.84         |                  | 2.51          |            | 0.63  |
|     |          | 1.91  |            | 5.000        | 28.84         |                  | 2.51          |            | 0.63  |
|     |          | 2.000 |            | 5.083        | 28.84         |                  | 2.51          |            | 0.63  |
|     |          | 2.08  |            | 5.167        |               | 8.250            | 2.51          |            | 0.63  |
|     |          | 2.16  |            |              | 28.84         |                  | 1.25          |            | 0.63  |
|     |          | 2.25  |            |              | 8.15          |                  | 1.25          |            | 0.63  |
|     |          | 2.33  |            |              | 8.15          |                  | 1.25          |            | 0.63  |
|     |          | 2.41  |            |              | 8.15          |                  | 1.25          |            | 0.63  |
|     |          | 2.500 |            |              | 8.15          |                  | 1.25          |            | 0.63  |
|     |          | 2.583 |            |              | 8.15          |                  | 1.25          |            | 0.63  |
|     |          | 2.66  |            |              |               | 8.833            | 1.25          |            | 0.63  |
|     |          | 2.75  |            |              | 8.15          |                  | 1.25          |            | 0.63  |
|     |          | 2.83  |            |              | 8.15          |                  |               | 12.08      | 0.63  |
|     |          | 2.91  |            |              | 8.15          |                  |               | 12.17      | 0.63  |
|     |          | 3.000 |            |              |               | 9.167            |               | 12.25      | 0.63  |
|     |          | 3.083 | 3.76       | 6.167        | 8.15          | 9.250            | 1.25          |            |       |
|     |          |       |            |              |               |                  |               |            |       |
| Max | .Eff.In  |       |            | 28.84        |               | 19.01            |               |            |       |
|     | _        |       | (min)      | 10.00        |               | 20.00            |               |            |       |
|     | rage Co  |       | (min)=     | 10.70        | (11)          | 18.90 (ii)       |               |            |       |
|     | t Hyd.   |       |            | 10.00        |               | 20.00            |               |            |       |
| Uni | t Hyd.   | peak  | (cms)=     | 0.11         |               | 0.06             |               |            |       |
|     |          |       | , ,        |              |               |                  |               | TALS*      |       |
|     | K FLOW   |       | (cms)=     | 0.06         |               | 0.02             |               | .079 (iii) | )     |
| TIN | ME TO PE | AK    | (hrs)=     | 5.25         |               | 5.33             |               | 5.25       |       |
|     |          |       |            |              |               |                  |               |            |       |

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## $LangstaffRd\_EA\_Existing\_HumberWatershed \\ RUNOFF VOLUME & (mm) = & 68.71 & 30.35 & 47.6 \\ TOTAL RAINFALL & (mm) = & 62.71 & 62.71 & 62.71 \\ RUNOFF COEFFICIENT & = & 0.97 & $\alpha$ ^ 40$ & 62.77 \\ RUNOFF COEFFICIENT & = & 0.97 & $\alpha$ ^ 40$ & 62.77 \\ RUNOFF COEFFICIENT & = & 0.97 & $\alpha$ ^ 40$ & 62.77 \\ RUNOFF COEFFICIENT & & 0.97 & $\alpha$ & 62.77 \\ RUNO$ 47.65 62.71

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
- CN\* = 83.0 Ia = Dep. Storage (Above)
  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
  THAN THE STORAGE COEFFICIENT.
  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB | | STANDHYD ( 0115)| |ID= 1 DT= 5.0 min | Area (ha)= 1.00 Total Imp(%)= 46.00 Dir. Conn.(%)= 46.00 IMPERVIOUS PERVIOUS (i) Surface Area Dep. Storage Average Slope (ha)= (mm)= (%)= (m)= 0.46 2.00 1.00 475.00 Length Mannings n 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

RAIN | TIME RAIN | TIME RM/hr | hrs | 0.00 | 3.167 | 3.76 | 6.250 | 8.15 | 9.33 | 0.00 | 3.250 | 3.76 | 6.250 | 8.15 | 9.33 | 0.66 | 6.417 | 4.39 | 9.50 | 0.63 | 3.417 | 10.66 | 6.417 | 4.39 | 9.50 | 0.63 | 3.583 | 10.66 | 6.580 | 4.39 | 9.57 | 0.63 | 3.583 | 10.66 | 6.667 | 4.39 | 9.57 | 0.63 | 3.583 | 10.66 | 6.667 | 4.39 | 9.57 | 0.63 | 3.583 | 10.66 | 6.667 | 4.39 | 9.75 | 0.63 | 3.583 | 10.66 | 6.673 | 4.39 | 9.57 | 0.63 | 3.583 | 10.66 | 6.673 | 4.39 | 9.75 | 0.63 | 3.583 | 10.66 | 6.578 | 4.39 | 9.75 | 0.63 | 3.583 | 10.66 | 6.750 | 4.39 | 9.83 | 0.63 | 3.750 | 10.66 | 6.750 | 4.39 | 10.00 | 0.63 | 3.350 | 10.66 | 6.917 | 4.39 | 10.00 | 0.63 | 3.917 | 10.66 | 7.083 | 4.39 | 10.00 | 0.63 | 4.000 | 10.66 | 7.083 | 4.39 | 10.17 | 0.63 | 4.083 | 10.66 | 7.083 | 4.39 | 10.17 | 0.63 | 4.408 | 10.66 | 7.250 | 4.39 | 10.35 | 0.63 | 4.250 | 10.66 | 7.250 | 4.39 | 10.35 | 0.63 | 4.250 | 10.66 | 7.250 | 4.39 | 10.35 | 0.63 | 4.250 | 10.66 | 7.250 | 4.39 | 10.35 | 0.63 | 4.250 | 10.66 | 7.250 | 4.39 | 10.35 | 0.63 | 4.250 | 10.66 | 7.250 | 4.39 | 10.35 | 0.63 | 4.250 | 10.66 | 7.250 | 4.39 | 10.35 | 0.63 | 4.250 | 10.66 | 7.250 | 4.39 | 10.35 | 0.63 | 4.250 | 10.66 | 7.250 | 4.39 | 10.35 | 0.63 | 4.250 | 10.66 | 7.250 | 4.39 | 10.35 | 0.63 | 4.250 | 10.66 | 7.250 | 4.39 | 10.35 | 0.63 | 4.250 | 10.65 | 7.250 | 4.39 | 10.35 | 0.63 | 4.250 | 10.65 | 7.250 | 4.39 | 10.35 | 0.63 | 4.250 | 10.65 | 7.250 | 4.39 | 10.35 | 0.63 | 4.250 | 10.65 | 7.250 | 4.39 | 10.35 | 0.63 | 4.250 | 10.65 | 7.250 | 4.39 | 10.35 | 0.63 | 4.250 | 10.65 | 7.250 | 4.39 | 10.35 | 0.63 | 4.250 | 10.65 | 7.250 | 4.39 | 10.35 | 0.63 | 4.250 | 10.65 | 7.250 | 4.39 | 10.35 | 0.63 | 4.250 | 10.65 | 7.250 | 4.39 | 10.35 | 0.63 | 4.250 | 10.65 | 7.250 | 4.39 | 10.35 | 0.63 | 4.250 | 10.65 | 7.250 | 4.39 | 10.35 | 0.63 | 4.250 | 10.65 | 7.250 | 4.39 | 10.35 | 0.63 | 4.250 | 10.65 | 7.250 | 4.39 | 10.35 | 0.63 | 4.250 | 10.65 | 7.250 | 4.39 | 10.35 | 0.63 | 4.250 | 10.65 | 7.250 | 4.39 | 10.35 | 10.45 | 0.65 | 1.250 | 10.250 | 0.63 | 4.250 | 0.250 | 10.25 hrs 0.083 0.167 mm/hr 0.63 0.63 0.167 0.250 0.333 0.417 0.500 0.583 0.667 0.750 0.833 0.63 0.917 1.000 1.083 1.167 1.250 1.333 0.63 0.63 0.63 0.63 0.63 1.417 0.63 1.583 1.667 1.750 1.833 1.917 0.63 0.63 0.63 0.63

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| LangstaffRd_EA_Existing_HumberWater |        |      |       |      |       |  |  |  |
|-------------------------------------|--------|------|-------|------|-------|--|--|--|
| + ID2= 2 (                          | 0410): | 2.24 | 0.139 | 5.25 | 46.15 |  |  |  |
|                                     |        |      |       |      |       |  |  |  |
| ID = 3 (                            | 0420): | 6.59 | 0.399 | 5.25 | 46.15 |  |  |  |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS TE ANY.

\*\*\*\*\*\*\*\*\*\*\*\* \*\* SIMULATION:Run 08 \*\*

CALIB

| READ STORM          | Filer     | name: C:\    | Jsers\ray | .zhao\App | pD        |           |        |
|---------------------|-----------|--------------|-----------|-----------|-----------|-----------|--------|
| İ                   | ĺ         | ata          | \Local\Te | mp\       |           |           |        |
| i                   | i         |              | 50948-ccb |           | h92-Redft | F20f5fh5\ | 4f8285 |
| Ptotal= 73.10 mm    | Commo     | nts: 25Y     |           | C 4000 0  | DJE OCUII | 2013103   |        |
| FLUCAT- 73.10 IIIII | Comme     | :111.5. 231. | 12        |           |           |           |        |
|                     |           |              |           |           |           |           |        |
| T:                  | IME RAIN  |              | RAIN      | ' TIME    | RAIN      |           | RAI    |
|                     | hrs mm/hr | hrs          | mm/hr     | ' hrs     | mm/hr     | hrs       | mm/h   |
| 0                   | .25 0.00  | 3.50         | 12.43     | 6.75      | 5.12      | 10.00     | 0.73   |
| 0                   | .50 0.73  | 3.75         | 12.43     | 7.00      | 5.12      | 10.25     | 0.73   |
| 0                   | .75 0.73  | 4.00         | 12.43     | 7.25      | 5.12      | 10.50     | 0.73   |
| 1                   | .00 0.73  | 4.25         | 12.43     | 7.50      | 2.92      | 10.75     | 0.73   |
| 1                   | .25 0.73  | 4.50         | 33.63     | 7.75      | 2.92      | 11.00     | 0.73   |
| 1                   | .50 0.73  | 4.75         | 33.63     | 8.00      | 2.92      | 11.25     | 0.73   |
| 1.                  | .75 0.73  | 5.00         | 33.63     | 8.25      | 2.92      | 11.50     | 0.73   |
| 2.                  | .00 0.73  | 5.25         | 33.63     | 8.50      | 1.46      | 11.75     | 0.73   |
| 2                   | .25 0.73  | 5.50         | 9.50      | 8.75      | 1.46      | 12.00     | 0.73   |
| 2.                  | .50 4.39  | 5.75         | 9.50      | 9.00      | 1.46      | 12.25     | 0.73   |
| 2.                  | .75 4.39  | 6.00         | 9.50      | 9.25      | 1.46      | İ         |        |
| 3.                  | .00 4.39  | 6.25         | 9.50      | 9.50      | 0.73      | i         |        |
|                     |           |              |           |           |           |           |        |

3.25 4.39 | 6.50 5.12 | 9.75 0.73 |

| CALIB | | STANDHYD ( 0110) | | ID= 1 DT= 5.0 min | Area (ha)= 1.58 Total Imp(%)= 57.00 Dir. Conn.(%)= 57.00 PERVIOUS (i) (ha)= (mm)= (%)= (m)= Surface Area 0.90 2.00 1.00 0.68 5.00 2.00 Dep. Storage Average Slope Length Mannings n 25.00 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TRANSFORMED HYETOGRAPH |       |       |       |        |       |      |       |  |  |  |
|------------------------|-------|-------|-------|--------|-------|------|-------|--|--|--|
| TIME                   | RAIN  | TIME  | RAIN  | ' TIME | RAIN  | TIME | RAIN  |  |  |  |
| hrs                    | mm/hr | hrs   | mm/hr | ' hrs  | mm/hr | hrs  | mm/hr |  |  |  |
| 0.083                  | 0.00  | 3.167 | 4.39  | 6.250  | 9.50  | 9.33 | 0.73  |  |  |  |

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| Lang  | ctaffDd D                                     | A Evict                               | ing Humb           | erWatersh | nd.      |      |  |  |  |  |
|---|---|---------------------------------------|--------------------|-----------|----------|------|--|--|--|--|
| 2 999 9 63  | 5 AR3   | 28 84<br>                             | 1 8 167            | 2 51      | 11 25    | 0.63 |  |  |  |  |
| 2.083 0.63  | 5.167   | 28.84                                 | 8.250              | 2.51      | 11.33    | 0.63 |  |  |  |  |
| 2.167 0.63  | 5.250   | 28.84                                 | 8.333              | 1.25      | 11.42    | 0.63 |  |  |  |  |
| 2.250 0.63  | 5.333   | 8.15                                  | 8.417              | 1.25      | 11.50    | 0.63 |  |  |  |  |
| 2.333 3.76  | 5.417   | 8.15                                  | 8.500              | 1.25      | 11.58    | 0.63 |  |  |  |  |
| 2.417 3.76  | 5.500   | 8.15                                  | 8.583              | 1.25      | 11.67    | 0.63 |  |  |  |  |
| 2.500 3.76  | 5.583   | 8.15                                  | 8.667              | 1.25      | 11.75    | 0.63 |  |  |  |  |
| 2.583 3.76  | 5.667   | 8.15                                  | 8.750              | 1.25      | 11.83    | 0.63 |  |  |  |  |
| 2.667 3.76  | 5.750   | 8.15                                  | 8.833              | 1.25      | 11.92    | 0.63 |  |  |  |  |
| 2.750 3.76  | 5.833   | 8.15                                  | 8.917              | 1.25      | 12.00    | 0.63 |  |  |  |  |
| 2.833 3.76  | 5.917   | 8.15                                  | 9.000              | 1.25      | 12.08    | 0.63 |  |  |  |  |
| 2.917 3.76  | 6.000   | 8.15                                  | 9.083              | 1.25      | 12.17    | 0.63 |  |  |  |  |
| 3.000 3.76  | 6.083   | 8.15                                  | 9.16/              | 1.25      | 12.25    | 0.63 |  |  |  |  |
| 3.083 3.76  | 6.16/   | 8.15                                  | 9.250              | 1.25      |          |      |  |  |  |  |
| Langstafffd EA_Existing_HumberWatershed   |   |                                       |                    |           |          |      |  |  |  |  |
| oven (min)  | 10.04   |                                       | 20.01              |           |          |      |  |  |  |  |
| Storage Coeff (min)-  | 10.00   | (11)                                  | 18 90 (            | 1)        |          |      |  |  |  |  |
| Unit Hyd Theak (min)=   | 10.70   | (11)                                  | 20.00              | /         |          |      |  |  |  |  |
| Unit Hyd neak (cms)=  | 0.00  |                                       | 0 06               |           |          |      |  |  |  |  |
|   |   |                                       |                    |           | ALS*     |      |  |  |  |  |
| PFAK FLOW (cms)=  | 9.94  |                                       | 0.02               | 0.        | 060 (iii | )    |  |  |  |  |
| TIME TO PEAK (hrs)=   | 5.25  |                                       | 5.33               |           | 25       | ,    |  |  |  |  |
| RUNOFF VOLUME (mm)=   | 60.71   |                                       | 30.35              | 44        | 1.30     |      |  |  |  |  |
| TOTAL RAINFALL (mm)=  | 62.71   |                                       | 62.71              | 62        | .71      |      |  |  |  |  |
| PEAK FLOW (cms)= TIME TO PEAK (hrs)= RUNOFF VOLUME (mm)= TOTAL RAINFALL (mm)= RUNOFF COEFFICIENT =                      | 0.97  |                                       | 0.48               | 6         | .71      |      |  |  |  |  |
| (i) CN PROCEDURE SELECT<br>CN* = 83.0 Iz<br>(ii) TIME STEP (DT) SHOL<br>THAN THE STORAGE CO<br>(iii) PEAK FLOW DOES NOT | a = Dep.<br>JLD BE SM<br>DEFFICIEN<br>INCLUDE | Storage<br>ALLER OF<br>T.<br>BASEFLOW | (Above)<br>R EQUAL | 1         |          |      |  |  |  |  |
|   |   |                                       |                    |           |          |      |  |  |  |  |
| ADD HYD ( 0410)   |   |                                       |                    |           |          |      |  |  |  |  |
| ADD HYD ( 0410)  1 + 2 = 3  | AREA O  | DEVR                                  | TDEAK              | P V       |          |      |  |  |  |  |
| (   | (ha) (  | cms)                                  | (hrs)              | (mm)      |          |      |  |  |  |  |
| TD1= 1 ( 0115): 1   | 1.00 0.                                       | 969                                   | 5.25               | 44.30     |          |      |  |  |  |  |
| + TD2= 2 ( 0120): 1   | 1.24 0.                                       | 079                                   | 5.25               | 47.65     |          |      |  |  |  |  |
| =======================================   |   |                                       |                    |           |          |      |  |  |  |  |
| ID = 3 ( 0410): 2   |   |                                       |                    |           |          |      |  |  |  |  |
|   |   |                                       |                    |           |          |      |  |  |  |  |
| NOTE: PEAK FLOWS DO NOT   | INCLUDE                                       | BASEFLOV                              | S IF ANY           | ·.        |          |      |  |  |  |  |
|   |   |                                       |                    |           |          |      |  |  |  |  |
| ADD HVD / Q42Q\I  |   |                                       |                    |           |          |      |  |  |  |  |
| 1 + 2 = 3   | AREA O  | PEAK                                  | TPEAK              | R.V.      |          |      |  |  |  |  |
| 1 + 2 = 3   A<br>   | (ha) (  | cms)                                  | (hrs)              | (mm)      |          |      |  |  |  |  |
| ID1= 1 ( 0405):   | 1.35 0.                                       | 259                                   | 5.25               | 46.14     |          |      |  |  |  |  |
|   |   |                                       |                    |           |          |      |  |  |  |  |

|                 | Lange   | taffRd F | Δ Fyist | ing HumberW | atersh | ed         |      |
|-----------------|---------|----------|---------|-------------|--------|------------|------|
| 0.16            |         | 3.250    |         | 6.333       | 5.12   |            | 0.73 |
| 0.25            |         |          |         |             | 5.12   |            | 0.73 |
| 0.33            |         | 3.417    |         |             | 5.12   |            | 0.73 |
| 0.41            |         |          |         |             | 5.12   |            | 0.73 |
| 0.50            | 0 0.73  | 3.583    |         |             | 5.12   |            | 0.73 |
| 0.58            |         |          |         |             | 5.12   |            | 0.73 |
| 0.66            | 7 0.73  | 3.750    | 12.43   |             | 5.12   | 9.92       | 0.73 |
| 0.75            | 0 0.73  | 3.833    | 12.43   | 6.917       | 5.12   | 10.00      | 0.73 |
| 0.83            | 3 0.73  | 3.917    | 12.43   | 7.000       | 5.12   | 10.08      | 0.73 |
| 0.91            | 7 0.73  | 4.000    | 12.43   | 7.083       | 5.12   | 10.17      | 0.73 |
| 1.00            | 0 0.73  | 4.083    | 12.43   | 7.167       | 5.12   | 10.25      | 0.73 |
| 1.08            | 3 0.73  | 4.167    | 12.43   | 7.250       | 5.12   | 10.33      | 0.73 |
| 1.16            | 7 0.73  | 4.250    | 12.43   | 7.333       | 2.92   | 10.42      | 0.73 |
| 1.25            | 0 0.73  | 4.333    | 33.63   | 7.417       | 2.92   | 10.50      | 0.73 |
| 1.33            | 3 0.73  | 4.417    | 33.63   | 7.500       | 2.92   | 10.58      | 0.73 |
| 1.41            | 7 0.73  | 4.500    | 33.63   | 7.583       | 2.92   | 10.67      | 0.73 |
| 1.50            | 0 0.73  | 4.583    | 33.63   | 7.667       | 2.92   | 10.75      | 0.73 |
| 1.58            | 3 0.73  | 4.667    | 33.63   | 7.750       | 2.92   | 10.83      | 0.73 |
| 1.66            | 7 0.73  | 4.750    | 33.63   | 7.833       | 2.92   | 10.92      | 0.73 |
| 1.75            |         | 4.833    |         | 7.917       | 2.92   | 11.00      | 0.73 |
| 1.83            | 3 0.73  | 4.917    | 33.63   | 8.000       | 2.92   | 11.08      | 0.73 |
| 1.91            |         | 5.000    |         | 8.083       | 2.92   | 11.17      | 0.73 |
| 2.00            | 0 0.73  | 5.083    | 33.63   | 8.167       | 2.92   | 11.25      | 0.73 |
| 2.08            | 3 0.73  | 5.167    | 33.63   | 8.250       | 2.92   | 11.33      | 0.73 |
| 2.16            | 7 0.73  | 5.250    | 33.63   | 8.333       | 1.46   | 11.42      | 0.73 |
| 2.25            | 0 0.73  | 5.333    | 9.50    | 8.417       | 1.46   | 11.50      | 0.73 |
| 2.33            | 3 4.39  | 5.417    | 9.50    | 8.500       | 1.46   | 11.58      | 0.73 |
| 2.41            | 7 4.39  | 5.500    | 9.50    | 8.583       | 1.46   | 11.67      | 0.73 |
| 2.50            | 0 4.39  | 5.583    | 9.50    | 8.667       | 1.46   | 11.75      | 0.73 |
| 2.58            | 3 4.39  | 5.667    | 9.50    | 8.750       | 1.46   | 11.83      | 0.73 |
| 2.66            | 7 4.39  | 5.750    | 9.50    | 8.833       | 1.46   | 11.92      | 0.73 |
| 2.75            | 0 4.39  | 5.833    | 9.50    | 8.917       | 1.46   | 12.00      | 0.73 |
| 2.83            | 3 4.39  | 5.917    | 9.50    | 9.000       | 1.46   | 12.08      | 0.73 |
| 2.91            | 7 4.39  | 6.000    | 9.50    | 9.083       | 1.46   | 12.17      | 0.73 |
| 3.00            |         | 6.083    | 9.50    |             | 1.46   |            | 0.73 |
| 3.08            | 3 4.39  | 6.167    | 9.50    | 9.250       | 1.46   | l          |      |
| Max.Eff.Inten.( | mm/hr)= | 33.63    |         | 25.08       |        |            |      |
| over            | (min)   | 10.00    |         | 25.00       |        |            |      |
| Storage Coeff.  | (min)=  | 12.14    | (ii)    | 21.40 (ii)  |        |            |      |
| Unit Hyd. Tpeak |         | 10.00    |         | 25.00       |        |            |      |
| Unit Hyd. peak  | (cms)=  | 0.10     |         | 0.05        | ****   | TALS*      |      |
| PEAK FLOW       | (cms)=  | 0.08     |         | 0.04        |        | .121 (iii) |      |
| TIME TO PEAK    | (hrs)=  | 5.25     |         | 5.33        |        | 5.25       |      |
| RUNOFF VOLUME   | (mm)=   | 71.10    |         | 41.07       |        | 3.18       |      |
| TOTAL RAINFALL  | (mm)=   | 73.10    |         | 73.10       |        | 3.10       |      |

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(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 85.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

## LangstaffRd\_EA\_Existing\_HumberWatershed THAN THE STORAGE COEFFICIENT. (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       | TRANSFORMED HYETOGRAPH |       |       |         |       |       |       |  |  |
|-------|------------------------|-------|-------|---------|-------|-------|-------|--|--|
| TIME  | RAIN                   | TIME  | RATN  | l' TTMF | RAIN  | TIME  | RAIN  |  |  |
| hrs   | mm/hr                  | hrs   | mm/hr | ' hrs   | mm/hr | i hrs | mm/hr |  |  |
| 0.083 | 0.00                   | 3.167 | 4.39  | 6.250   | 9.50  | 9.33  | 0.73  |  |  |
| 0.167 | 0.00                   | 3.250 | 4.39  | 6.333   | 5.12  | 9.42  | 0.73  |  |  |
| 0.250 | 0.00                   | 3.333 | 12.43 | 6.417   | 5.12  | 9.50  | 0.73  |  |  |
| 0.333 | 0.73                   | 3.417 | 12.43 | 6.500   | 5.12  | 9.58  | 0.73  |  |  |
| 0.417 | 0.73                   | 3.500 | 12.43 | 6.583   | 5.12  | 9.67  | 0.73  |  |  |
| 0.500 | 0.73                   | 3.583 | 12.43 | 6.667   | 5.12  | 9.75  | 0.73  |  |  |
| 0.583 | 0.73                   | 3.667 | 12.43 | 6.750   | 5.12  | 9.83  | 0.73  |  |  |
| 0.667 | 0.73                   | 3.750 | 12.43 | 6.833   | 5.12  | 9.92  | 0.73  |  |  |
| 0.750 | 0.73                   | 3.833 | 12.43 | 6.917   | 5.12  | 10.00 | 0.73  |  |  |
| 0.833 | 0.73                   | 3.917 | 12.43 | 7.000   | 5.12  | 10.08 | 0.73  |  |  |
| 0.917 | 0.73                   | 4.000 | 12.43 | 7.083   | 5.12  | 10.17 | 0.73  |  |  |
| 1.000 | 0.73                   | 4.083 | 12.43 | 7.167   | 5.12  | 10.25 | 0.73  |  |  |
| 1.083 | 0.73                   | 4.167 | 12.43 | 7.250   | 5.12  | 10.33 | 0.73  |  |  |
| 1.167 | 0.73                   | 4.250 | 12.43 | 7.333   | 2.92  | 10.42 | 0.73  |  |  |
| 1.250 | 0.73                   | 4.333 | 33.63 | 7.417   | 2.92  | 10.50 | 0.73  |  |  |
| 1.333 | 0.73                   | 4.417 | 33.63 | 7.500   | 2.92  | 10.58 | 0.73  |  |  |
| 1.417 | 0.73                   | 4.500 | 33.63 | 7.583   | 2.92  | 10.67 | 0.73  |  |  |
| 1.500 | 0.73                   | 4.583 | 33.63 | 7.667   | 2.92  | 10.75 | 0.73  |  |  |
| 1.583 | 0.73                   | 4.667 | 33.63 | 7.750   | 2.92  | 10.83 | 0.73  |  |  |
| 1.667 | 0.73                   | 4.750 | 33.63 | 7.833   | 2.92  | 10.92 | 0.73  |  |  |
| 1.750 | 0.73                   | 4.833 | 33.63 | 7.917   | 2.92  | 11.00 | 0.73  |  |  |
| 1.833 | 0.73                   | 4.917 | 33.63 | 8.000   | 2.92  | 11.08 | 0.73  |  |  |
| 1.917 | 0.73                   | 5.000 | 33.63 | 8.083   | 2.92  | 11.17 | 0.73  |  |  |
| 2.000 | 0.73                   | 5.083 | 33.63 | 8.167   | 2.92  | 11.25 | 0.73  |  |  |
| 2.083 | 0.73                   | 5.167 | 33.63 | 8.250   | 2.92  | 11.33 | 0.73  |  |  |
| 2.167 | 0.73                   | 5.250 | 33.63 | 8.333   | 1.46  | 11.42 | 0.73  |  |  |
| 2.250 | 0.73                   | 5.333 | 9.50  | 8.417   | 1.46  | 11.50 | 0.73  |  |  |
| 2.333 | 4.39                   | 5.417 | 9.50  | 8.500   | 1.46  | 11.58 | 0.73  |  |  |
| 2.417 | 4.39                   | 5.500 | 9.50  | 8.583   | 1.46  | 11.67 | 0.73  |  |  |
| 2.500 | 4.39                   | 5.583 | 9.50  | 8.667   | 1.46  | 11.75 | 0.73  |  |  |
| 2.583 | 4.39                   | 5.667 | 9.50  | 8.750   | 1.46  | 11.83 | 0.73  |  |  |

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#### LangstaffRd EA Existing HumberWatershed

| LangstaffRd_EA_Existing_HumberWatershed |            |       |            |       |           |       |  |  |  |  |
|---|------------|-------|------------|-------|-----------|-------|--|--|--|--|
| TRANSFORMED HYETOGRAPH                  |            |       |            |       |           |       |  |  |  |  |
|   |            |       |            |       |           |       |  |  |  |  |
|   | IN   TIME  | RAIN  |            | RAIN  |           | RAIN  |  |  |  |  |
|   | hr   hrs   |       |            | mm/hr |           | mm/hr |  |  |  |  |
|   | 00   3.167 |       | 6.250      | 9.50  |           | 0.73  |  |  |  |  |
|   | 00   3.250 |       | 6.333      | 5.12  |           | 0.73  |  |  |  |  |
|   | 00   3.333 |       | 6.417      | 5.12  |           | 0.73  |  |  |  |  |
|   | 73   3.417 |       | 6.500      | 5.12  |           | 0.73  |  |  |  |  |
|   | 73   3.500 |       | 6.583      | 5.12  |           | 0.73  |  |  |  |  |
|   | 73   3.583 |       | 6.667      | 5.12  |           | 0.73  |  |  |  |  |
|   | 73   3.667 |       | 6.750      | 5.12  |           | 0.73  |  |  |  |  |
|   | 73   3.750 |       | 6.833      | 5.12  |           | 0.73  |  |  |  |  |
|   | 73   3.833 |       | 6.917      |       | 10.00     | 0.73  |  |  |  |  |
|   | 73   3.917 |       | 7.000      |       | 10.08     | 0.73  |  |  |  |  |
|   | 73   4.000 |       | 7.083      |       | 10.17     | 0.73  |  |  |  |  |
| 1.000 0.                                | 73   4.083 | 12.43 | 7.167      |       | 10.25     | 0.73  |  |  |  |  |
| 1.083 0.                                | 73   4.167 |       | 7.250      |       | 10.33     | 0.73  |  |  |  |  |
|   | 73   4.250 |       | 7.333      |       | 10.42     | 0.73  |  |  |  |  |
|   | 73   4.333 |       |            |       | 10.50     | 0.73  |  |  |  |  |
|   | 73   4.417 |       | 7.500      |       | 10.58     | 0.73  |  |  |  |  |
|   | 73   4.500 | 33.63 | 7.583      |       | 10.67     | 0.73  |  |  |  |  |
|   | 73   4.583 |       | 7.667      |       | 10.75     | 0.73  |  |  |  |  |
|   | 73 4.667   |       | 7.750      |       | 10.83     | 0.73  |  |  |  |  |
|   | 73   4.750 |       | 7.833      |       | 10.92     | 0.73  |  |  |  |  |
|   | 73   4.833 |       | 7.917      |       | 11.00     | 0.73  |  |  |  |  |
|   | 73   4.917 |       | 8.000      |       | 11.08     | 0.73  |  |  |  |  |
|   | 73   5.000 |       | 8.083      |       | 11.17     | 0.73  |  |  |  |  |
|   | 73   5.083 |       | 8.167      |       | 11.25     | 0.73  |  |  |  |  |
|   | 73   5.167 |       | 8.250      |       | 11.33     | 0.73  |  |  |  |  |
|   | 73   5.250 |       |            |       | 11.42     | 0.73  |  |  |  |  |
|   | 73   5.333 |       | 8.417      |       | 11.50     | 0.73  |  |  |  |  |
|   | 39   5.417 |       | 8.500      |       | 11.58     | 0.73  |  |  |  |  |
|   | 39   5.500 |       | 8.583      |       | 11.67     | 0.73  |  |  |  |  |
|   | 39   5.583 |       | 8.667      |       | 11.75     | 0.73  |  |  |  |  |
|   | 39   5.667 |       | 8.750      |       | 11.83     | 0.73  |  |  |  |  |
|   | 39   5.750 |       | 8.833      |       | 11.92     | 0.73  |  |  |  |  |
|   | 39   5.833 |       | 8.917      |       | 12.00     | 0.73  |  |  |  |  |
|   | 39   5.917 |       | 9.000      |       | 12.08     | 0.73  |  |  |  |  |
|   | 39   6.000 |       | 9.083      |       | 12.17     | 0.73  |  |  |  |  |
|   | 39   6.083 |       | 9.167      |       | 12.25     | 0.73  |  |  |  |  |
| 3.083 4.                                | 39   6.167 | 9.50  | 9.250      | 1.46  |           |       |  |  |  |  |
|   |            |       |            |       |           |       |  |  |  |  |
| Max.Eff.Inten.(mm/hr)=                  |            |       | 23.77      |       |           |       |  |  |  |  |
| over (min)                              | 15.00      |       | 25.00      |       |           |       |  |  |  |  |
| Storage Coeff. (min)=                   |            |       | 22.03 (ii) |       |           |       |  |  |  |  |
| Unit Hyd. Tpeak (min)=                  |            |       | 25.00      |       |           |       |  |  |  |  |
| Unit Hyd. peak (cms)=                   | 0.08       |       | 0.05       |       |           |       |  |  |  |  |
|   |            |       |            |       | ALS*      |       |  |  |  |  |
| PEAK FLOW (cms)=                        |            |       | 0.06       |       | 165 (iii) |       |  |  |  |  |
| TIME TO PEAK (hrs)=                     |            |       | 5.33       |       | . 25      |       |  |  |  |  |
| RUNOFF VOLUME (mm)=                     |            |       | 38.61      |       | .82       |       |  |  |  |  |
| TOTAL RAINFALL (mm)=                    |            |       | 73.10      |       | 3.10      |       |  |  |  |  |
| RUNOFF COEFFICIENT =                    | 0.97       |       | 0.53       | 6     | 76        |       |  |  |  |  |
|   |            |       |            |       |           |       |  |  |  |  |

0.06 5.33 38.61 73.10 0.53 Page 35

|  | Langstaff  | Rd_EA_Exist         | ting_Humbe   | rWatersh | ed        |      |
|--|--|---------------------|--------------|----------|-----------|------|
| 2.66/  | 4.39   5.  | 750 9.50            | 8.833        | 1.46     | 11.92     | 0.73 |
| 2.730  | 4.39   5.0   | 17 9.50             | 0.917        | 1.40     | 12.00     | 0.73 |
| 2.055  | 4 39   6 6   | 9 9 9 9 9           | 9 083        | 1.46     | 12.00     | 0.73 |
| 3.000  | 4.39   6.0   | 9.50                | 9.167        | 1.46     | 12.25     | 0.73 |
| 3.083  | 4.39   5.3<br>4.39   5.3<br>4.39   5.3<br>4.39   6.0<br>4.39   6.0<br>4.39   6.0 | 167 9.50            | 9.250        | 1.46     |           | 0.75 |
|  |  |                     |              |          |           |      |
| Max.Eff.Inten.(mm/h<br>over (mi<br>Storage Coeff. (mi<br>Unit Hyd. Tpeak (mi<br>Unit Hyd. peak (cm | n) 10  | 9.00                | 25.00        |          |           |      |
| Storage Coeff. (mi   | .n)= 1   | 2.14 (ii)           | 21.31 (i     | i)       |           |      |
| Unit Hyd. Tpeak (mi  | n)= 10   | 9.00                | 25.00        |          |           |      |
| Unit Hyd. peak (cm   | ıs)= (   | 0.10                | 0.05         |          |           |      |
|  |  |                     |              |          | TALS*     |      |
| PEAK FLOW (cm  | ıs)= (   | 0.09                | 0.04         | 0        | .129 (iii | )    |
| PEAK FLOW (cm<br>TIME TO PEAK (hr<br>RUNOFF VOLUME (m<br>TOTAL RAINFALL (m<br>RUNOFF COEFFICIENT   | 's)= !   | 5.25                | 5.33         |          | 5.25      |      |
| RUNOFF VOLUME (m   | ım)= 7:  | 1.10                | 42.37        | 59       | 9.89      |      |
| TOTAL RAINFALL (m  | m)= /:   | 3.10                | /3.10        | /:       | 3.10      |      |
| RUNOFF COEFFICIENT   | = (  | 9.9/                | 0.58         | •        | 0.82      |      |
| THAN THE STOR<br>(iii) PEAK FLOW DOE<br>   | S NOT INCLU  | JDE BASEFLO         |              |          |           |      |
| ID1= 1 ( 0105):  | 1.63   | 0.129               | 5.25         | 59.89    |           |      |
| + ID2= 2 ( 0110):  | 1.58   | 0.121               | 5.25         | 58.18    |           |      |
| ID = 3 ( 0400):  |  |                     |              |          |           |      |
| NOTE: PEAK FLOWS D   | O NOT INCL   | JDE BASEFLO         | WS IF ANY    |          |           |      |
|  |  |                     |              |          |           |      |
| CALIB<br>STANDHYD ( 0125)   A<br>ID= 1 DT= 5.0 min   T   | rea (ha<br>otal Imp(%  | )= 2.27<br>)= 53.00 | Dir. Con     | n.(%)= ! | 53.00     |      |
|  |  |                     |              |          |           |      |
| Surface Area (h  | IMPEI  | 1 30<br>(ATOO2 b    | 1 07<br>1 07 | 1)       |           |      |
| Den Storage (m   | m)-  | 2 00                | 5 00         |          |           |      |
| Avenage Slone (  | ,-<br>%\-  | 1 00                | 2 00         |          |           |      |
| Length (   | m)= 800  | 9 00                | 20 00        |          |           |      |
| Surface Area (h Dep. Storage (m Average Slope ( Length ( Mannings n                                | = 0  | .013                | 0.250        |          |           |      |
| NOTE: RAINFALL   |  |                     |              | TIME ST  | EP.       |      |

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### ${\tt LangstaffRd\_EA\_Existing\_HumberWatershed}$

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |         |       |                |       |
|-------------------|-------|---------|-------|----------------|-------|
| STANDHYD ( 0130)  | Area  | (ha)=   | 2.08  |                |       |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 51.00 | Dir. Conn.(%)= | 51.00 |
|                   |       |         |       |                |       |
|                   |       | IMPERVI | OUS   | PERVIOUS (i)   |       |
| Surface Area      | (ha)= | 1.0     | 6     | 1.02           |       |
| Dep. Storage      | (mm)= | 2.0     | 0     | 5.00           |       |
| Average Slope     | (%)=  | 1.0     | 0     | 2.00           |       |
| Length            | (m)=  | 800.0   | 0     | 20.00          |       |
| Mannings n        | =     | 0.01    | 3     | 0.250          |       |
|                   |       |         |       |                |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    |       | ) HYETOGRA |      | -     |       |
|-------|-------|-------|-------|------------|------|-------|-------|
| TIME  | RAIN  |       | RAIN  | ' TIME     | RAIN |       | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr | ' hrs      |      |       | mm/hr |
| 0.083 | 0.00  | 3.167 | 4.39  | 6.250      | 9.50 |       | 0.73  |
| 0.167 | 0.00  | 3.250 | 4.39  |            | 5.12 |       | 0.73  |
| 0.250 | 0.00  | 3.333 | 12.43 | 6.417      | 5.12 | 9.50  | 0.73  |
| 0.333 | 0.73  | 3.417 | 12.43 | 6.500      | 5.12 | 9.58  | 0.73  |
| 0.417 | 0.73  | 3.500 | 12.43 | 6.583      | 5.12 | 9.67  | 0.73  |
| 0.500 | 0.73  | 3.583 | 12.43 | 6.667      | 5.12 | 9.75  | 0.73  |
| 0.583 | 0.73  | 3.667 | 12.43 | 6.750      | 5.12 | 9.83  | 0.73  |
| 0.667 | 0.73  | 3.750 | 12.43 | 6.833      | 5.12 | 9.92  | 0.73  |
| 0.750 | 0.73  | 3.833 | 12.43 | 6.917      | 5.12 | 10.00 | 0.73  |
| 0.833 | 0.73  | 3.917 | 12.43 | 7.000      | 5.12 | 10.08 | 0.73  |
| 0.917 |       | 4.000 |       |            | 5.12 |       | 0.73  |
| 1.000 | 0.73  |       | 12.43 | 7.167      | 5.12 |       | 0.73  |
| 1.083 | 0.73  |       | 12.43 |            | 5.12 | 10.33 | 0.73  |
| 1.167 | 0.73  | 4.250 | 12.43 | 7.333      | 2.92 | 10.42 | 0.73  |
| 1.250 |       | 4.333 | 33.63 | 7.417      | 2.92 |       | 0.73  |
| 1.333 | 0.73  | 4.417 |       |            | 2.92 | 10.58 | 0.73  |
| 1.417 |       | 4.500 | 33.63 | 7.583      | 2.92 |       | 0.73  |
| 1.500 | 0.73  | 4.583 | 33.63 | 7.667      | 2.92 | 10.75 | 0.73  |
| 1.583 | 0.73  |       | 33.63 | 7.750      | 2.92 | 10.83 | 0.73  |
| 1.667 | 0.73  | 4.750 | 33.63 | 7.833      | 2.92 | 10.92 | 0.73  |
| 1.750 | 0.73  |       | 33.63 | 7.917      | 2.92 | 11.00 | 0.73  |
| 1.833 | 0.73  |       | 33.63 | 8.000      | 2.92 | 11.08 | 0.73  |
| 1.917 |       | 5.000 | 33.63 | 8.083      | 2.92 | 11.17 | 0.73  |
| 2.000 | 0.73  | 5.083 | 33.63 | 8.167      | 2.92 | 11.25 | 0.73  |
| 2.083 | 0.73  |       | 33.63 |            | 2.92 | 11.33 | 0.73  |
| 2.167 | 0.73  | 5.250 | 33.63 | 8.333      | 1.46 | 11.42 | 0.73  |
|       |       |       | _     |            |      |       |       |

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LangstaffRd_EA_Existing_HumberWatershed

0.73 | 5.333 | 9.50 | 8.417 | 1.46 | 1

4.39 | 5.600 | 9.50 | 8.580 | 1.46 | 1

4.39 | 5.500 | 9.50 | 8.583 | 1.46 | 1

4.39 | 5.583 | 9.50 | 8.667 | 1.46 | 1

4.39 | 5.667 | 9.50 | 8.750 | 1.46 | 1

4.39 | 5.667 | 9.50 | 8.833 | 1.46 | 1

4.39 | 5.750 | 9.50 | 8.917 | 1.46 | 1

4.39 | 5.917 | 9.50 | 9.000 | 1.46 | 1

4.39 | 5.900 | 9.50 | 9.000 | 1.46 | 1

4.39 | 6.000 | 9.50 | 9.000 | 1.46 | 1

4.39 | 6.003 | 9.50 | 9.167 | 1.46 | 1

4.39 | 6.167 | 9.50 | 9.250 | 1.46 |
                                                                                                                                                                             Natershed
1.46 | 11.50
1.46 | 11.58
1.46 | 11.67
1.46 | 11.75
1.46 | 11.83
1.46 | 11.92
1.46 | 12.00
1.46 | 12.01
                                    2.250
                                     2.333
                                    2.333
2.417
2.500
2.583
2.667
2.750
                                                                                                                                                                                                                                    0.73
0.73
0.73
0.73
0.73
                                     2.833
                                                                                                                                                                                                                                     0.73
                                     2.917
                                                                                                                                                                                                                                     0.73
                                                                                                                                                                                                    12.25
                                                                                             33.63
15.00
13.76 (ii)
15.00
                                                                                                                                    23.77
25.00
22.03 (ii)
Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                                                                 0.08
                                                                                                                                             0.05
                                                                                                                                                                                      *TOTALS*
PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                                                              0.10
5.25
71.10
73.10
                                                                                                                                          0.05
5.33
38.61
73.10
0.53
                                                                                                                                                                                           0.150 (iii)
5.25
55.17
                                                                                                0.97
```

ADD HYD ( 0405)| 1 + 2 = 3 | ID1= 1 ( 0125): + ID2= 2 ( 0130): AREA (ha) 2.27 2.08 QPEAK (cms) 0.165 0.150 TPEAK (hrs) 5.25 5.25 R.V. (mm) 55.82 55.17 ID = 3 ( 0405): 4.35 0.315 5.25 55.51

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

Area (ha)= 1.24 Total Imp(%)= 57.00 Dir. Conn.(%)= 57.00 IMPERVIOUS PERVIOUS (i) Surface Area Dep. Storage Average Slope (ha)= (mm)= (%)=

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|                 | Lang   | staffRd_EA_E | kisting_HumberN | Vatershed   |
|-----------------|--------|--------------|-----------------|-------------|
| PEAK FLOW       | (cms)= | 0.07         | 0.03            | 0.096 (iii) |
| TIME TO PEAK    | (hrs)= | 5.25         | 5.33            | 5.25        |
| RUNOFF VOLUME   | (mm)=  | 71.10        | 38.61           | 57.12       |
| TOTAL RAINFALL  | (mm)=  | 73.10        | 73.10           | 73.10       |
| RUNOFF COEFFICI | ENT =  | 0.97         | 0.53            | 0.78        |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| I CALTB I         |               |       |                |       |
|-------------------|---------------|-------|----------------|-------|
| STANDHYD ( 0115)  | Area (ha)-    | 1 00  |                |       |
|                   |               |       |                |       |
| ID= 1 DT= 5.0 min | Total Imp(%)= | 46.00 | Dir. Conn.(%)= | 46.00 |

|               |       | IMPERVIOUS | PERVIOUS | (i) |
|---------------|-------|------------|----------|-----|
| Surface Area  | (ha)= | 0.46       | 0.54     |     |
| Dep. Storage  | (mm)= | 2.00       | 5.00     |     |
| Average Slope | (%)=  | 1.00       | 2.00     |     |
| Length        | (m)=  | 475.00     | 17.00    |     |
| Mannings n    | =     | 0.013      | 0.250    |     |
|               |       |            |          |     |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR/   | ANSFORME | D HYETOGRA | APH   | -     |       |
|-------|-------|-------|----------|------------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME     | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs      | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 4.39     | 6.250      | 9.50  | 9.33  | 0.73  |
| 0.167 | 0.00  | 3.250 | 4.39     | 6.333      | 5.12  | 9.42  | 0.73  |
| 0.250 | 0.00  | 3.333 | 12.43    | 6.417      | 5.12  | 9.50  | 0.73  |
| 0.333 | 0.73  | 3.417 | 12.43    | 6.500      | 5.12  | 9.58  | 0.73  |
| 0.417 | 0.73  | 3.500 | 12.43    | 6.583      | 5.12  | 9.67  | 0.73  |
| 0.500 | 0.73  | 3.583 | 12.43    | 6.667      | 5.12  | 9.75  | 0.73  |
| 0.583 | 0.73  | 3.667 | 12.43    | 6.750      | 5.12  | 9.83  | 0.73  |
| 0.667 | 0.73  | 3.750 | 12.43    | 6.833      | 5.12  | 9.92  | 0.73  |
| 0.750 | 0.73  | 3.833 | 12.43    | 6.917      | 5.12  | 10.00 | 0.73  |
| 0.833 | 0.73  | 3.917 | 12.43    | 7.000      | 5.12  | 10.08 | 0.73  |
| 0.917 | 0.73  | 4.000 | 12.43    | 7.083      | 5.12  | 10.17 | 0.73  |
| 1.000 | 0.73  | 4.083 | 12.43    | 7.167      | 5.12  | 10.25 | 0.73  |
| 1.083 | 0.73  | 4.167 | 12.43    | 7.250      | 5.12  | 10.33 | 0.73  |
| 1.167 | 0.73  | 4.250 | 12.43    | 7.333      | 2.92  | 10.42 | 0.73  |
| 1.250 | 0.73  | 4.333 | 33.63    | 7.417      | 2.92  | 10.50 | 0.73  |
| 1.333 | 0.73  | 4.417 | 33.63    | 7.500      | 2.92  | 10.58 | 0.73  |
| 1.417 | 0.73  | 4.500 | 33.63    | 7.583      | 2.92  | 10.67 | 0.73  |
| 1.500 | 0.73  | 4.583 | 33.63    | 7.667      | 2.92  | 10.75 | 0.73  |
| 1.583 | 0.73  | 4.667 | 33.63    | 7.750      | 2.92  | 10.83 | 0.73  |
| 1.667 | 0.73  | 4.750 | 33.63    | 7.833      | 2.92  | 10.92 | 0.73  |
| 1.750 | 0.73  | 4.833 | 33.63    | 7.917      | 2.92  | 11.00 | 0.73  |

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LangstaffRd\_EA\_Existing\_HumberWatershed Length 475.00 0.013 Mannings n 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|                 |         | TR    | ANSFORME | ED HYETOGRA | PH    | -     |       |
|-----------------|---------|-------|----------|-------------|-------|-------|-------|
| TIM             | E RAIN  |       | RAIN     |             | RAIN  |       | RAIN  |
| hr              | s mm/hr | hrs   | mm/hr    | i' hrs      | mm/hr | hrs   | mm/hr |
| 0.08            | 3 0.00  | 3.167 | 4.39     | 6.250       | 9.50  | 9.33  | 0.73  |
| 0.16            | 7 0.00  | 3.250 | 4.39     | 6.333       | 5.12  | 9.42  | 0.73  |
| 0.25            | 0.00    | 3.333 | 12.43    | 6.417       | 5.12  | 9.50  | 0.73  |
| 0.33            | 3 0.73  | 3.417 | 12.43    | 6.500       | 5.12  | 9.58  | 0.73  |
| 0.41            | 7 0.73  | 3.500 | 12.43    | 6.583       | 5.12  | 9.67  | 0.73  |
| 0.50            | 0 0.73  | 3.583 | 12.43    | 6.667       | 5.12  | 9.75  | 0.73  |
| 0.58            | 3 0.73  | 3.667 | 12.43    | 6.750       | 5.12  | 9.83  | 0.73  |
| 0.66            | 7 0.73  | 3.750 | 12.43    | 6.833       | 5.12  | 9.92  | 0.73  |
| 0.75            | 0 0.73  | 3.833 | 12.43    | 6.917       | 5.12  | 10.00 | 0.73  |
| 0.83            | 3 0.73  | 3.917 | 12.43    | 7.000       | 5.12  | 10.08 | 0.73  |
| 0.91            | 7 0.73  | 4.000 | 12.43    | 7.083       | 5.12  | 10.17 | 0.73  |
| 1.00            | 0 0.73  | 4.083 |          |             | 5.12  |       | 0.73  |
| 1.08            |         | 4.167 | 12.43    | 7.250       | 5.12  | 10.33 | 0.73  |
| 1.16            | 7 0.73  | 4.250 | 12.43    | 7.333       | 2.92  | 10.42 | 0.73  |
| 1.25            | 0 0.73  | 4.333 | 33.63    | 7.417       | 2.92  | 10.50 | 0.73  |
| 1.33            | 3 0.73  | 4.417 | 33.63    | 7.500       | 2.92  | 10.58 | 0.73  |
| 1.41            |         | 4.500 | 33.63    | 7.583       | 2.92  |       | 0.73  |
| 1.50            | 0 0.73  | 4.583 | 33.63    | 7.667       | 2.92  | 10.75 | 0.73  |
| 1.58            | 3 0.73  | 4.667 | 33.63    |             | 2.92  | 10.83 | 0.73  |
| 1.66            | 7 0.73  | 4.750 | 33.63    | 7.833       | 2.92  |       | 0.73  |
| 1.75            | 0 0.73  | 4.833 | 33.63    | 7.917       | 2.92  | 11.00 | 0.73  |
| 1.83            | 3 0.73  | 4.917 | 33.63    | 8.000       | 2.92  |       | 0.73  |
| 1.91            | 7 0.73  | 5.000 | 33.63    | 8.083       | 2.92  | 11.17 | 0.73  |
| 2.00            | 0 0.73  | 5.083 | 33.63    | 8.167       | 2.92  | 11.25 | 0.73  |
| 2.08            | 3 0.73  | 5.167 | 33.63    | 8.250       | 2.92  | 11.33 | 0.73  |
| 2.16            | 7 0.73  | 5.250 | 33.63    | 8.333       | 1.46  | 11.42 | 0.73  |
| 2.25            | 0 0.73  | 5.333 | 9.50     | 8.417       | 1.46  | 11.50 | 0.73  |
| 2.33            |         | 5.417 | 9.50     | 8.500       | 1.46  | 11.58 | 0.73  |
| 2.41            |         | 5.500 |          | 8.583       | 1.46  | 11.67 | 0.73  |
| 2.50            | 0 4.39  | 5.583 | 9.50     | 8.667       | 1.46  | 11.75 | 0.73  |
| 2.58            |         | 5.667 | 9.50     |             | 1.46  |       | 0.73  |
| 2.66            | 7 4.39  | 5.750 |          | 8.833       | 1.46  | 11.92 | 0.73  |
| 2.75            |         |       | 9.50     |             | 1.46  |       | 0.73  |
| 2.83            |         | 5.917 |          | 9.000       | 1.46  | 12.08 | 0.73  |
| 2.91            | 7 4.39  | 6.000 | 9.50     | 9.083       | 1.46  | 12.17 | 0.73  |
| 3.00            |         | 6.083 | 9.50     |             | 1.46  |       | 0.73  |
| 3.08            | 3 4.39  | 6.167 | 9.50     | 9.250       | 1.46  | l     |       |
| Max.Eff.Inten.( | mm/hr)= | 33.63 |          | 23.77       |       |       |       |
| over            | (min)   | 10.00 |          | 20.00       |       |       |       |
| Storage Coeff.  | (min)=  | 10.06 | (ii)     | 17.57 (ii)  |       |       |       |
| Unit Hyd. Tpeak | (min)=  | 10.00 |          | 20.00       |       |       |       |
| Unit Hyd. peak  | (cms)=  | 0.11  |          | 0.06        |       |       |       |
|                 |         |       |          |             | *TO   | τΔις* |       |

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\*TOTALS\*

```
1.833
1.917
2.000
                                                                                                                      11.08
11.17
11.25
11.33
                                                                                                                                        0.73
0.73
                                                                                                          2.92
                             2.083
                                                                                                          2.92
                                                                                                                                        0.73
                             2.167
                                                                                                         1.46
                                                                                                                      11.42
11.50
                                                                                                                                        0.73
                             2 250
                                                                                                          1 46
                            2.250
2.333
2.417
2.500
2.583
                                                                                                         1.46
1.46
1.46
1.46
1.46
                                                                                                                      11.58
11.67
11.75
11.83
                             2.667
                                                                                                                      11.92
                                                                                                                                        0.73
                              2.750
                                                                                                          1.46
                                                                                                                      12.00
                                                                                                                                        0.73
                             2.833
2.917
                                                                                                          1.46
                                                                                                                      12.08
12.17
                                                                                                                                        0.73
0.73
                                                                                                         1.46
1.46
1.46
        Max.Eff.Inten.(mm/hr)=
                                                             33.63
                                                                                     23.77
        over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                             10.00
10.06 (ii)
                                                                                     20.00
17.57 (ii)
                                                             10.00
                                                                                     20.00
       PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                             0.04
5.25
71.10
                                                                                                                 0.073 (iii)
5.25
53.54
73.10
                                                                                     5.33
38.61
                                                             73.10
                                                                                     73.10
                                                              0.97
                                                                                                                   0.73
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN* = 83.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COFFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
 | ADD HYD ( 0410)|
| 1 + 2 = 3 |
                                                                  QPEAK
(cms)
                                                                                                    (mm)
53.54
                                                     (ha)
1.00
                                                                                     (hrs)
5.25
          ID1= 1 ( 0115):
+ ID2= 2 ( 0120):
                                                                 0.073
0.096
                                                                                     5.25
                                                                                                    57.12
           ID = 3 ( 0410):
                                                    2.24
                                                                                     5.25
        NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
| ADD HYD ( 0420)|
| 1 + 2 = 3 |
```

AREA QPEAK TPEAK

#### LangstaffRd\_EA\_Existing\_HumberWatershed (ha) (cms) (hrs) (mm) 4.35 0.315 5.25 55.51 2.24 0.168 5.25 55.52 ID1= 1 ( 0405): + ID2= 2 ( 0410): ID = 3 ( 0420): 6.59 0.483 5.25 55.52 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY. Ptotal= 80.82 mm RAIN ' TIME mm/hr ' hrs 13.74 | 6.75 | 6.75 | 6.75 | 7.60 | 7.75 | 7.75 | 7.77 | 8.90 | 7.77 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 8.25 | 7.17 | 7.17 | 8.25 | 7.17 | 7.17 | 7.17 | 7.17 | 7.17 | 7.17 | 7.17 | 7.17 | 7.17 | 7.17 | 7.17 | 7.17 | 7.17 | 7.17 | 7.17 RAIN | ' mm/hr | ' 13.74 | 13.74 | 13.74 | 13.74 | 37.17 | 37.17 | 37.17 | 37.17 | 10.50 | 10.50 | 10.50 | 5.66 | RAIN | TIME mm/hr | hrs | 0.00 | 3.50 | 0.81 | 3.75 | 0.81 | 4.00 | 0.81 | 4.50 | 0.81 | 4.50 | 0.81 | 4.50 | 0.81 | 4.50 | 0.81 | 4.50 | 0.81 | 5.50 | 0.81 | 5.50 | 4.85 | 5.75 | 4.85 | 6.60 | 4.85 | 6.50 | 4.85 | 6.50 RAIN | TIME mm/hr | hrs 5.66 | 10.00 5.66 | 10.25 5.66 | 10.50 3.23 | 11.75 3.23 | 11.50 1.62 | 11.75 1.62 | 12.25 1.62 | 0.81 | TIME hrs 0.25 0.50 0.75 1.00 1.25 1.50 1.75 2.00 2.25 2.50 2.75 0.81 0.81 0.81 0.81 0.81 0.81 0.81 0.81 3.00 0.81 3.25 0.81 TMPERVTOUS PERVIOUS (i) Surface Area Dep. Storage Average Slope Length (ha)= (mm)= (%)= (m)= 0.90 2.00 1.00 650.00 0.68 5.00 2.00 25.00 Mannings n 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----RAIN | TIME RAIN | TIME RAIN | TIME

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LangstaffRd\_EA\_Existing\_HumberWatershed

CN\* = 85.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |         |       |                |       |
|-------------------|-------|---------|-------|----------------|-------|
| STANDHYD ( 0105)  | Area  | (ha)=   | 1.63  |                |       |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 61.00 | Dir. Conn.(%)= | 61.00 |
|                   |       |         |       |                |       |
|                   |       | IMPERVI | OUS   | PERVIOUS (i)   |       |
| Surface Area      | (ha)= | 0.9     | 9     | 0.64           |       |
| Dep. Storage      | (mm)= | 2.0     | 0     | 5.00           |       |
| Average Slope     | (%)=  | 1.0     | 0     | 2.00           |       |
| Length            | (m)=  | 650.0   | 0     | 25.00          |       |
| Mannings n        | ` =   | 0.01    | 3     | 0.250          |       |
|                   |       |         |       |                |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TRANSFORMED HYETOGRAPH |       |       |       |        |       |       |       |  |
|------------------------|-------|-------|-------|--------|-------|-------|-------|--|
| TIME                   | RAIN  | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |
| hrs                    | mm/hr | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |
| 0.083                  | 0.00  | 3.167 | 4.85  | 6.250  | 10.50 | 9.33  | 0.81  |  |
| 0.167                  | 0.00  | 3.250 | 4.85  | 6.333  | 5.66  | 9.42  | 0.81  |  |
| 0.250                  | 0.00  | 3.333 | 13.74 | 6.417  | 5.66  | 9.50  | 0.81  |  |
| 0.333                  | 0.81  | 3.417 | 13.74 | 6.500  | 5.66  | 9.58  | 0.81  |  |
| 0.417                  | 0.81  | 3.500 | 13.74 | 6.583  | 5.66  | 9.67  | 0.81  |  |
| 0.500                  | 0.81  | 3.583 | 13.74 | 6.667  | 5.66  | 9.75  | 0.81  |  |
| 0.583                  | 0.81  | 3.667 | 13.74 | 6.750  | 5.66  | 9.83  | 0.81  |  |
| 0.667                  | 0.81  | 3.750 | 13.74 | 6.833  | 5.66  | 9.92  | 0.81  |  |
| 0.750                  | 0.81  | 3.833 | 13.74 | 6.917  | 5.66  | 10.00 | 0.81  |  |
| 0.833                  | 0.81  | 3.917 | 13.74 | 7.000  | 5.66  | 10.08 | 0.81  |  |
| 0.917                  | 0.81  | 4.000 | 13.74 | 7.083  | 5.66  | 10.17 | 0.81  |  |
| 1.000                  | 0.81  | 4.083 | 13.74 | 7.167  | 5.66  | 10.25 | 0.81  |  |
| 1.083                  | 0.81  | 4.167 | 13.74 | 7.250  | 5.66  | 10.33 | 0.81  |  |
| 1.167                  | 0.81  | 4.250 | 13.74 | 7.333  | 3.23  | 10.42 | 0.81  |  |
| 1.250                  | 0.81  | 4.333 | 37.17 | 7.417  | 3.23  | 10.50 | 0.81  |  |
| 1.333                  | 0.81  | 4.417 | 37.17 | 7.500  | 3.23  | 10.58 | 0.81  |  |
| 1.417                  | 0.81  | 4.500 | 37.17 | 7.583  | 3.23  | 10.67 | 0.81  |  |
| 1.500                  | 0.81  | 4.583 | 37.17 | 7.667  | 3.23  | 10.75 | 0.81  |  |
| 1.583                  | 0.81  | 4.667 | 37.17 | 7.750  | 3.23  | 10.83 | 0.81  |  |
| 1.667                  | 0.81  | 4.750 | 37.17 | 7.833  | 3.23  | 10.92 | 0.81  |  |
| 1.750                  | 0.81  | 4.833 | 37.17 | 7.917  | 3.23  | 11.00 | 0.81  |  |
| 1.833                  | 0.81  | 4.917 | 37.17 | 8.000  | 3.23  | 11.08 | 0.81  |  |
| 1.917                  | 0.81  | 5.000 | 37.17 | 8.083  | 3.23  | 11.17 | 0.81  |  |
| 2.000                  | 0.81  | 5.083 | 37.17 | 8.167  | 3.23  | 11.25 | 0.81  |  |
| 2.083                  | 0.81  | 5.167 | 37.17 | 8.250  | 3.23  | 11.33 | 0.81  |  |
| 2.167                  | 0.81  | 5.250 | 37.17 | 8.333  | 1.62  | 11.42 | 0.81  |  |
| 2.250                  | 0.81  | 5.333 | 10.50 | 8.417  | 1.62  | 11.50 | 0.81  |  |
| 2.333                  | 4.85  | 5.417 | 10.50 | 8.500  | 1.62  | 11.58 | 0.81  |  |
| 2.417                  | 4.85  | 5.500 | 10.50 | 8.583  | 1.62  | 11.67 | 0.81  |  |

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|                    |       |       |       | ing_Humber |       |            |       |
|--------------------|-------|-------|-------|------------|-------|------------|-------|
| hrs                | mm/hr |       | mm/hr |            | mm/hr |            | mm/hi |
| 0.083              | 0.00  |       |       |            | 10.50 |            | 0.81  |
| 0.167              |       | 3.250 | 4.85  |            | 5.66  |            | 0.81  |
| 0.250              |       | 3.333 | 13.74 |            | 5.66  |            | 0.81  |
| 0.333              |       | 3.417 |       |            | 5.66  |            | 0.81  |
| 0.417              |       | 3.500 | 13.74 |            | 5.66  |            | 0.81  |
| 0.500              |       | 3.583 | 13.74 |            | 5.66  |            | 0.81  |
| 0.583              |       | 3.667 |       | 6.750      | 5.66  |            | 0.81  |
| 0.667              |       | 3.750 |       | 6.833      | 5.66  |            | 0.81  |
| 0.750              |       | 3.833 |       |            | 5.66  |            | 0.81  |
| 0.833              |       | 3.917 |       | 7.000      | 5.66  |            | 0.81  |
| 0.917              |       | 4.000 |       |            | 5.66  |            | 0.81  |
| 1.000              |       | 4.083 |       |            | 5.66  |            | 0.81  |
| 1.083              |       | 4.167 |       |            | 5.66  |            | 0.81  |
| 1.167              |       | 4.250 | 13.74 |            | 3.23  |            | 0.81  |
| 1.250              | 0.81  | 4.333 | 37.17 | 7.417      | 3.23  | 10.50      | 0.81  |
| 1.333              |       | 4.417 | 37.17 |            | 3.23  |            | 0.81  |
| 1.417              | 0.81  | 4.500 | 37.17 | 7.583      | 3.23  | 10.67      | 0.81  |
| 1.500              | 0.81  | 4.583 | 37.17 | 7.667      | 3.23  | 10.75      | 0.81  |
| 1.583              | 0.81  | 4.667 | 37.17 | 7.750      | 3.23  | 10.83      | 0.81  |
| 1.667              | 0.81  | 4.750 | 37.17 | 7.833      | 3.23  | 10.92      | 0.81  |
| 1.750              | 0.81  | 4.833 | 37.17 | 7.917      | 3.23  | 11.00      | 0.81  |
| 1.833              | 0.81  | 4.917 | 37.17 | 8.000      | 3.23  | 11.08      | 0.81  |
| 1.917              | 0.81  | 5.000 | 37.17 | 8.083      | 3.23  | 11.17      | 0.81  |
| 2.000              | 0.81  | 5.083 | 37.17 | 8.167      | 3.23  | 11.25      | 0.81  |
| 2.083              | 0.81  | 5.167 | 37.17 |            | 3.23  | 11.33      | 0.81  |
| 2.167              | 0.81  | 5.250 | 37.17 | 8.333      | 1.62  | 11.42      | 0.81  |
| 2.250              | 0.81  | 5.333 | 10.50 | 8.417      | 1.62  | 11.50      | 0.81  |
| 2,333              |       | 5.417 | 10.50 |            | 1.62  |            | 0.81  |
| 2.417              |       | 5.500 |       | 8.583      | 1.62  |            | 0.81  |
| 2.500              |       | 5.583 | 10.50 |            | 1.62  |            | 0.81  |
| 2.583              |       | 5.667 |       | 8.750      | 1.62  |            | 0.81  |
| 2.667              |       | 5.750 | 10.50 |            | 1.62  |            | 0.81  |
| 2.750              |       | 5.833 |       | 8.917      | 1.62  |            | 0.81  |
| 2.833              |       | 5.917 | 10.50 |            | 1.62  |            | 0.81  |
| 2.917              |       | 6.000 |       | 9.083      | 1.62  |            | 0.81  |
| 3.000              |       | 6.083 | 10.50 |            | 1.62  |            | 0.81  |
| 3.083              |       | 6.167 | 10.50 |            | 1.62  |            |       |
| Max.Eff.Inten.(mm/ | 'hn\- | 37.17 |       | 28.73      |       |            |       |
| over (m            |       | 10.00 |       | 25.00      |       |            |       |
|                    | iin)= | 11.67 | (44)  | 20.44 (ii) |       |            |       |
| Unit Hyd. Tpeak (m |       | 10.00 |       | 25.00      |       |            |       |
|                    | :ms)= | 0.10  |       | 0.05       |       |            |       |
| , , (-             | -,    | ,,    |       |            | *T0T  | TALS*      |       |
| PEAK FLOW (c       | :ms)= | 0.09  |       | 0.04       |       | .136 (iii) |       |
|                    | ırs)= | 5.25  |       | 5.33       |       | 5.25       |       |
|                    | mm)=  | 78.82 |       | 47.65      |       | 5.41       |       |
|                    | mm)=  | 80.82 |       | 80.82      | 86    | 9.82       |       |
| RUNOFF COEFFICIENT |       | 0.98  |       | 0.59       | 6     | 9.81       |       |
|                    |       |       |       |            |       |            |       |

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

| Lang   | staffRd EA                | Existing Humb          | erWatersh  | ed       |      |
|--|---------------------------|------------------------|------------|----------|------|
| 2.500 4.85   | 5.583                     | 10.50   8.667          | 1.62       | 11.75    | 0.81 |
| 2.583 4.85   | 5.667                     | 10.50   8.750          | 1.62       | 11.83    | 0.81 |
| 2.667 4.85   | 5.750                     | 10.50   8.833          | 1.62       | 11.92    | 0.81 |
| 2.750 4.85   | 5.833                     | 10.50   8.917          | 1.62       | 12.00    | 0.81 |
| 2.833 4.85   | 5.917                     | 10.50   9.000          | 1.62       | 12.08    | 0.81 |
| 2.917 4.85   | 6.000                     | 10.50   9.083          | 1.62       | 12.17    | 0.81 |
| 3.000 4.85   | 6.083                     | 10.50   9.167          | 1.62       | 12.25    | 0.81 |
| 2.500 4.85<br>2.583 4.85<br>2.667 4.85<br>2.750 4.85<br>2.750 4.85<br>2.833 4.85<br>2.917 4.85<br>3.000 4.85<br>3.003 4.85 | 6.167                     | 10.50   9.250          | 1.62       |          |      |
|  |                           |                        |            |          |      |
| over (min)   | 10 00                     | 25.42                  |            |          |      |
| Storage Coeff (min)=   | 11 67 (                   | ii) 20 35 (i           | ii)        |          |      |
| Unit Hvd. Tneak (min)=   | 10.00                     | 25.00                  | /          |          |      |
| Max.Eff.Inten.(mm/hr)= over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)=                       | 0.10                      | 0.05                   |            |          |      |
|  |                           |                        | *101       | TALS*    |      |
| PEAK FLOW (cms)= TIME TO PEAK (hrs)= RUNOFF VOLUME (mm)= TOTAL RAINFALL (mm)=  | 0.10                      | 9.94                   |            | 145 (iii | )    |
| TIME TO PEAK (hrs)=  | 5.25                      | 5.33                   |            | 5.25     | ,    |
| RUNOFF VOLUME (mm)=  | 78.82                     | 5.33<br>49.06<br>80.82 | 67         | 7.21     |      |
| TOTAL RAINFALL (mm)=   | 80.82                     | 80.82                  | 67<br>86   | 9.82     |      |
| RUNOFF COEFFICIENT =   | 0.98                      | 0.61                   | 6          | 9.83     |      |
| (ii) TIME STEP (DT) SHOL<br>THAN THE STORAGE CC<br>(iii) PEAK FLOW DOES NOT  | DEFFICIENT.<br>INCLUDE BA | SEFLOW IF ANY.         |            |          |      |
| ADD 11VD / Q4QQ\   |                           |                        |            |          |      |
| 1 + 2 = 3  | AREA OPE                  | AK TPEAK               | R.V.       |          |      |
| · (  | (ha) (cm                  | s) (hrs)               | (mm)       |          |      |
| ID1= 1 ( 0105): 1  | i.63 0.14                 | 5 5.25                 | 67.21      |          |      |
| + ID2= 2 ( 0110): 1  | 1.58 0.13                 | 6 5.25                 | 65.41      |          |      |
|  |                           |                        |            |          |      |
| ID = 3 ( 0400): 3  | 3.21 0.28                 | 1 5.25                 | 66.32      |          |      |
| NOTE: PEAK FLOWS DO NOT  | INCLUDE BA                | SEFLOWS IF ANY         | <i>(</i> . |          |      |
|  |                           |                        |            |          |      |
| Lourn  |                           |                        |            |          |      |
| CALIB<br>  STANDHYD ( 0125)  Area<br> ID= 1 DT= 5.0 min   Total I  | (ha)= 2<br>Imp(%)= 53     | .27<br>.00 Dir. Cor    | nn.(%)= 5  | 53.00    |      |
|  | TMPERVTOUS                | PERVIOUS (             | (i)        |          |      |
| Surface Area (ha)=   | 1.20                      | 1.07                   | ,          |          |      |
| Dep. Storage (mm)=   | 2.00                      | 5.00                   |            |          |      |
| Average Slope (%)=   | 1.00                      | 2.00                   |            |          |      |
| Length (m)=  | 800.00                    | 20.00                  |            |          |      |
| Surface Area (ha)= Dep. Storage (mm)= Average Slope (%)= Length (m)= Mannings n =  | 0.013                     | 0.250                  |            |          |      |
|  |                           |                        |            |          |      |

## LangstaffRd\_EA\_Existing\_HumberWatershed NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

RANSFORMED HYETOGRAPH ---RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME RAI TRANSFORMED HYETOGRAPH RAIN | mm/hr | 0.00 | 0.00 | TIME hrs 3.167 RAIN mm/hr 0.81 hrs 0.083 0.167 3.250 0.250 0.00 3.333 0.81 0.333 3.417 0.81 3.417 3.500 3.583 3.667 3.750 3.833 3.917 0.333 0.417 0.500 0.583 0.667 0.750 0.81 0.81 0.81 0.81 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.833 0.917 4.000 4.083 4.167 4.250 4.333 4.417 4.500 4.583 4.667 4.750 4.833 4.917 5.000 5.083 5.167 0.81 5.66 5.66 3.23 3.23 3.23 3.23 3.23 1.083 1.167 1.250 1.333 37.17 | 7.583 | 37.17 | 7.667 | 37.17 | 7.667 | 37.17 | 7.759 | 37.17 | 7.759 | 37.17 | 7.759 | 37.17 | 8.080 | 37.17 | 8.167 | 37.17 | 8.167 | 37.17 | 8.167 | 37.17 | 8.167 | 37.17 | 8.150 | 8.450 | 8.450 | 8.450 | 8.450 | 8.450 | 8.583 | 10.59 | 8.657 | 10.50 | 8.833 | 10.50 | 8.900 | 10.50 | 8.900 | 10.50 | 8.900 | 10.50 | 9.900 | 10.50 | 9.900 | 10.50 | 9.250 | 9.250 | 9.250 | 1.417 0.81 | 1.583 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 4.85 | 3.23 3.23 3.23 3.23 3.23 3.23 3.23 1.62 10.83 0.81 1.750 1.833 1.917 2.083 11.33 0.81 2.167 5.250 11.42 5.250 5.333 5.417 5.500 5.583 5.667 5.750 5.833 5.917 1.62 1.62 1.62 1.62 1.62 1.62 1.62 2.250 11.50 11.58 0.81 11.58 11.67 11.75 11.83 11.92 12.00 2.833 1.62 12.08 0.81 2.917 6.000 1.62 0.81 1.62 6.083 6.167 12.25 over (min)=
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 15.00 25.00 13.22 (ii) 21.04 (ii) 15.00 25.00 0.08 0.05 \*TOTALS\* PEAK FLOW (cms)= TIME TO PEAK (hrs)= RUNOFF VOLUME (mm)= 0.187 (iii) 5.25 62.90 0.07 0.12 5.25 78.82

|                     | Langs | taffRd_E | A_Existi | ing_Humbe | rWatersh | ed    |      |
|---------------------|-------|----------|----------|-----------|----------|-------|------|
| 2.083               | 0.81  | 5.167    | 37.17    | 8.250     | 3.23     | 11.33 | 0.81 |
| 2.167               | 0.81  | 5.250    | 37.17    | 8.333     | 1.62     | 11.42 | 0.81 |
| 2.250               | 0.81  | 5.333    | 10.50    | 8.417     | 1.62     | 11.50 | 0.81 |
| 2.333               | 4.85  | 5.417    | 10.50    | 8.500     | 1.62     | 11.58 | 0.81 |
| 2.417               | 4.85  | 5.500    | 10.50    | 8.583     | 1.62     | 11.67 | 0.81 |
| 2.500               | 4.85  | 5.583    | 10.50    | 8.667     | 1.62     | 11.75 | 0.81 |
| 2.583               | 4.85  | 5.667    | 10.50    | 8.750     | 1.62     | 11.83 | 0.81 |
| 2.667               | 4.85  | 5.750    | 10.50    | 8.833     | 1.62     | 11.92 | 0.81 |
| 2.750               | 4.85  | 5.833    | 10.50    | 8.917     | 1.62     | 12.00 | 0.81 |
| 2.833               | 4.85  | 5.917    | 10.50    | 9.000     | 1.62     | 12.08 | 0.81 |
| 2.917               | 4.85  | 6.000    | 10.50    | 9.083     | 1.62     | 12.17 | 0.81 |
| 3.000               | 4.85  | 6.083    | 10.50    | 9.167     | 1.62     | 12.25 | 0.81 |
| 3.083               | 4.85  | 6.167    | 10.50    | 9.250     | 1.62     | l     |      |
| Max.Eff.Inten.(mm/h | nr)=  | 37.17    |          | 27.36     |          |       |      |
| oven (mi            |       | 15 00    |          | 25 00     |          |       |      |

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| over             | (min)  | 15.00      | 25.00      |             |
|------------------|--------|------------|------------|-------------|
| Storage Coeff.   | (min)= | 13.22 (ii) | 21.04 (ii) |             |
| Unit Hyd. Tpeak  | (min)= | 15.00      | 25.00      |             |
| Unit Hyd. peak   | (cms)= | 0.08       | 0.05       |             |
|                  |        |            |            | *TOTALS*    |
| PEAK FLOW        | (cms)= | 0.11       | 0.06       | 0.170 (iii) |
| TIME TO PEAK     | (hrs)= | 5.25       | 5.33       | 5.25        |
| RUNOFF VOLUME    | (mm)=  | 78.82      | 44.97      | 62.23       |
| TOTAL RAINFALL   | (mm)=  | 80.82      | 80.82      | 80.82       |
| RUNOFF COEFFICIE | NT =   | 0.98       | 0.56       | 0.77        |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
   CN\* = 83.0 Ia = Dep. Storage (Above)
  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
   THAN THE STORAGE COFFFICENT.
  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0405)                         |           |           |           |       |
|---|-----------|-----------|-----------|-------|
| 1 + 2 = 3                               | AREA      | QPEAK     | TPEAK     | R.V.  |
|   | (ha)      | (cms)     | (hrs)     | (mm)  |
| ID1= 1 ( 0125):                         | 2.27      | 0.187     | 5.25      | 62.90 |
| + ID2= 2 ( 0130):                       | 2.08      | 0.170     | 5.25      | 62.23 |
| ======================================= |           |           |           |       |
| ID = 3 ( 0405):                         | 4.35      | 0.357     | 5.25      | 62.58 |
|   |           |           |           |       |
| NOTE: PEAK FLOWS DO I                   | NOT INCLU | DE BASEFL | OWS IF AN | NY.   |

| CALIB             |       |         |       |        |           |       |  |
|-------------------|-------|---------|-------|--------|-----------|-------|--|
| STANDHYD ( 0120)  | Area  | (ha)=   | 1.24  |        |           |       |  |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 57.00 | Dir.   | Conn.(%)= | 57.00 |  |
|                   |       |         |       |        |           |       |  |
|                   |       | IMPERVI | OUS   | PERVIO | IS (i)    |       |  |
| Surface Area      | (ha)= | 0.7     |       | 0.5    |           |       |  |

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LangstaffRd\_EA\_Existing\_HumberWatershed (mm)= 80.82 80.82 80.8 NT = 0.98 0.56 0.7 TOTAL RAINFALL RUNOFF COEFFICIENT

|               |       | IMPERVIOUS | PERVIOUS (i) |
|---------------|-------|------------|--------------|
| Surface Area  | (ha)= | 1.06       | 1.02         |
| Dep. Storage  | (mm)= | 2.00       | 5.00         |
| Average Slope | (%)=  | 1.00       | 2.00         |
| Length        | (m)=  | 800.00     | 20.00        |
| Mannings n    | =     | 0.013      | 0.250        |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TRANSFORMED HYETOGRAPH |       |       |       |        |       |       |       |  |
|------------------------|-------|-------|-------|--------|-------|-------|-------|--|
| TIME                   | RAIN  | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |
| hrs                    | mm/hr | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |
| 0.083                  | 0.00  | 3.167 | 4.85  | 6.250  | 10.50 | 9.33  | 0.81  |  |
| 0.167                  | 0.00  | 3.250 | 4.85  | 6.333  | 5.66  | 9.42  | 0.81  |  |
| 0.250                  | 0.00  | 3.333 | 13.74 | 6.417  | 5.66  | 9.50  | 0.81  |  |
| 0.333                  | 0.81  | 3.417 | 13.74 | 6.500  | 5.66  | 9.58  | 0.81  |  |
| 0.417                  | 0.81  | 3.500 | 13.74 | 6.583  | 5.66  | 9.67  | 0.81  |  |
| 0.500                  | 0.81  | 3.583 | 13.74 | 6.667  | 5.66  | 9.75  | 0.81  |  |
| 0.583                  | 0.81  | 3.667 | 13.74 | 6.750  | 5.66  | 9.83  | 0.81  |  |
| 0.667                  | 0.81  | 3.750 | 13.74 | 6.833  | 5.66  | 9.92  | 0.81  |  |
| 0.750                  | 0.81  | 3.833 | 13.74 | 6.917  | 5.66  | 10.00 | 0.81  |  |
| 0.833                  | 0.81  | 3.917 | 13.74 | 7.000  | 5.66  | 10.08 | 0.81  |  |
| 0.917                  | 0.81  | 4.000 | 13.74 | 7.083  | 5.66  | 10.17 | 0.81  |  |
| 1.000                  | 0.81  | 4.083 | 13.74 | 7.167  | 5.66  | 10.25 | 0.81  |  |
| 1.083                  | 0.81  | 4.167 | 13.74 | 7.250  | 5.66  | 10.33 | 0.81  |  |
| 1.167                  | 0.81  | 4.250 | 13.74 | 7.333  | 3.23  | 10.42 | 0.81  |  |
| 1.250                  | 0.81  | 4.333 | 37.17 | 7.417  | 3.23  | 10.50 | 0.81  |  |
| 1.333                  | 0.81  | 4.417 | 37.17 | 7.500  | 3.23  | 10.58 | 0.81  |  |
| 1.417                  | 0.81  | 4.500 | 37.17 | 7.583  | 3.23  | 10.67 | 0.81  |  |
| 1.500                  | 0.81  | 4.583 | 37.17 | 7.667  | 3.23  | 10.75 | 0.81  |  |
| 1.583                  | 0.81  | 4.667 | 37.17 | 7.750  | 3.23  | 10.83 | 0.81  |  |
| 1.667                  | 0.81  | 4.750 | 37.17 | 7.833  | 3.23  | 10.92 | 0.81  |  |
| 1.750                  | 0.81  | 4.833 | 37.17 | 7.917  | 3.23  | 11.00 | 0.81  |  |
| 1.833                  | 0.81  | 4.917 | 37.17 | 8.000  | 3.23  | 11.08 | 0.81  |  |
| 1.917                  | 0.81  | 5.000 | 37.17 | 8.083  | 3.23  | 11.17 | 0.81  |  |
| 2.000                  | 0.81  | 5.083 | 37.17 | 8.167  | 3.23  | 11.25 | 0.81  |  |
|                        |       |       |       |        |       |       |       |  |

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LangstaffRd EA Existing HumberWatershed

| Dan Channe    | /\    | 2      | 5 00  |
|---------------|-------|--------|-------|
| Dep. Storage  | (mm)= | 2.00   | 5.00  |
| Average Slope | (%)=  | 1.00   | 2.00  |
| Length        | (m)=  | 475.00 | 17.00 |
| Mannings n    | =     | 0.013  | 0.250 |

NOTE: RATNEALL WAS TRANSFORMED TO 5 0 MIN TIME STEP

TRANSFORMED HYETOGRAPH ---ME RAIN | TIME RAIN | TIME
rs mm/hr | hrs hrs mm/hr | 0.00 | hrs 3.167 mm/hr hrs mm/hr | mm/hr 0.81 9.33 9.42 9.50 9.58 9.67 9.75 9.83 4.85 | 6.250 4.85 | 6.250 4.85 | 6.333 13.74 | 6.583 13.74 | 6.657 13.74 | 6.667 13.74 | 6.750 13.74 | 6.833 13.74 | 6.917 13.74 | 7.080 13.74 | 7.080 13.74 | 7.250 13.74 | 7.250 13.74 | 7.250 13.74 | 7.250 13.74 | 7.590 13.74 | 7.590 13.74 | 7.590 13.74 | 7.590 13.71 | 7.590 13.71 | 7.590 13.71 | 7.590 13.71 | 7.833 13.71 | 7.750 13.71 | 8.080 13.71 | 8.080 13.71 | 8.080 13.71 | 8.080 13.71 | 8.808 13.71 | 8.808 13.71 | 8.808 13.71 | 8.808 13.71 | 8.808 13.71 | 8.808 13.71 | 8.808 13.71 | 8.808 13.71 | 8.808 13.71 | 8.808 13.71 | 8.808 13.71 | 8.808 13.71 | 8.808 13.71 | 8.808 13.71 | 8.808 13.71 | 8.808 13.71 | 8.808 13.71 | 8.808 13.71 | 8.808 13.71 | 8.808 13.71 | 8.808 13.71 | 8.808 13.71 | 8.808 14.70 | 8.808 15.70 | 8.850 16.50 | 8.850 16.50 | 8.850 16.50 | 8.833 16.50 | 8.833 16.50 | 9.000 16.50 | 9.000 16.50 | 9.000 16.50 | 9.000 16.50 | 9.000 16.50 | 9.000 16.50 | 9.000 16.50 | 9.000 16.50 | 9.000 16.50 | 9.000 16.50 | 9.000 16.50 | 9.000 16.50 | 9.000 16.50 | 9.000 16.50 | 9.000 16.50 | 9.000 16.50 | 9.000 17.50 | 9.000 18.50 | 9.000 19.50 | 9.000 19.50 | 9.000 19.50 | 9.250 0.083 10.50 | 0.083 0.167 0.250 0.333 0.417 0.500 0.583 5.66 | 5.66 | 5.66 | 5.66 | 5.66 | 5.66 | 5.66 | 0.00 3.250 3.333 3.417 3.590 3.583 3.667 3.750 3.833 3.917 4.060 4.250 4.250 4.250 4.250 4.583 4.450 4.583 4.4750 4.583 5.667 5.250 5.333 5.417 5.583 5.583 0.81 0.81 0.81 0.81 0.81 0.667 0.81 9.92 0.81 10.00 0.750 0.81 5.66 0.81 0.750 0.833 0.917 1.000 1.083 1.167 0.81 0.81 0.81 0.81 0.81 5.66 5.66 5.66 5.66 3.23 3.23 10.00 10.08 10.17 10.25 10.33 10.42 10.50 0.81 0.81 1.250 0.81 1.333 0.81 3.23 10.58 0.81 1.417 0.81 10.67 0.81 1.500 1.583 1.667 1.750 1.833 0.81 0.81 0.81 0.81 3.23 3.23 3.23 3.23 10.07 10.75 10.83 10.92 11.00 11.08 0.81 0.81 0.81 0.81 0.81 3.23 0.81 1.917 0.81 3.23 11.17 0.81 2.000 0.81 3.23 11.25 0.81 2.083 0.81 3.23 11.33 0.81 2.167 2.250 2.333 2.417 2.500 2.583 0.81 0.81 4.85 4.85 4.85 4.85 1.62 1.62 1.62 1.62 11.42 11.50 11.58 11.67 0.81 11.75 1.62 0.81 5.667 1.62 11.83 0.81 5.667 5.750 5.833 5.917 6.000 6.083 6.167

Max.Eff.Inten.(mm/hr)= 37.17 27.36 over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)= 10.00 20.00 9.67 (ii) 16.76 (ii) 10.00 20.00

4.85

4.85

4.85 | 4.85 | 4.85 | 4.85 |

2.667

2.750

2.833 2.917 3.000 3.083

1.62 11.92

1.62 12.00

12.08

1.62 1.62 1.62 1.62

0.81

0.81

0.81 0.81

| Unit Hyd. peak  | (cms)= | 0.11  | 0.06  |             |
|-----------------|--------|-------|-------|-------------|
|                 |        |       |       | *TOTALS*    |
| PEAK FLOW       | (cms)= | 0.07  | 0.03  | 0.108 (iii) |
| TIME TO PEAK    | (hrs)= | 5.25  | 5.33  | 5.25        |
| RUNOFF VOLUME   | (mm)=  | 78.82 | 44.97 | 64.26       |
| TOTAL RAINFALL  | (mm)=  | 80.82 | 80.82 | 80.82       |
| RUNOFF COEFFICI | ENT =  | 0.98  | 0.56  | 0.80        |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |          |              |                   |       |
|-------------------|----------|--------------|-------------------|-------|
| STANDHYD ( 0115)  | Area     | (ha)= 1.0    | 30                |       |
| ID= 1 DT= 5.0 min | Total    | Imp(%)= 46.0 | 00 Dir. Conn.(%)= | 46.00 |
|                   |          |              |                   |       |
|                   |          | IMPERVIOUS   | PERVIOUS (i)      |       |
| Surface Area      | (ha)=    | 0.46         | 0.54              |       |
| Dep. Storage      | ( mm ) = | 2.00         | 5.00              |       |
| Average Slope     | (%)=     | 1.00         | 2.00              |       |
| Length            | (m)=     | 475.00       | 17.00             |       |
| Mannings n        |          | 0.013        | 0.250             |       |
|                   |          |              |                   |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 4.85     | 6.250   | 10.50 | 9.33  | 0.81  |
| 0.167 | 0.00  | 3.250 | 4.85     | 6.333   | 5.66  | 9.42  | 0.81  |
| 0.250 | 0.00  | 3.333 | 13.74    | 6.417   | 5.66  | 9.50  | 0.81  |
| 0.333 | 0.81  | 3.417 | 13.74    | 6.500   | 5.66  | 9.58  | 0.81  |
| 0.417 | 0.81  | 3.500 | 13.74    | 6.583   | 5.66  | 9.67  | 0.81  |
| 0.500 | 0.81  | 3.583 | 13.74    | 6.667   | 5.66  | 9.75  | 0.81  |
| 0.583 | 0.81  | 3.667 | 13.74    | 6.750   | 5.66  | 9.83  | 0.81  |
| 0.667 | 0.81  | 3.750 | 13.74    | 6.833   | 5.66  | 9.92  | 0.81  |
| 0.750 | 0.81  | 3.833 | 13.74    | 6.917   | 5.66  | 10.00 | 0.81  |
| 0.833 | 0.81  | 3.917 | 13.74    | 7.000   | 5.66  | 10.08 | 0.81  |
| 0.917 | 0.81  | 4.000 | 13.74    | 7.083   | 5.66  | 10.17 | 0.81  |
| 1.000 | 0.81  | 4.083 | 13.74    | 7.167   | 5.66  | 10.25 | 0.81  |
| 1.083 | 0.81  | 4.167 | 13.74    | 7.250   | 5.66  | 10.33 | 0.81  |
| 1.167 | 0.81  | 4.250 | 13.74    | 7.333   | 3.23  | 10.42 | 0.81  |
| 1.250 | 0.81  | 4.333 | 37.17    | 7.417   | 3.23  | 10.50 | 0.81  |
| 1.333 | 0.81  | 4.417 | 37.17    | 7.500   | 3.23  | 10.58 | 0.81  |
| 1.417 | 0.81  | 4.500 | 37.17    | 7.583   | 3.23  | 10.67 | 0.81  |
| 1.500 | 0.81  | 4.583 | 37.17    | 7.667   | 3.23  | 10.75 | 0.81  |
| 1.583 | 0.81  | 4.667 | 37.17    | 7.750   | 3.23  | 10.83 | 0.81  |
|       |       |       |          |         |       |       |       |

| 500 | 13.74 | 0.505 | 3.00 | ) ).0/ | 0.01 |   |
|-----|-------|-------|------|--------|------|---|
| 583 | 13.74 | 6.667 | 5.66 | 9.75   | 0.81 |   |
| 667 | 13.74 | 6.750 | 5.66 | 9.83   | 0.81 |   |
| 750 | 13.74 | 6.833 | 5.66 | 9.92   | 0.81 | ADD HYD ( 0410)   |
| 833 | 13.74 | 6.917 | 5.66 | 10.00  | 0.81 | $\begin{vmatrix} 1+2=3 \end{vmatrix}$ AREA QPEAK TPEAK R.V. |
| 917 | 13.74 | 7.000 | 5.66 | 10.08  | 0.81 | (ha) (cms) (hrs) (mm)                                       |
| 000 | 13.74 | 7.083 | 5.66 | 10.17  | 0.81 | ID1= 1 ( 0115): 1.00 0.083 5.25 60.53                       |
| 083 | 13.74 | 7.167 | 5.66 | 10.25  | 0.81 | + ID2= 2 ( 0120): 1.24 0.108 5.25 64.26                     |
| 167 | 13.74 | 7.250 | 5.66 | 10.33  | 0.81 |   |
| 250 | 13.74 | 7.333 | 3.23 | 10.42  | 0.81 | ID = 3 ( 0410): 2.24 0.190 5.25 62.59                       |
| 333 | 37.17 | 7.417 | 3.23 | 10.50  | 0.81 |   |
| 417 | 37.17 | 7.500 | 3.23 | 10.58  | 0.81 | NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.           |
| 500 | 37.17 | 7.583 | 3.23 | 10.67  | 0.81 |   |
| 583 | 37.17 | 7.667 | 3.23 | 10.75  | 0.81 |   |
| 667 | 37.17 | 7.750 | 3.23 | 10.83  | 0.81 |   |
|     | Page  | 49    |      |        |      | Page 50   |
|     |       |       |      |        |      |   |
|     |       |       |      |        |      |   |
|     |       |       |      |        |      |   |
|     |       |       |      |        |      |   |
|     |       |       |      |        |      |   |

| ADD HYD ( 0420)          |                     | staffRd_E | A_Existi  | .ng_Humbe       | rWatersh  | ed        |         |
|--------------------------|---------------------|-----------|-----------|-----------------|-----------|-----------|---------|
| 1 + 2 = 3<br>ID1= 1 ( 04 | A<br>- (<br>105): 4 |           | ms) (     | (hrs)<br>5.25 ( | 52.58     |           |         |
| + ID2= 2 ( 04            |                     |           |           |                 |           |           |         |
| ID = 3 ( 04              |                     |           |           |                 | 52.58     |           |         |
| NOTE: PEAK FLO           | DWS DO NOT          | INCLUDE E | BASEFLOWS | S IF ANY        |           |           |         |
| *******                  | ******              | **        |           |                 |           |           |         |
| ** SIMULATION:Run 1      | 2                   | **        |           |                 |           |           |         |
| ***********              | *******             | **        |           |                 |           |           |         |
|                          |                     |           |           |                 |           |           |         |
|                          |                     |           |           |                 |           |           |         |
| READ STORM               | Filena              | me: C:\Us |           |                 | oD        |           |         |
|                          |                     |           | ocal\Ten  |                 | .02 0-466 | 2045467   | 07225   |
| Ptotal= 88.54 mm         | l Common            |           |           | e-4ce0-8t       | 92-veatt  | 20f5fb5\6 | 9Ca/235 |
| FLUCAI- 00.34 IIIII      | - Commen            | 15. 1001. | .2        |                 |           |           |         |
| TI                       | 4E RAIN             | TIME      | RAIN      | ' TIME          | RAIN      | TIME      | RAIN    |
| hı                       | rs mm/hr            | hrs       | mm/hr     | ' hrs           | mm/hr     | hrs       | mm/hr   |
| 0.2                      | 25 0.00             | 3.50      | 15.05     | 6.75            | 6.20      | 10.00     | 0.89    |
| 0.5                      | 0.89                | 3.75      |           |                 |           | 10.25     |         |
| 0.7                      | 75 0.89             | 4.00      | 15.05     | 7.25            | 6.20      | 10.50     | 0.89    |
|                          | 0.89                |           |           |                 |           | 10.75     |         |
| 1.2                      | 25 0.89             | 4.50      | 40.71     | 7.75            | 3.54      | 11.00     | 0.89    |
|                          | 0.89                |           |           |                 |           |           |         |
| 1.3                      | 75 0.89             | 5.00      | 40.71     | 8.25            | 3.54      | 11.50     | 0.89    |
|                          | 0.89                |           |           |                 |           | 11.75     |         |
|                          | 25 0.89             |           |           |                 |           | 12.00     |         |
| 2.5                      | 50 5.31             | 5.75      | 11.51     | 9.00            | 1.77      | 12.25     | 0.89    |
| 2.5                      | 75 5.31             | 6.00      | 11.51     | 9.25            | 1.77      |           |         |
| 3.6                      | 90 5.31             | 6.25      | 11.51     | 9.50            | 0.89      |           |         |
| 3.2                      | 25 5.31             | 6.50      | 6.20      | 9.75            | 0.89      |           |         |
|                          |                     |           |           |                 |           |           |         |

| 3.25              | 5.31    | 6.50        | 6.20   9. | .75 0.89     |       |
|-------------------|---------|-------------|-----------|--------------|-------|
|                   |         |             |           |              |       |
|                   |         |             |           |              |       |
| CALIB             |         |             |           |              |       |
| STANDHYD ( 0110)  | Area    | (ha)= 1     | .58       |              |       |
| ID= 1 DT= 5.0 min | Total   | Imp(%)= 57  | .00 Dir.  | Conn.(%)=    | 57.00 |
|                   |         |             |           |              |       |
|                   |         | IMPERVIOUS  | PERVIOL   | JS (i)       |       |
| Surface Area      | (ha)=   | 0.90        | 0.68      | 3            |       |
| Dep. Storage      | (mm)=   | 2.00        | 5.00      | 9            |       |
| Average Slope     | (%)=    | 1.00        | 2.00      | 9            |       |
| Length            | (m)=    | 650.00      | 25.00     | 9            |       |
| Mannings n        | =       | 0.013       | 0.256     | 9            |       |
|                   |         |             |           |              |       |
| NOTE: RAINF       | ALL WAS | TRANSFORMED | TO 5.0 N  | MIN. TIME ST | EP.   |

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| La                     | ngstaffRd E | A Exist | ing Humber | Natersh | ed         |       |
|------------------------|-------------|---------|------------|---------|------------|-------|
|                        |             |         | D HYETOGRA |         |            |       |
| TIME RAI               |             | RAIN    |            | RAIN    | TIME       | RAIN  |
| hrs mm/h               | r İ hrs     | mm/hr   | i' hrs     | mm/hr   | i hrs      | mm/hr |
| 0.083 0.0              |             | 5.31    | 6.250      | 11.51   |            | 0.89  |
| 0.167 0.0              | 0 3.250     | 5.31    | 6.333      | 6.20    | 9.42       | 0.89  |
| 0.250 0.0              |             |         | 6.417      | 6.20    |            | 0.89  |
| 0.333 0.8              |             |         | 6.500      | 6.20    |            | 0.89  |
| 0.417 0.8              |             |         | 6.583      | 6.20    |            | 0.89  |
| 0.500 0.8              | 9 3.583     | 15.05   | 6.667      | 6.20    | 9.75       | 0.89  |
| 0.583 0.8              |             |         | 6.750      | 6.20    |            | 0.89  |
| 0.667 0.8              |             |         | 6.833      | 6.20    | 9.92       | 0.89  |
| 0.750 0.8              |             | 15.05   | 6.917      | 6.20    |            | 0.89  |
| 0.833 0.8              | 9 3.917     | 15.05   | 7.000      | 6.20    | 10.08      | 0.89  |
| 0.917 0.8              |             | 15.05   | 7.083      | 6.20    |            | 0.89  |
| 1.000 0.8              |             | 15.05   | 7.167      | 6.20    |            | 0.89  |
| 1.083 0.8              |             | 15.05   | 7.250      | 6.20    | 10.33      | 0.89  |
| 1.167 0.8              |             | 15.05   | 7.333      | 3.54    |            | 0.89  |
| 1.250 0.8              |             | 40.71   | 7.417      | 3.54    |            | 0.89  |
| 1.333 0.8              |             | 40.71   | 7.500      | 3.54    |            | 0.89  |
| 1.417 0.8              |             | 40.71   | 7.583      | 3.54    |            | 0.89  |
| 1.500 0.8              |             | 40.71   | 7.667      | 3.54    |            | 0.89  |
| 1.583 0.8              |             | 40.71   | 7.750      | 3.54    |            | 0.89  |
| 1.667 0.8              |             | 40.71   | 7.833      | 3.54    |            | 0.89  |
| 1.750 0.8              |             |         | 7.917      | 3.54    | 11.00      | 0.89  |
| 1.833 0.8              |             | 40.71   | 8.000      | 3.54    |            | 0.89  |
| 1.917 0.8              |             | 40.71   | 8.083      | 3.54    |            | 0.89  |
| 2.000 0.8              |             |         | 8.167      | 3.54    | 11.25      | 0.89  |
| 2.083 0.8              | 9   5.167   | 40.71   | 8.250      | 3.54    | 11.33      | 0.89  |
| 2.167 0.8              | 9   5.250   | 40.71   | 8.333      | 1.77    | 11.42      | 0.89  |
| 2.250 0.8              | 9   5.333   | 11.51   | 8.417      | 1.77    | 11.50      | 0.89  |
| 2.333 5.3              | 1   5.417   | 11.51   | 8.500      | 1.77    | 11.58      | 0.89  |
| 2.417 5.3              | 1   5.500   | 11.51   | 8.583      | 1.77    | 11.67      | 0.89  |
| 2.500 5.3              | 1   5.583   | 11.51   | 8.667      | 1.77    | 11.75      | 0.89  |
| 2.583 5.3              | 1   5.667   | 11.51   | 8.750      | 1.77    | 11.83      | 0.89  |
| 2.667 5.3              | 1   5.750   | 11.51   | 8.833      | 1.77    | 11.92      | 0.89  |
| 2.750 5.3              | 1   5.833   | 11.51   | 8.917      | 1.77    | 12.00      | 0.89  |
| 2.833 5.3              | 1   5.917   | 11.51   | 9.000      | 1.77    | 12.08      | 0.89  |
| 2.917 5.3              | 1   6.000   | 11.51   | 9.083      | 1.77    | 12.17      | 0.89  |
| 3.000 5.3              | 1   6.083   | 11.51   | 9.167      | 1.77    | 12.25      | 0.89  |
| 3.083 5.3              | 1   6.167   | 11.51   | 9.250      | 1.77    |            |       |
| Max.Eff.Inten.(mm/hr)= | 40.71       |         | 32.40      |         |            |       |
| over (min)             | 10.00       |         | 20.00      |         |            |       |
| Storage Coeff. (min)=  | 11.25       | (ii)    | 19.61 (ii) |         |            |       |
| Unit Hyd. Tpeak (min)= | 10.00       |         | 20.00      |         |            |       |
| Unit Hyd. peak (cms)=  | 0.10        |         | 0.06       |         |            |       |
|                        |             |         |            |         | TALS*      |       |
| PEAK FLOW (cms)=       | 0.10        |         | 0.05       |         | .153 (iii) |       |
| TIME TO PEAK (hrs)=    | 5.25        |         | 5.33       |         | . 25       |       |
| RUNOFF VOLUME (mm)=    | 86.54       |         | 54.37      |         | 2.70       |       |
| TOTAL RAINFALL (mm)=   | 88.54       |         | 88.54      |         | 3.54       |       |
| RUNOFF COEFFICIENT =   | 0.98        |         | 0.61       | (       | 9.82       |       |

LangstaffRd EA Existing HumberWatershed 0.81 | 4.750 | 37.17 | 7.833 | 3.23 | 16 |
0.81 | 4.833 | 37.17 | 7.917 | 3.23 | 11 |
0.81 | 4.917 | 37.17 | 8.080 | 3.23 | 11 |
0.81 | 5.000 | 37.17 | 8.083 | 3.23 | 12 |
0.81 | 5.160 | 37.17 | 8.167 | 3.23 | 11 |
0.81 | 5.160 | 37.17 | 8.263 | 3.23 | 12 |
0.81 | 5.167 | 37.17 | 8.253 | 3.23 | 12 |
0.81 | 5.250 | 37.17 | 8.333 | 1.62 | 12 |
0.81 | 5.333 | 10.50 | 8.417 | 1.62 | 12 |
4.85 | 5.5417 | 10.50 | 8.583 | 1.62 | 12 |
4.85 | 5.583 | 10.50 | 8.583 | 1.62 | 12 |
4.85 | 5.583 | 10.50 | 8.750 | 1.62 | 1 |
4.85 | 5.5750 | 10.50 | 8.750 | 1.62 | 1 |
4.85 | 5.833 | 10.50 | 8.917 | 1.62 | 1 |
4.85 | 5.833 | 10.50 | 8.917 | 1.62 | 1 |
4.85 | 5.833 | 10.50 | 8.917 | 1.62 | 1 |
4.85 | 5.833 | 10.50 | 8.917 | 1.62 | 1 |
4.85 | 5.833 | 10.50 | 9.083 | 1.62 | 1 |
4.85 | 6.000 | 10.50 | 9.083 | 1.62 | 1 |
4.85 | 6.167 | 10.50 | 9.083 | 1.62 | 1 |
4.85 | 6.167 | 10.50 | 9.083 | 1.62 | 1 |
4.85 | 6.167 | 10.50 | 9.083 | 1.62 | 1 |
4.85 | 6.167 | 10.50 | 9.083 | 1.62 | 1 |
4.85 | 6.167 | 10.50 | 9.083 | 1.62 | 1 |

27.36 20.00 16.76 (ii) 20.00 0.06

0.04 5.33 44.97 80.82 0.56

37.17 10.00 9.67 (ii) 10.00 0.11

0.05 5.25 78.82 80.82 0.98

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 83.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COFFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

1.667 1.750 1.833 1.917 2.000 2.083 2.167 2.250 2.333 2.417 2.500 2.583 2.667 2.750 2.833 2.917

3.000

Max.Eff.Inten.(mm/hr)= over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)=

PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =

Ratershed
3.23 | 10.92
3.23 | 11.00
3.23 | 11.00
3.23 | 11.00
3.23 | 11.00
3.23 | 11.17
3.23 | 11.25
3.23 | 11.25
3.23 | 11.33
1.62 | 11.42
1.62 | 11.50
1.62 | 11.50
1.62 | 11.50
1.62 | 11.50
1.62 | 11.50
1.62 | 11.50
1.62 | 11.50
1.62 | 11.50
1.62 | 11.50
1.62 | 11.50
1.62 | 11.50
1.62 | 11.50
1.62 | 12.00
1.62 | 12.00
1.62 | 12.05
1.62 | 12.25
1.62 | 12.25

\*TOTALS\*

0.083 (iii) 5.25 60.53 80.82 0.75

0.81 0.81 0.81 0.81 0.81 0.81

0.81 0.81 0.81

0.81 0.81 0.81 0.81 0.81 0.81 0.81

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 85.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB | STANDHYD ( 0105) | Area (ha)= 1.63 |ID= 1 DT= 5.0 min | Total Imp(%)= 61.00 Dir. Conn.(%)= 61.00

| ID= | 1 DT= 5.0 min | Total | Imp(%)= | 61.00 | Dir.    | Conn.  |
|-----|---------------|-------|---------|-------|---------|--------|
|     |               |       | IMPERVI | ous   | PERVIOL | JS (i) |
|     | Surface Area  | (ha)= | 0.9     | 9     | 0.64    |        |
|     | Dep. Storage  | (mm)= | 2.0     | 0     | 5.00    | )      |
|     | Average Slope | (%)=  | 1.0     | 0     | 2.00    | )      |
|     | Length        | (m)=  | 650.0   | 0     | 25.00   | )      |
|     | Mannings n    | =     | 0.01    | 3     | 0.250   | )      |
|     |               |       |         |       |         |        |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 5.31     | 6.250   | 11.51 | 9.33  | 0.89  |
| 0.167 | 0.00  | 3.250 | 5.31     | 6.333   | 6.20  | 9.42  | 0.89  |
| 0.250 | 0.00  | 3.333 | 15.05    | 6.417   | 6.20  | 9.50  | 0.89  |
| 0.333 | 0.89  | 3.417 | 15.05    | 6.500   | 6.20  | 9.58  | 0.89  |
| 0.417 | 0.89  | 3.500 | 15.05    | 6.583   | 6.20  | 9.67  | 0.89  |
| 0.500 | 0.89  | 3.583 | 15.05    | 6.667   | 6.20  | 9.75  | 0.89  |
| 0.583 | 0.89  | 3.667 | 15.05    | 6.750   | 6.20  | 9.83  | 0.89  |
| 0.667 | 0.89  | 3.750 | 15.05    | 6.833   | 6.20  | 9.92  | 0.89  |
| 0.750 | 0.89  | 3.833 | 15.05    | 6.917   | 6.20  | 10.00 | 0.89  |
| 0.833 | 0.89  | 3.917 | 15.05    | 7.000   | 6.20  | 10.08 | 0.89  |
| 0.917 | 0.89  | 4.000 | 15.05    | 7.083   | 6.20  | 10.17 | 0.89  |
| 1.000 | 0.89  | 4.083 | 15.05    | 7.167   | 6.20  | 10.25 | 0.89  |
| 1.083 | 0.89  | 4.167 | 15.05    | 7.250   | 6.20  | 10.33 | 0.89  |
| 1.167 | 0.89  | 4.250 | 15.05    | 7.333   | 3.54  | 10.42 | 0.89  |
| 1.250 | 0.89  | 4.333 | 40.71    | 7.417   | 3.54  | 10.50 | 0.89  |
| 1.333 | 0.89  | 4.417 | 40.71    | 7.500   | 3.54  | 10.58 | 0.89  |
| 1.417 | 0.89  | 4.500 | 40.71    | 7.583   | 3.54  | 10.67 | 0.89  |
| 1.500 | 0.89  | 4.583 | 40.71    | 7.667   | 3.54  | 10.75 | 0.89  |
| 1.583 | 0.89  | 4.667 | 40.71    | 7.750   | 3.54  | 10.83 | 0.89  |
| 1.667 | 0.89  | 4.750 | 40.71    | 7.833   | 3.54  | 10.92 | 0.89  |
| 1.750 | 0.89  | 4.833 | 40.71    | 7.917   | 3.54  | 11.00 | 0.89  |
| 1.833 | 0.89  | 4.917 | 40.71    | 8.000   | 3.54  | 11.08 | 0.89  |
| 1.917 | 0.89  | 5.000 | 40.71    | 8.083   | 3.54  | 11.17 | 0.89  |
| 2.000 | 0.89  | 5.083 | 40.71    | 8.167   | 3.54  | 11.25 | 0.89  |
| 2.083 | 0.89  | 5.167 | 40.71    | 8.250   | 3.54  | 11.33 | 0.89  |
| 2.167 | 0.89  | 5.250 | 40.71    | 8.333   | 1.77  | 11.42 | 0.89  |
| 2.250 | 0.89  | 5.333 | 11.51    | 8.417   | 1.77  | 11.50 | 0.89  |

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LangstaffRd\_EA\_Existing\_HumberWatershed = 0.013 0.250 Mannings n

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR     | ANSFORMFI | HYETOGR | APH   |       |       |
|-------|-------|--------|-----------|---------|-------|-------|-------|
| TIME  | RAIN  | l TIME |           | ' TIME  | RAIN  |       | RAIN  |
| hrs   | mm/hr | hrs    | mm/hr     | ' hrs   | mm/hr |       | mm/hr |
| 0.083 | 0.00  | 3.167  | 5.31      | 6.250   | 11.51 | 9.33  | 0.89  |
| 0.167 | 0.00  | 3.250  | 5.31      | 6.333   | 6.20  | 9.42  | 0.89  |
| 0.250 | 0.00  | 3.333  | 15.05     | 6.417   | 6.20  | 9.50  | 0.89  |
| 0.333 | 0.89  | 3.417  | 15.05     | 6.500   | 6.20  | 9.58  | 0.89  |
| 0.417 | 0.89  | 3.500  | 15.05     | 6.583   | 6.20  | 9.67  | 0.89  |
| 0.500 | 0.89  | 3.583  | 15.05     | 6.667   | 6.20  | 9.75  | 0.89  |
| 0.583 | 0.89  | 3.667  | 15.05     | 6.750   | 6.20  | 9.83  | 0.89  |
| 0.667 | 0.89  | 3.750  | 15.05     | 6.833   | 6.20  | 9.92  | 0.89  |
| 0.750 | 0.89  | 3.833  | 15.05     | 6.917   | 6.20  | 10.00 | 0.89  |
| 0.833 | 0.89  | 3.917  | 15.05     | 7.000   | 6.20  | 10.08 | 0.89  |
| 0.917 | 0.89  | 4.000  | 15.05     | 7.083   | 6.20  | 10.17 | 0.89  |
| 1.000 | 0.89  | 4.083  | 15.05     | 7.167   | 6.20  | 10.25 | 0.89  |
| 1.083 | 0.89  | 4.167  | 15.05     | 7.250   | 6.20  | 10.33 | 0.89  |
| 1.167 | 0.89  | 4.250  | 15.05     | 7.333   | 3.54  | 10.42 | 0.89  |
| 1.250 | 0.89  | 4.333  | 40.71     | 7.417   | 3.54  | 10.50 | 0.89  |
| 1.333 | 0.89  | 4.417  | 40.71     | 7.500   | 3.54  | 10.58 | 0.89  |
| 1.417 | 0.89  | 4.500  | 40.71     | 7.583   | 3.54  | 10.67 | 0.89  |
| 1.500 | 0.89  | 4.583  | 40.71     | 7.667   | 3.54  | 10.75 | 0.89  |
| 1.583 | 0.89  | 4.667  | 40.71     | 7.750   | 3.54  | 10.83 | 0.89  |
| 1.667 | 0.89  | 4.750  | 40.71     | 7.833   | 3.54  | 10.92 | 0.89  |
| 1.750 | 0.89  | 4.833  | 40.71     | 7.917   | 3.54  | 11.00 | 0.89  |
| 1.833 | 0.89  | 4.917  | 40.71     | 8.000   | 3.54  | 11.08 | 0.89  |
| 1.917 | 0.89  | 5.000  | 40.71     | 8.083   | 3.54  | 11.17 | 0.89  |
| 2.000 | 0.89  | 5.083  | 40.71     | 8.167   | 3.54  | 11.25 | 0.89  |
| 2.083 | 0.89  | 5.167  | 40.71     | 8.250   | 3.54  | 11.33 | 0.89  |
| 2.167 | 0.89  | 5.250  | 40.71     | 8.333   | 1.77  | 11.42 | 0.89  |
| 2.250 | 0.89  | 5.333  | 11.51     | 8.417   | 1.77  | 11.50 | 0.89  |
| 2.333 | 5.31  | 5.417  | 11.51     | 8.500   | 1.77  | 11.58 | 0.89  |
| 2.417 | 5.31  | 5.500  | 11.51     | 8.583   | 1.77  | 11.67 | 0.89  |
| 2.500 | 5.31  | 5.583  | 11.51     | 8.667   | 1.77  | 11.75 | 0.89  |
| 2.583 | 5.31  | 5.667  | 11.51     | 8.750   | 1.77  | 11.83 | 0.89  |
| 2.667 | 5.31  | 5.750  | 11.51     | 8.833   | 1.77  | 11.92 | 0.89  |
| 2.750 | 5.31  | 5.833  | 11.51     | 8.917   | 1.77  | 12.00 | 0.89  |
| 2.833 | 5.31  | 5.917  | 11.51     | 9.000   | 1.77  | 12.08 | 0.89  |
| 2.917 | 5.31  | 6.000  | 11.51     | 9.083   | 1.77  | 12.17 | 0.89  |
| 3.000 | 5.31  | 6.083  | 11.51     | 9.167   | 1.77  | 12.25 | 0.89  |
| 3.083 | 5.31  | 6.167  | 11.51     | 9.250   | 1.77  |       |       |

40.71 15.00 12.74 (ii) 30.98 25.00 20.18 (ii) over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 15.00 25.00 0.08 0.05 \*TOTALS\* (cms)= 0.13 0.08 0.209 (iii)

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Max.Eff.Inten.(mm/hr)=

PEAK FLOW

LangstaffRd\_EA\_Existing\_HumberWatershed 5.31 | 5.417 | 11.51 | 8.500 | 1.77 | 1 5.31 | 5.500 | 11.51 | 8.563 | 1.77 | 1 5.31 | 5.583 | 11.51 | 8.667 | 1.77 | 1 5.31 | 5.667 | 11.51 | 8.750 | 1.77 | 1 5.31 | 5.333 | 11.51 | 8.833 | 1.77 | 1 5.31 | 5.333 | 11.51 | 8.917 | 1.77 | 1 5.31 | 5.917 | 11.51 | 9.000 | 1.77 | 1 5.31 | 6.000 | 11.51 | 9.083 | 1.77 | 1 5.31 | 6.083 | 11.51 | 9.167 | 1.77 | 1 5.31 | 6.167 | 11.51 | 9.250 | 1.77 | 2.417 2.500 2.583 2.667 2.750 2.833 11.67 11.75 11.83 11.92 12.00 12.08 12.17 0.89 0.89 0.89 0.89 0.89 2.917 0.89 3.000 12.25 0.89 3.083 Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 40.71 10.00 11.25 (ii) 10.00 0.10 33.12 20.00 19.53 (ii) 20.00 0.06 \*TOTALS\* PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 0.11 5.25 86.54 88.54 0.98 0.162 (iii) 5.25 74.58 88.54 0.84 0.05 5.33 55.88 88.54 0.63 (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: (1) ON PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 86.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY. | ADD HYD ( 0400)| | 1 + 2 = 3 | AREA (ha) 1.63 1.58 QPEAK (cms) 0.162 0.153 TPEAK (hrs) 5.25 5.25 R.V. (mm) 74.58 72.70 ID1= 1 ( 0105): + ID2= 2 ( 0110): ID = 3 ( 0400): 5.25 73.65 3.21 0.315 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY. Area (ha)= 2.27 Total Imp(%)= 53.00 Dir. Conn.(%)= 53.00 IMPERVIOUS PERVIOUS (i) Surface Area Dep. Storage Average Slope Length (ha)= (mm)= (%)= (m)= 1.20 2.00 1.00 800.00 1.07 5.00 2.00 20.00 Page 54

1.77 | 11.58 1.77 | 11.67

0.89

2.333

LangstaffRd\_EA\_Existing\_HumberWatershed )= 5.25 5.33 5.2 )= 86.54 51.48 70.0 )= 88.54 88.54 88.5 TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 5.25 70.06 88.54 0.98 0.79

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 83.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COFFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB | | STANDHYD ( 0130) | |ID= 1 DT= 5.0 min | Area (ha)= 2.08 Total Imp(%)= 51.00 Dir. Conn.(%)= 51.00 IMPERVIOUS PERVIOUS (i) Surface Area 1.06 2.00 1.00 800.00 0.013 1.02 5.00 2.00 (ha)= Dep. Storage Average Slope Length Mannings n (mm)= (%)= (m)=

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | ) HYETOGR | APH   |       |       |
|-------|-------|-------|----------|-----------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME    | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs     | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 5.31     | 6.250     | 11.51 | 9.33  | 0.89  |
| 0.167 | 0.00  | 3.250 | 5.31     | 6.333     | 6.20  | 9.42  | 0.89  |
| 0.250 | 0.00  | 3.333 | 15.05    | 6.417     | 6.20  | 9.50  | 0.89  |
| 0.333 | 0.89  | 3.417 | 15.05    | 6.500     | 6.20  | 9.58  | 0.89  |
| 0.417 | 0.89  | 3.500 | 15.05    | 6.583     | 6.20  | 9.67  | 0.89  |
| 0.500 | 0.89  | 3.583 | 15.05    | 6.667     | 6.20  | 9.75  | 0.89  |
| 0.583 | 0.89  | 3.667 | 15.05    | 6.750     | 6.20  | 9.83  | 0.89  |
| 0.667 | 0.89  | 3.750 | 15.05    | 6.833     | 6.20  | 9.92  | 0.89  |
| 0.750 | 0.89  | 3.833 | 15.05    | 6.917     | 6.20  | 10.00 | 0.89  |
| 0.833 | 0.89  | 3.917 | 15.05    | 7.000     | 6.20  | 10.08 | 0.89  |
| 0.917 | 0.89  | 4.000 | 15.05    | 7.083     | 6.20  | 10.17 | 0.89  |
| 1.000 | 0.89  | 4.083 | 15.05    | 7.167     | 6.20  | 10.25 | 0.89  |
| 1.083 | 0.89  | 4.167 | 15.05    | 7.250     | 6.20  | 10.33 | 0.89  |
| 1.167 | 0.89  | 4.250 | 15.05    | 7.333     | 3.54  | 10.42 | 0.89  |
| 1.250 | 0.89  | 4.333 | 40.71    | 7.417     | 3.54  | 10.50 | 0.89  |
| 1.333 | 0.89  | 4.417 | 40.71    | 7.500     | 3.54  | 10.58 | 0.89  |
| 1.417 | 0.89  | 4.500 | 40.71    | 7.583     | 3.54  | 10.67 | 0.89  |
| 1.500 | 0.89  | 4.583 | 40.71    | 7.667     | 3.54  | 10.75 | 0.89  |
| 1.583 | 0.89  | 4.667 | 40.71    | 7.750     | 3.54  | 10.83 | 0.89  |
| 1.667 | 0.89  | 4.750 | 40.71    | 7.833     | 3.54  | 10.92 | 0.89  |
| 1.750 | 0.89  | 4.833 | 40.71    | 7.917     | 3.54  | 11.00 | 0.89  |
| 1.833 | 0.89  | 4.917 | 40.71    | 8.000     | 3.54  | 11.08 | 0.89  |
|       |       |       |          |           |       |       |       |

|  |         |          |        | ing_HumberW |      |            |      |
|--|---------|----------|--------|-------------|------|------------|------|
| 1.917                                    |         |          |        | 8.083       |      | 11.17      | 0.89 |
| 2.000                                    | 0.89    | 5.083    | 40.71  | 8.167       |      | 11.25      | 0.89 |
| 2.083                                    | 0.89    | 5.167    | 40.71  | 8.250       |      | 11.33      | 0.89 |
| 2.167                                    |         |          |        | 8.333       |      | 11.42      | 0.89 |
|  |         |          |        | 8.417       |      | 11.50      | 0.89 |
|  |         |          |        | 8.500       |      | 11.58      | 0.89 |
|  |         |          |        | 8.583       |      | 11.67      | 0.89 |
| 2.500                                    |         | 5.583    |        | 8.667       | 1.77 |            | 0.89 |
|  | 5.31    |          |        | 8.750       |      | 11.83      | 0.89 |
|  |         |          |        | 8.833       |      | 11.92      | 0.89 |
| 2.750                                    |         |          |        | 8.917       |      | 12.00      | 0.89 |
|  |         |          |        | 9.000       |      | 12.08      | 0.89 |
| 2.917                                    | 5.31    | 6.000    | 11.51  | 9.083       |      | 12.17      | 0.89 |
| 3.000                                    |         |          |        | 9.167       |      | 12.25      | 0.89 |
| 3.083                                    | 5.31    | 6.167    | 11.51  | 9.250       | 1.77 | l          |      |
| Max.Eff.Inten.(mm,                       |         |          |        | 30.98       |      |            |      |
| over (r                                  | in)     | 15.00    |        | 25.00       |      |            |      |
| Storage Coeff. (r<br>Unit Hyd. Tpeak (r  | in)=    | 12.74    | (ii)   | 20.18 (ii)  |      |            |      |
|  |         |          |        |             |      |            |      |
| Unit Hyd. peak (d                        | :ms)=   | 0.08     |        | 0.05        |      |            |      |
|  |         |          |        |             | *T01 | ΓALS*      |      |
| PEAK FLOW (d                             | :ms)=   | 0.12     |        | 0.07        | 0.   | .190 (iii) |      |
| TIME TO PEAK (H                          | ırs)=   | 5.25     |        | 5.33        |      | 5.25       |      |
| RUNOFF VOLUME (                          | mm)=    | 86.54    |        | 51.48       | 69   | 9.36       |      |
| TOTAL RAINFALL (                         | mm)=    | 88.54    |        | 88.54       | 88   | 3.54       |      |
| RUNOFF COEFFICIENT                       | =       | 0.98     |        | 0.58        | 6    | 3.78       |      |
|  |         |          |        |             |      |            |      |
| (i) CN PROCEDURE                         | SELECTE | D FOR PE | RVTOUS | LOSSES.     |      |            |      |
| CN* = 83.                                |         |          |        |             |      |            |      |
| (ii) TIME STEP (E                        |         |          |        |             |      |            |      |
| THAN THE STO                             |         |          |        |             |      |            |      |
| (1111) ================================= |         |          |        |             |      |            |      |

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0405) <br>  1 + 2 = 3      | AREA                 | OPEAK                   | TPEAK                 | R.V.                   |  |
|--------------------------------------|----------------------|-------------------------|-----------------------|------------------------|--|
| ID1= 1 ( 0125):<br>+ ID2= 2 ( 0130): | (ha)<br>2.27<br>2.08 | (cms)<br>0.209<br>0.190 | (hrs)<br>5.25<br>5.25 | (mm)<br>70.06<br>69.36 |  |
| ID = 3 ( 0405):                      | 4.35                 | 0.399                   | 5.25                  | 69.72                  |  |
| NOTE: PEAK FLOWS DO N                | OT INCLU             | DE BASEFL               | OWS IF A              | NY.                    |  |

| CALIB | STANDHYD ( 0120) |ID= 1 DT= 5.0 min | Area (ha)= 1.24 Total Imp(%)= 57.00 Dir. Conn.(%)= 57.00

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## \*TOTALS\*

PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 0.08 5.25 86.54 88.54 0.98 0.04 5.25 51.48 88.54 0.58 \*TOTALS\* 0.120 (iii) 5.25 71.46 88.54 0.81

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICENT:

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB  <br>STANDHYD ( 0115) | Area      | (ha)= 1.00  |                |       |
|-----------------------------|-----------|-------------|----------------|-------|
| ID= 1 DT= 5.0 min           | Total Imp | 0(%)= 46.00 | Dir. Conn.(%)= | 46.00 |
|                             |           |             |                |       |
|                             | I         | MPERVIOUS   | PERVIOUS (i)   |       |

|               |       | IMPERVIOUS | PERVIOUS (i |
|---------------|-------|------------|-------------|
| Surface Area  | (ha)= | 0.46       | 0.54        |
| Dep. Storage  | (mm)= | 2.00       | 5.00        |
| Average Slope | (%)=  | 1.00       | 2.00        |
| Length        | (m)=  | 475.00     | 17.00       |
| Mannings n    | =     | 0.013      | 0.250       |
|               |       |            |             |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR/   | ANSFORME | D HYETOGR | APH   | -     |       |
|-------|-------|-------|----------|-----------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME    | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs     | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 5.31     | 6.250     | 11.51 | 9.33  | 0.89  |
| 0.167 | 0.00  | 3.250 | 5.31     | 6.333     | 6.20  | 9.42  | 0.89  |
| 0.250 | 0.00  | 3.333 | 15.05    | 6.417     | 6.20  | 9.50  | 0.89  |
| 0.333 | 0.89  | 3.417 | 15.05    | 6.500     | 6.20  | 9.58  | 0.89  |
| 0.417 | 0.89  | 3.500 | 15.05    | 6.583     | 6.20  | 9.67  | 0.89  |
| 0.500 | 0.89  | 3.583 | 15.05    | 6.667     | 6.20  | 9.75  | 0.89  |
| 0.583 | 0.89  | 3.667 | 15.05    | 6.750     | 6.20  | 9.83  | 0.89  |
| 0.667 | 0.89  | 3.750 | 15.05    | 6.833     | 6.20  | 9.92  | 0.89  |
| 0.750 | 0.89  | 3.833 | 15.05    | 6.917     | 6.20  | 10.00 | 0.89  |
| 0.833 | 0.89  | 3.917 | 15.05    | 7.000     | 6.20  | 10.08 | 0.89  |
| 0.917 | 0.89  | 4.000 | 15.05    | 7.083     | 6.20  | 10.17 | 0.89  |
| 1.000 | 0.89  | 4.083 | 15.05    | 7.167     | 6.20  | 10.25 | 0.89  |
| 1.083 | 0.89  | 4.167 | 15.05    | 7.250     | 6.20  | 10.33 | 0.89  |
| 1.167 | 0.89  | 4.250 | 15.05    | 7.333     | 3.54  | 10.42 | 0.89  |
| 1.250 | 0.89  | 4.333 | 40.71    | 7.417     | 3.54  | 10.50 | 0.89  |
| 1.333 | 0.89  | 4.417 | 40.71    | 7.500     | 3.54  | 10.58 | 0.89  |
| 1.417 | 0.89  | 4.500 | 40.71    | 7.583     | 3.54  | 10.67 | 0.89  |

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## LangstaffRd\_EA\_Existing\_HumberWatershed IMPERVIOUS PERVIOUS (i)

|               |       | THEFUATORS | FEKA1003 (1) |
|---------------|-------|------------|--------------|
| Surface Area  | (ha)= | 0.71       | 0.53         |
| Dep. Storage  | (mm)= | 2.00       | 5.00         |
| Average Slope | (%)=  | 1.00       | 2.00         |
| Length        | (m)=  | 475.00     | 17.00        |
| Mannings n    | - =   | 0.013      | 0.250        |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | D HYETOGR | APH   |       |       |
|-------|-------|-------|----------|-----------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME    | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs     | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 5.31     | 6.250     | 11.51 | 9.33  | 0.89  |
| 0.167 | 0.00  | 3.250 | 5.31     | 6.333     | 6.20  | 9.42  | 0.89  |
| 0.250 | 0.00  | 3.333 | 15.05    | 6.417     | 6.20  | 9.50  | 0.89  |
| 0.333 | 0.89  | 3.417 | 15.05    | 6.500     | 6.20  | 9.58  | 0.89  |
| 0.417 | 0.89  | 3.500 | 15.05    | 6.583     | 6.20  | 9.67  | 0.89  |
| 0.500 | 0.89  | 3.583 | 15.05    | 6.667     | 6.20  | 9.75  | 0.89  |
| 0.583 | 0.89  | 3.667 | 15.05    | 6.750     | 6.20  | 9.83  | 0.89  |
| 0.667 | 0.89  | 3.750 | 15.05    | 6.833     | 6.20  | 9.92  | 0.89  |
| 0.750 | 0.89  | 3.833 | 15.05    | 6.917     | 6.20  | 10.00 | 0.89  |
| 0.833 | 0.89  | 3.917 | 15.05    | 7.000     | 6.20  | 10.08 | 0.89  |
| 0.917 | 0.89  | 4.000 | 15.05    | 7.083     | 6.20  | 10.17 | 0.89  |
| 1.000 | 0.89  | 4.083 | 15.05    | 7.167     | 6.20  | 10.25 | 0.89  |
| 1.083 | 0.89  | 4.167 | 15.05    | 7.250     | 6.20  | 10.33 | 0.89  |
| 1.167 | 0.89  | 4.250 | 15.05    | 7.333     | 3.54  | 10.42 | 0.89  |
| 1.250 | 0.89  | 4.333 | 40.71    | 7.417     | 3.54  | 10.50 | 0.89  |
| 1.333 | 0.89  | 4.417 | 40.71    | 7.500     | 3.54  | 10.58 | 0.89  |
| 1.417 | 0.89  | 4.500 | 40.71    | 7.583     | 3.54  | 10.67 | 0.89  |
| 1.500 | 0.89  | 4.583 | 40.71    | 7.667     | 3.54  | 10.75 | 0.89  |
| 1.583 | 0.89  | 4.667 | 40.71    | 7.750     | 3.54  | 10.83 | 0.89  |
| 1.667 | 0.89  | 4.750 | 40.71    | 7.833     | 3.54  | 10.92 | 0.89  |
| 1.750 | 0.89  | 4.833 | 40.71    | 7.917     | 3.54  | 11.00 | 0.89  |
| 1.833 | 0.89  | 4.917 | 40.71    | 8.000     | 3.54  | 11.08 | 0.89  |
| 1.917 | 0.89  | 5.000 | 40.71    | 8.083     | 3.54  | 11.17 | 0.89  |
| 2.000 | 0.89  | 5.083 | 40.71    | 8.167     | 3.54  | 11.25 | 0.89  |
| 2.083 | 0.89  | 5.167 | 40.71    | 8.250     | 3.54  | 11.33 | 0.89  |
| 2.167 | 0.89  | 5.250 | 40.71    | 8.333     | 1.77  | 11.42 | 0.89  |
| 2.250 | 0.89  | 5.333 | 11.51    | 8.417     | 1.77  | 11.50 | 0.89  |
| 2.333 | 5.31  | 5.417 | 11.51    | 8.500     | 1.77  | 11.58 | 0.89  |
| 2.417 | 5.31  | 5.500 | 11.51    | 8.583     | 1.77  | 11.67 | 0.89  |
| 2.500 | 5.31  | 5.583 | 11.51    | 8.667     | 1.77  | 11.75 | 0.89  |
| 2.583 | 5.31  | 5.667 | 11.51    | 8.750     | 1.77  | 11.83 | 0.89  |
| 2.667 | 5.31  | 5.750 | 11.51    | 8.833     | 1.77  | 11.92 | 0.89  |
| 2.750 | 5.31  | 5.833 | 11.51    | 8.917     | 1.77  | 12.00 | 0.89  |
| 2.833 | 5.31  | 5.917 | 11.51    | 9.000     | 1.77  | 12.08 | 0.89  |
| 2.917 | 5.31  | 6.000 | 11.51    | 9.083     | 1.77  | 12.17 | 0.89  |
| 3.000 | 5.31  | 6.083 | 11.51    | 9.167     | 1.77  | 12.25 | 0.89  |
| 3.083 | 5.31  | 6.167 | 11.51    | 9.250     | 1.77  |       |       |

Max.Eff.Inten.(mm/hr)= over (min)

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|       | Langs | taffRd E | A Existi | ng_Humber | Watersh | ed    |      |
|-------|-------|----------|----------|-----------|---------|-------|------|
| 1.500 | 0.89  |          |          |           | 3.54    |       | 0.89 |
| 1.583 | 0.89  | 4.667    | 40.71    | 7.750     | 3.54    | 10.83 | 0.89 |
| 1.667 | 0.89  | 4.750    | 40.71    | 7.833     | 3.54    | 10.92 | 0.89 |
| 1.750 | 0.89  | 4.833    | 40.71    | 7.917     | 3.54    | 11.00 | 0.89 |
| 1.833 | 0.89  | 4.917    | 40.71    | 8.000     | 3.54    | 11.08 | 0.89 |
| 1.917 | 0.89  | 5.000    | 40.71    | 8.083     | 3.54    | 11.17 | 0.89 |
| 2.000 | 0.89  | 5.083    | 40.71    | 8.167     | 3.54    | 11.25 | 0.89 |
| 2.083 | 0.89  | 5.167    | 40.71    | 8.250     | 3.54    | 11.33 | 0.89 |
| 2.167 | 0.89  | 5.250    | 40.71    | 8.333     | 1.77    | 11.42 | 0.89 |
| 2.250 | 0.89  | 5.333    | 11.51    | 8.417     | 1.77    | 11.50 | 0.89 |
| 2.333 | 5.31  | 5.417    | 11.51    | 8.500     | 1.77    | 11.58 | 0.89 |
| 2.417 | 5.31  | 5.500    | 11.51    | 8.583     | 1.77    | 11.67 | 0.89 |
| 2.500 | 5.31  | 5.583    | 11.51    | 8.667     | 1.77    | 11.75 | 0.89 |
| 2.583 | 5.31  | 5.667    | 11.51    | 8.750     | 1.77    | 11.83 | 0.89 |
| 2.667 | 5.31  | 5.750    | 11.51    | 8.833     | 1.77    | 11.92 | 0.89 |
| 2.750 | 5.31  | 5.833    | 11.51    | 8.917     | 1.77    | 12.00 | 0.89 |
| 2.833 | 5.31  | 5.917    | 11.51    | 9.000     | 1.77    | 12.08 | 0.89 |
| 2.917 | 5.31  | 6.000    | 11.51    | 9.083     | 1.77    | 12.17 | 0.89 |
| 3.000 | 5.31  | 6.083    | 11.51    | 9.167     | 1.77    | 12.25 | 0.89 |
| 3.083 | 5.31  | 6.167    | 11.51    | 9.250     | 1.77    | ĺ     |      |
|       |       |          |          |           |         |       |      |

| Max.Eff.Inten.(r | nm/hr)= | 40.71     | 30.98      |             |
|------------------|---------|-----------|------------|-------------|
| over             | (min)   | 10.00     | 20.00      |             |
| Storage Coeff.   | (min)=  | 9.32 (ii) | 16.07 (ii) |             |
| Unit Hyd. Tpeak  | (min)=  | 10.00     | 20.00      |             |
| Unit Hyd. peak   | (cms)=  | 0.12      | 0.06       |             |
|                  |         |           |            | *TOTALS*    |
| PEAK FLOW        | (cms)=  | 0.05      | 0.04       | 0.093 (iii) |
| TIME TO PEAK     | (hrs)=  | 5.25      | 5.25       | 5.25        |
| RUNOFF VOLUME    | (mm)=   | 86.54     | 51.48      | 67.60       |
| TOTAL RAINFALL   | (mm)=   | 88.54     | 88.54      | 88.54       |
| RUNOFF COEFFICIE | ENT =   | 0.98      | 0.58       | 0.76        |
|                  |         |           |            |             |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0410)| | 1 + 2 = 3 | | ID1= 1 ( 0115): + ID2= 2 ( 0120): AREA (ha) 1.00 1.24 QPEAK (cms) 0.093 0.120 ID = 3 ( 0410): 2.24 0.212 5.25 69.73

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD ( 0420)                         |              |                |               |               |  |
|---|--------------|----------------|---------------|---------------|--|
| 1 + 2 = 3                               | AREA         | QPEAK          | TPEAK         | R.V.          |  |
| ID1= 1 ( 0405):                         | (ha)<br>4.35 | (cms)<br>0.399 | (hrs)<br>5.25 | (mm)<br>69.72 |  |
| + ID2= 2 ( 0410):                       | 2.24         | 0.212          | 5.25          | 69.73         |  |
| ======================================= |              |                |               |               |  |
| ID = 3 ( 0420):                         | 6.59         | 0.611          | 5.25          | 69.73         |  |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

# Don River Watershed Visual OTTHYMO Summary - Existing

## LangstaffRd\_EA\_Existing\_WestDonWatershd

| * | ¥ | 1 | S | Ι | M | U | L | Α | Т | Ι | 0 | N | : | R | u | n | 0 | 2 |  |  |  |  |  | * | * |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--|--|--|--|--|---|---|--|
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |  |  |  |  |   |   |  |

| ** SIMULATION:Run | 02 **      |  |
|-------------------|------------|--|
| ************      | ********** |  |

| READ STORM       | F4lenes  | (.)!!    |         |        |          |          |          |  |  |  |  |  |  |  |  |
|------------------|--|----------|---------|--------|----------|----------|----------|--|--|--|--|--|--|--|--|
| KEAD STURM       | ata\Local\Temp\<br>278a4b54-8409-4519-9819-1b44900a1c25\e8708d30 |          |         |        |          |          |          |  |  |  |  |  |  |  |  |
| j j              |  |          |         |        | 19-1b449 | 00a1c25\ | e8708d30 |  |  |  |  |  |  |  |  |
| Ptotal= 42.93 mm | Comment  | s: 2yr-1 | L2hrSCS |        |          |          |          |  |  |  |  |  |  |  |  |
|                  |  |          |         |        |          |          |          |  |  |  |  |  |  |  |  |
| TIME             | RAIN   |          | RAIN    | ' TIME | RAIN     | TIME     | RAIN     |  |  |  |  |  |  |  |  |
| hrs              | mm/hr  | hrs      | mm/hr   | ' hrs  | mm/hr    | hrs      | mm/hr    |  |  |  |  |  |  |  |  |
| 0.25             | 0.00   | 3.50     | 1.02    | 6.75   | 8.13     | 10.00    | 1.02     |  |  |  |  |  |  |  |  |
| 0.50             | 1.02   | 3.75     | 2.03    | 7.00   | 3.05     | 10.25    | 1.02     |  |  |  |  |  |  |  |  |
| 0.75             | 1.02   | 4.00     | 2.03    | 7.25   | 3.05     | 10.50    | 1.02     |  |  |  |  |  |  |  |  |
| 1.00             | 1.02   | 4.25     | 1.02    | 7.50   | 3.05     | 10.75    | 1.02     |  |  |  |  |  |  |  |  |
| 1.25             | 0.00   | 4.50     | 3.05    | 7.75   | 2.03     | 11.00    | 1.02     |  |  |  |  |  |  |  |  |
| 1.50             | 1.02   | 4.75     | 3.05    | 8.00   | 3.05     | 11.25    | 1.02     |  |  |  |  |  |  |  |  |
| 1.75             | 1.02   | 5.00     | 3.05    | 8.25   | 2.03     | 11.50    | 0.00     |  |  |  |  |  |  |  |  |
| 2.00             | 1.02   | 5.25     | 3.05    | 8.50   | 2.03     | 11.75    | 1.02     |  |  |  |  |  |  |  |  |
| 2.25             | 1.02   | 5.50     | 5.08    | 8.75   | 2.03     | 12.00    | 1.02     |  |  |  |  |  |  |  |  |
| 2.50             | 1.02   | 5.75     | 5.08    | 9.00   | 1.02     | 12.25    | 1.02     |  |  |  |  |  |  |  |  |
| 2.75             | 2.03   | 6.00     | 38.61   | 9.25   | 2.03     |          |          |  |  |  |  |  |  |  |  |
| 3.00             | 2.03   | 6.25     | 38.61   | 9.50   | 1.02     |          |          |  |  |  |  |  |  |  |  |
| 3.25             | 2.03   | 6.50     | 8.13    | 9.75   | 2.03     |          |          |  |  |  |  |  |  |  |  |

|  | <br>  | <br> | <br> | <br> | <br> |   | <br> | <br> | <br> | <br> | <br> | <br> | <br> | <br> | <br> | <br> | <br> | <br> | <br> | <br> | <br> |  |
|--|-------|------|------|------|------|---|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|--|
|  | <br>- | <br> | <br> | <br> | <br> | - |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |  |

| CALIB  <br>  STANDHYD ( 0145) <br> ID= 1 DT= 5.0 min                  | Area<br>Total                  | (ha)= 3.05<br>Imp(%)= 62.00             |  |
|---|--------------------------------|---|--|
| Surface Area<br>Dep. Storage<br>Average Slope<br>Length<br>Mannings n | (ha)=<br>(mm)=<br>(%)=<br>(m)= | 1.89<br>2.00<br>1.00<br>531.00<br>0.013 | PERVIOUS (i)<br>1.16<br>5.00<br>2.00<br>40.00<br>0.250 |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR/   | ANSFORME | D HYETOGR | APH   |      |       |
|-------|-------|-------|----------|-----------|-------|------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME    | RAIN  | TIME | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs     | mm/hr | hrs  | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250     | 38.61 | 9.33 | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333     | 8.13  | 9.42 | 1.02  |
| 0.250 | 0.00  | 3.333 | 1.02     | 6.417     | 8.13  | 9.50 | 1.02  |
| 0.333 | 1.02  | 3.417 | 1.02     | 6.500     | 8.13  | 9.58 | 2.03  |
| 0.417 | 1.02  | 3.500 | 1.02     | 6.583     | 8.13  | 9.67 | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03     | 6.667     | 8.13  | 9.75 | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03     | 6.750     | 8.13  | 9.83 | 1.02  |

62.00

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## $LangstaffRd\_EA\_Existing\_WestDonWatershd \\ | STANDHYD ( 0140)| Area (ha)= 1.27$

| ID= 1 DT= 5.0 min | Total | Imp(%)= | 52.00 | Dir.    | Conn.(%)= | 52.0 |
|-------------------|-------|---------|-------|---------|-----------|------|
|                   |       | IMPERVI | ous   | PERVIOU | IS (i)    |      |
| Surface Area      | (ha)= | 0.6     | 6     | 0.61    |           |      |
| Dep. Storage      | (mm)= | 2.0     | 0     | 5.00    | 1         |      |
| Average Slope     | (%)=  | 1.0     | 0     | 2.00    | 1         |      |
| Length            | (m)=  | 503.0   | 0     | 25.00   | 1         |      |
| Mannings n        | ` =   | 0.01    | 3     | 0.250   | )         |      |
|                   |       |         |       |         |           |      |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TP    | ANS EORMEI | D HYETOGR | ADH   | _     |       |
|-------|-------|-------|------------|-----------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN       | l' TIME   | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr      | l' hrs    | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03       | 6.250     | 38.61 | 9.33  | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03       | 6.333     | 8.13  | 9.42  | 1.02  |
| 0.250 | 0.00  | 3.333 | 1.02       | 6.417     | 8.13  | 9.50  | 1.02  |
| 0.333 | 1.02  | 3.417 | 1.02       | 6.500     | 8.13  | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 1.02       | 6.583     | 8.13  | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03       | 6.667     | 8.13  | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03       | 6.750     | 8.13  | 9.83  | 1.02  |
| 0.667 | 1.02  | 3.750 | 2.03       | 6.833     | 3.05  | 9.92  | 1.02  |
| 0.750 | 1.02  | 3.833 | 2.03       | 6.917     | 3.05  | 10.00 | 1.02  |
| 0.833 | 1.02  | 3.917 | 2.03       | 7.000     | 3.05  | 10.08 | 1.02  |
| 0.917 | 1.02  | 4.000 | 2.03       | 7.083     | 3.05  | 10.17 | 1.02  |
| 1.000 | 1.02  | 4.083 | 1.02       | 7.167     | 3.05  | 10.25 | 1.02  |
| 1.083 | 0.00  | 4.167 | 1.02       | 7.250     | 3.05  | 10.33 | 1.02  |
| 1.167 | 0.00  | 4.250 | 1.02       | 7.333     | 3.05  | 10.42 | 1.02  |
| 1.250 | 0.00  | 4.333 | 3.05       | 7.417     | 3.05  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 3.05       | 7.500     | 3.05  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 3.05       | 7.583     | 2.03  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 3.05       | 7.667     | 2.03  | 10.75 | 1.02  |
| 1.583 | 1.02  | 4.667 | 3.05       | 7.750     | 2.03  | 10.83 | 1.02  |
| 1.667 | 1.02  | 4.750 | 3.05       | 7.833     | 3.05  | 10.92 | 1.02  |
| 1.750 | 1.02  | 4.833 | 3.05       | 7.917     | 3.05  | 11.00 | 1.02  |
| 1.833 | 1.02  | 4.917 | 3.05       | 8.000     | 3.05  | 11.08 | 1.02  |
| 1.917 | 1.02  | 5.000 | 3.05       | 8.083     | 2.03  | 11.17 | 1.02  |
| 2.000 | 1.02  | 5.083 | 3.05       | 8.167     | 2.03  | 11.25 | 1.02  |
| 2.083 | 1.02  | 5.167 | 3.05       | 8.250     | 2.03  | 11.33 | 0.00  |
| 2.167 | 1.02  | 5.250 | 3.05       | 8.333     | 2.03  | 11.42 | 0.00  |
| 2.250 | 1.02  | 5.333 | 5.08       | 8.417     | 2.03  | 11.50 | 0.00  |
| 2.333 | 1.02  | 5.417 | 5.08       | 8.500     | 2.03  | 11.58 | 1.02  |
| 2.417 | 1.02  | 5.500 | 5.08       | 8.583     | 2.03  | 11.67 | 1.02  |
| 2.500 | 1.02  | 5.583 | 5.08       | 8.667     | 2.03  | 11.75 | 1.02  |
| 2.583 | 2.03  | 5.667 | 5.08       | 8.750     | 2.03  | 11.83 | 1.02  |
| 2.667 | 2.03  | 5.750 | 5.08       | 8.833     | 1.02  | 11.92 | 1.02  |
| 2.750 | 2.03  | 5.833 | 38.61      | 8.917     | 1.02  | 12.00 | 1.02  |
| 2.833 | 2.03  | 5.917 | 38.61      | 9.000     | 1.02  | 12.08 | 1.02  |
| 2.917 | 2.03  | 6.000 | 38.61      | 9.083     | 2.03  | 12.17 | 1.02  |
| 3.000 | 2.03  | 6.083 | 38.61      | 9.167     | 2.03  | 12.25 | 1.02  |
| 3.083 | 2.03  | 6.167 | 38.61      | 9.250     | 2.03  | l     |       |

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|       |  | ing_WestDon  |  | hd   |  |
|-------|--|--|--|--|--|
| 3.750 |  | 6.833  | 3.05   |  | 1.02   |
| 3.833 |  | 6.917  |  | 10.00  | 1.02   |
| 3.917 | 2.03   |  | 3.05   |  | 1.02   |
| 4 000 | 2.03   |  |  |  | 1.02   |
|       |  |  |  |  | 1.02   |
|       |  |  |  |  | 1.02   |
|       |  |  |  |  | 1.02   |
|       |  |  |  |  | 1.02   |
|       |  |  |  |  | 1.02   |
|       |  |  |  |  |  |
|       |  |  |  |  | 1.02   |
|       |  |  |  |  | 1.02   |
|       |  |  |  |  | 1.02   |
|       |  |  |  |  | 1.02   |
|       |  |  |  |  | 1.02   |
|       |  |  |  |  | 1.02   |
|       |  |  |  |  | 1.02   |
|       |  |  |  |  | 0.00   |
|       |  |  |  |  | 0.00   |
|       |  |  |  |  |  |
| 5.333 | 5.08   |  |  |  | 0.00   |
| 5.41/ | 5.08   |  |  |  | 1.02   |
|       |  |  |  |  | 1.02   |
|       |  |  |  |  | 1.02   |
|       |  |  |  |  | 1.02   |
|       |  |  |  |  | 1.02   |
|       |  |  |  |  | 1.02   |
|       |  |  |  |  | 1.02   |
|       |  |  |  |  |  |
|       |  |  |  |  | 1.02   |
| 6.16/ | 38.61  | 9.250  | 2.03   | l  |  |
| 38.61 |  |  |  |  |  |
| 10.00 |  | 25.00  |  |  |  |
| 10.18 | (ii)   | 23.34 (ii)   |  |  |  |
| 10.00 |  | 25.00  |  |  |  |
| 0.11  |  | 0.05   |  |  |  |
|       |  |  |  |  |  |
|       |  |  |  |  |  |
|       |  |  |  |  |  |
|       |  |  |  |  |  |
| 42.93 |  | 42.93  |  | 2.93   |  |
| 0.95  |  | 0.42   |  | 3.75   |  |
|       | 4.080<br>4.167<br>4.250<br>4.353<br>4.4167<br>4.590<br>4.431<br>4.590<br>4.450<br>4.590<br>6.475<br>6.883<br>5.083<br>5.083<br>5.167<br>6.083<br>6.167<br>8.168<br>6.167<br>8.168<br>6.167<br>8.168<br>6.167<br>8.168<br>6.167<br>8.168<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169<br>6.169 | 4.000 2.03 4.167 1.02 4.167 1.02 4.167 1.02 4.333 3.05 4.590 3.05 4.590 3.05 4.593 3.05 5.083 3.05 5.083 3.05 5.083 3.05 5.083 3.05 5.083 3.05 5.083 3.05 5.083 3.05 5.083 3.05 5.083 3.05 5.084 3.05 5.085 3.05 5.086 3.05 5.087 3.05 5.088 3.05 5.089 3.05 5.088 3.05 5.089 3.05 5.089 3.05 5.089 3.05 5.089 3.05 5.080 3.05 5.080 3.05 5.080 3.05 5.080 3.05 6.083 3.05 | 4.000 2.03 7.083 4.083 1.02 7.167 4.167 1.02 7.250 4.167 1.02 7.250 4.250 1.02 7.590 4.590 3.05 7.417 4.667 3.05 7.583 4.583 3.05 7.583 4.583 3.05 7.583 4.583 3.05 7.583 4.583 3.05 7.833 4.583 3.05 7.833 4.583 3.05 8.000 5.000 3.05 7.833 5.000 3.05 8.000 5.000 3.05 8.000 5.000 3.05 8.000 5.000 3.05 8.000 5.000 3.05 8.167 5.000 3.05 8.333 5.083 3.05 8.167 5.167 3.05 8.825 5.250 3.05 8.333 5.583 5.08 8.417 5.417 5.08 8.583 5.583 5.08 8.583 5.583 5.08 8.583 5.583 3.61 8.500 5.600 38.61 9.083 6.083 38.61 9.083 6.083 38.61 9.083 6.083 38.61 9.083 6.083 38.61 9.083 6.083 38.61 9.083 6.083 38.61 9.083 6.083 38.61 9.250 38.61 9.000 10.18 (ii) 23.34 (ii) 10.00 25.00 10.19 0.04 6.25 6.50 | 4.000 2.03 7.083 3.05 4.167 1.02 7.167 3.05 4.167 1.02 7.250 3.05 4.167 1.02 7.250 3.05 4.333 3.05 7.417 3.05 4.590 3.05 7.583 2.03 4.583 3.05 7.560 3.05 4.590 3.05 7.583 2.03 4.583 3.05 7.567 2.03 4.750 3.05 7.750 2.03 4.750 3.05 7.750 2.03 4.750 3.05 7.750 2.03 4.750 3.05 7.750 2.03 4.750 3.05 7.750 2.03 4.750 3.05 7.750 2.03 4.750 3.05 7.750 2.03 4.750 3.05 8.000 3.05 5.000 3.05 8.003 2.03 5.083 3.05 8.167 2.03 5.083 3.05 8.167 2.03 5.500 5.08 8.850 2.03 5.550 5.08 8.8.167 2.03 5.550 5.08 8.8.500 2.03 5.550 5.08 8.8.500 2.03 5.550 5.08 8.8.500 2.03 5.550 5.08 8.8.500 2.03 5.550 5.08 8.8.500 2.03 5.550 5.08 8.8.500 2.03 5.550 5.08 8.8.500 2.03 5.550 5.08 8.8.500 2.03 5.560 3.05 8.500 2.03 5.667 5.08 8.8.500 2.03 5.560 5.08 8.8.500 2.03 5.560 5.08 8.8.500 2.03 5.560 5.08 8.8.500 2.03 5.560 5.08 8.8.500 2.03 5.560 5.08 8.8.500 2.03 5.570 5.08 8 8.8.750 2.03 5.833 3.66 8 8.917 1.02 5.917 3.66 1 9.083 2.03 6.167 3.8.61 9.083 2.03 6.167 3.8.61 9.050 2.03 38.61 2.04 6.090 38.61 9.050 2.03 38.61 2.04 6.090 25.00 10.18 (ii) 23.34 (ii) 10.00 25.00 10.18 (iii) 23.34 (iii) 10.00 25.00 10.18 (iii) 23.34 (iii) 10.00 25.00 10.19 0.04 0.04 6.25 6.50 0.04 6.25 6.50 0.04 6.25 6.50 0.04 6.293 18.14 33 | 4.000 2.03   7.083   3.05   10.17   4.083   4.084   4.083   1.02   7.167   3.05   10.25   4.167   1.02   7.7.50   3.05   10.33   4.250   1.02   7.7.50   3.05   10.33   3.05   10.42   4.333   3.05   7.417   3.05   10.50   4.417   3.05   7.583   3.05   10.50   4.500   3.05   7.583   3.05   10.50   4.500   3.05   7.750   2.03   10.67   4.583   3.05   7.750   2.03   10.67   4.583   3.05   7.750   2.03   10.67   4.833   3.05   7.783   3.05   10.92   4.833   3.05   7.783   3.05   10.92   4.917   3.05   8.060   3.05   11.08   4.917   3.05   8.060   3.05   11.08   4.917   3.05   8.060   3.05   11.08   5.063   3.05   8.863   2.03   11.75   5.083   3.05   8.167   2.03   11.55   5.167   3.05   8.8250   2.03   11.55   5.333   5.08   8.472   2.03   11.55   5.333   5.08   8.500   2.03   11.55   5.500   5.08   8.583   2.03   11.55   5.500   5.08   8.583   2.03   11.55   5.500   5.08   8.583   2.03   11.55   5.500   5.08   8.583   2.03   11.55   5.500   5.08   8.500   2.03   11.55   5.667   5.08   8.850   2.03   11.55   5.667   5.08   8.850   2.03   11.55   5.667   5.08   8.850   2.03   11.55   5.667   5.08   8.500   2.03   11.55   5.667   5.08   8.500   2.03   11.55   5.667   5.08   8.500   2.03   11.55   5.667   5.08   8.500   2.03   11.55   5.667   5.08   8.500   2.03   11.55   5.667   5.08   8.500   2.03   11.55   5.667   5.08   8.500   2.03   11.55   5.667   5.08   8.500   2.03   11.55   5.667   5.08   8.500   2.03   11.55   5.667   5.08   8.500   2.03   12.17   5.688   8.61   9.060   1.02   12.08   5.000   1.02   12.08   5.000   1.02   12.08   5.000   1.02   12.08   5.000   1.02   12.05   5.000   1.02   12.55   5.000   1.02   12.55   5.000   1.02   12.55   5.000   1.02   12.55   5.000   1.02   12.55   5.000   1.02   12.55   5.000   1.02   12.55   5.500   1.02   12.55   5.500   1.02   12.55   5.500   1.02   12.55   5.500   1.02   12.55   5.500   1.02   12.55   5.500   1.02   12.55   5.500   1.02   12.55   5.500   1.02   12.55   5.500   1.02   12.55   5.500   1.02   12.55   5.500   1.02   12.55   5.500   1.02   12.55   5.5 |

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### ${\tt LangstaffRd\_EA\_Existing\_WestDonWatershd}$

| Max.Eff.Inten.( | mm/hr)= | 38.61 | 18.46      |          |       |
|-----------------|---------|-------|------------|----------|-------|
| over            | (min)   | 10.00 | 25.00      |          |       |
| Storage Coeff.  | (min)=  | 9.85  | (ii) 20.32 | (ii)     |       |
| Unit Hyd. Tpeak | (min)=  | 10.00 | 25.00      |          |       |
| Unit Hyd. peak  | (cms)=  | 0.11  | 0.05       |          |       |
|                 |         |       |            | *TOTALS* | *     |
| PEAK FLOW       | (cms)=  | 0.07  | 0.02       | 0.081    | (iii) |
| TIME TO PEAK    | (hrs)=  | 6.25  | 6.50       | 6.25     |       |
| RUNOFF VOLUME   | (mm)=   | 40.93 | 15.99      | 28.95    |       |
| TOTAL RAINFALL  | (mm)=   | 42.93 | 42.93      | 42.93    |       |
| RUNOFF COEFFICI | ENT =   | 0.95  | 0.37       | 0.67     |       |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB | | STANDHYD ( 0135) |ID= 1 DT= 5.0 min | Area (ha)= 1.43 Total Imp(%)= 40.00 Dir. Conn.(%)= 40.00 IMPERVIOUS 0.57 2.00 1.00 503.00 0.013 PERVIOUS (i) (ha)= (mm)= (%)= (m)= Surface Area 0.86 5.00 2.00 30.00 0.250 Dep. Storage Average Slope Length Mannings n

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORMFI | HYFTOGR | APH   | _     |       |
|-------|-------|-------|-----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN      | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr     | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03      | 6.250   | 38.61 | 9.33  | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03      | 6.333   | 8.13  | 9.42  | 1.02  |
| 0.250 | 0.00  | 3.333 | 1.02      | 6.417   | 8.13  | 9.50  | 1.02  |
| 0.333 | 1.02  | 3.417 | 1.02      | 6.500   | 8.13  | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 1.02      | 6.583   | 8.13  | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03      | 6.667   | 8.13  | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03      | 6.750   | 8.13  | 9.83  | 1.02  |
| 0.667 | 1.02  | 3.750 | 2.03      | 6.833   | 3.05  | 9.92  | 1.02  |
| 0.750 | 1.02  | 3.833 | 2.03      | 6.917   | 3.05  | 10.00 | 1.02  |
| 0.833 | 1.02  | 3.917 | 2.03      | 7.000   | 3.05  | 10.08 | 1.02  |
| 0.917 | 1.02  | 4.000 | 2.03      | 7.083   | 3.05  | 10.17 | 1.02  |
| 1.000 | 1.02  | 4.083 | 1.02      | 7.167   | 3.05  | 10.25 | 1.02  |
| 1.083 | 0.00  | 4.167 | 1.02      | 7.250   | 3.05  | 10.33 | 1.02  |
| 1.167 | 0.00  | 4.250 | 1.02      | 7.333   | 3.05  | 10.42 | 1.02  |

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|                   | Langs | taffRd_E | A_Existi | ng_WestDo | onWaters | hd    |      |
|-------------------|-------|----------|----------|-----------|----------|-------|------|
| 1.250             | 0.00  | 4.333    | 3.05     | 7.417     | 3.05     | 10.50 | 1.02 |
| 1.333             | 1.02  | 4.417    | 3.05     | 7.500     | 3.05     | 10.58 | 1.02 |
| 1.417             | 1.02  | 4.500    | 3.05     | 7.583     | 2.03     | 10.67 | 1.02 |
| 1.500             | 1.02  | 4.583    | 3.05     | 7.667     | 2.03     | 10.75 | 1.02 |
| 1.583             | 1.02  | 4.667    | 3.05     | 7.750     | 2.03     | 10.83 | 1.02 |
| 1.667             | 1.02  | 4.750    | 3.05     | 7.833     | 3.05     | 10.92 | 1.02 |
| 1.750             | 1.02  | 4.833    | 3.05     | 7.917     | 3.05     | 11.00 | 1.02 |
| 1.833             | 1.02  | 4.917    | 3.05     | 8.000     | 3.05     | 11.08 | 1.02 |
| 1.917             | 1.02  | 5.000    | 3.05     | 8.083     | 2.03     | 11.17 | 1.02 |
| 2.000             | 1.02  | 5.083    | 3.05     | 8.167     | 2.03     | 11.25 | 1.02 |
| 2.083             | 1.02  | 5.167    | 3.05     | 8.250     | 2.03     | 11.33 | 0.00 |
| 2.167             | 1.02  | 5.250    | 3.05     | 8.333     | 2.03     | 11.42 | 0.00 |
| 2.250             | 1.02  | 5.333    | 5.08     | 8.417     | 2.03     | 11.50 | 0.00 |
| 2.333             | 1.02  | 5.417    | 5.08     | 8.500     | 2.03     | 11.58 | 1.02 |
| 2.417             | 1.02  | 5.500    | 5.08     | 8.583     | 2.03     | 11.67 | 1.02 |
| 2.500             | 1.02  | 5.583    | 5.08     | 8.667     | 2.03     | 11.75 | 1.02 |
| 2.583             | 2.03  | 5.667    | 5.08     | 8.750     | 2.03     | 11.83 | 1.02 |
| 2.667             | 2.03  | 5.750    | 5.08     | 8.833     | 1.02     | 11.92 | 1.02 |
| 2.750             | 2.03  | 5.833    | 38.61    | 8.917     | 1.02     | 12.00 | 1.02 |
| 2.833             | 2.03  | 5.917    | 38.61    | 9.000     | 1.02     | 12.08 | 1.02 |
| 2.917             | 2.03  | 6.000    | 38.61    | 9.083     | 2.03     | 12.17 | 1.02 |
| 3.000             | 2.03  | 6.083    | 38.61    | 9.167     | 2.03     | 12.25 | 1.02 |
| 3.083             | 2.03  | 6.167    | 38.61    | 9.250     | 2.03     |       |      |
| ten.(mm/          | hr)-  | 38.61    |          | 19.27     |          |       |      |
| · · · · ( IIIII / | , -   | 55.01    |          |           |          |       |      |

| Max.Eff.Inten.(r | mm/hr)= | 38.61     | 19.27      |             |
|------------------|---------|-----------|------------|-------------|
| over             | (min)   | 10.00     | 25.00      |             |
| Storage Coeff.   | (min)=  | 9.85 (ii) | 21.33 (ii) |             |
| Unit Hyd. Tpeak  | (min)=  | 10.00     | 25.00      |             |
| Unit Hyd. peak   | (cms)=  | 0.11      | 0.05       |             |
|                  |         |           |            | *TOTALS*    |
| PEAK FLOW        | (cms)=  | 0.06      | 0.03       | 0.078 (iii) |
| TIME TO PEAK     | (hrs)=  | 6.25      | 6.50       | 6.25        |
| RUNOFF VOLUME    | (mm)=   | 40.93     | 16.67      | 26.36       |
| TOTAL RAINFALL   | (mm)=   | 42.93     | 42.93      | 42.93       |
| RUNOFF COFFFTCTI | FNT =   | 0.95      | 0.39       | 0.61        |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: CN\* = 84.0 Ia = Dep. Storage (Above) (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COFFFICIENT. (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD ( 0420) | 1 + 2 = 3 | QPEAK (cms) 0.078 0.081 R.V. (mm) 26.36 28.95 AREA TPEAK (ha) 1.43 1.27 (hrs) 6.25 6.25 ID1= 1 ( 0135): + ID2= 2 ( 0140): ======= ID = 3 ( 0420): 0.158 6.25

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#### LangstaffRd EA\_Existing\_WestDonWatershull 1.02 | 4.833 | 3.05 | 7.917 | 3.05 | 12 1.02 | 4.917 | 3.05 | 8.000 | 3.05 | 12 1.02 | 5.000 | 3.05 | 8.080 | 2.03 | 12 1.02 | 5.1600 | 3.05 | 8.167 | 2.03 | 12 1.02 | 5.167 | 3.05 | 8.250 | 2.03 | 12 1.02 | 5.250 | 3.05 | 8.250 | 2.03 | 12 1.02 | 5.250 | 3.05 | 8.333 | 2.03 | 12 1.02 | 5.333 | 5.08 | 8.417 | 2.03 | 12 1.02 | 5.533 | 5.08 | 8.500 | 2.03 | 12 1.02 | 5.500 | 5.08 | 8.500 | 2.03 | 12 1.02 | 5.500 | 5.08 | 8.500 | 2.03 | 12 1.02 | 5.583 | 5.08 | 8.650 | 2.03 | 12 1.02 | 5.583 | 5.08 | 8.650 | 2.03 | 12 1.02 | 5.583 | 5.08 | 8.650 | 2.03 | 12 1.03 | 5.667 | 5.08 | 8.650 | 2.03 | 12 1.03 | 5.060 | 3.61 | 9.000 | 1.02 | 12 1.03 | 5.060 | 38.61 | 9.083 | 2.03 | 12 1.03 | 6.060 | 38.61 | 9.083 | 2.03 | 12 1.03 | 6.060 | 38.61 | 9.167 | 2.03 | 12 1.03 | 6.060 | 38.61 | 9.167 | 2.03 | 12 1.03 | 6.060 | 38.61 | 9.167 | 2.03 | 12 1.03 | 6.060 | 38.61 | 9.167 | 2.03 | 12 1.03 | 6.067 | 38.61 | 9.167 | 2.03 | 12 1.03 | 6.067 | 38.61 | 9.167 | 2.03 | 12 1.03 | 6.067 | 38.61 | 9.167 | 2.03 | 12 1.03 | 6.067 | 38.61 | 9.167 | 2.03 | 12 1.03 | 6.067 | 38.61 | 9.167 | 2.03 | 12 1.03 | 6.067 | 38.61 | 9.167 | 2.03 | 12 1.04 | 6.167 | 38.61 | 9.167 | 2.03 | 12 1.05 | 6.167 | 38.61 | 9.167 | 2.03 | 12 1.05 | 6.167 | 38.61 | 9.167 | 2.03 | 12 1.05 | 6.167 | 38.61 | 9.167 | 2.03 | 12 1.05 | 6.167 | 38.61 | 9.167 | 2.03 | 12 1.05 | 6.167 | 38.61 | 9.167 | 2.03 | 12 1.05 | 6.167 | 38.61 | 9.167 | 2.03 | 12 1.05 | 6.167 | 38.61 | 9.167 | 2.03 | 12 1.05 | 6.167 | 38.61 | 9.167 | 2.03 | 12 1.05 | 6.167 | 38.61 | 9.167 | 2.03 | 12 1.05 | 6.167 | 38.61 | 9.167 | 2.03 | 12 1.05 | 6.167 | 38.61 | 9.167 | 2.03 | 12 1.05 | 6.167 | 38.61 | 9.167 | 2.03 | 12 1.05 | 6.167 | 38.61 | 9.167 | 2.03 | 12 1.05 | 6.167 | 38.61 | 9.167 | 2.03 | 12 1.05 | 6.167 | 38.61 | 9.167 | 2.03 | 12 1.05 | 6.167 | 38.61 | 9.167 | 2.03 | 12 1.05 | 6.167 | 38.61 | 9.167 | 2.03 | 12 nWatershd 3.65 | 11.00 3.65 | 11.08 2.03 | 11.08 2.03 | 11.17 2.03 | 11.3 2.03 | 11.42 2.03 | 11.50 2.03 | 11.50 2.03 | 11.50 2.03 | 11.50 2.03 | 11.50 2.03 | 11.50 2.03 | 12.03 1.02 | 12.03 1.02 | 12.03 1.02 | 12.03 1.03 | 12.03 2.03 | 12.05 2.03 | 12.05 2.03 | 12.05 2.03 | 12.25 2.03 | 12.25 1.750 1.833 1.917 2.083 0.00 0.00 1.02 1.02 1.02 2 167 2.167 2.250 2.333 2.417 2.500 2.583 2.667 1.02 2.750 1.02 2.833 2.917 3.000 3.083 Max.Eff.Inten.(mm/hr)= 38.61 19.37 over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)= 10.00 20.00 9.46 (ii) 18.44 (ii) 10.00 20.00 0.12 0.06

- \*TOTALS\*
  0.058 (iii)
  6.25
  26.95
  42.93 PEAK FLOW (cms)=
  TIME TO PEAK (hrs)=
  RUNOFF VOLUME (mm)=
  TOTAL RAINFALL (mm)=
  RUNOFF COEFFICIENT = 0.04 6.25 40.93 42.93 6.42 15.99 42.93 0.95
- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
- CN\* = 83.0 Ia = Dep. Storage (Above)
  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
  THAN THE STORAGE COEFFICIENT.
  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| (111) 1 1 1 1 1 1 1 1 1                 | 5025 110      | . 11102002       | <i>D</i> , <i>S E</i> | 2011    |           |       |  |
|---|---------------|------------------|-----------------------|---------|-----------|-------|--|
| CALIB                                   |               |                  |                       |         |           |       |  |
| STANDHYD ( 0205) <br> ID= 1 DT= 5.0 min | Area<br>Total | (ha)=<br>Imp(%)= | 1.11<br>38.00         | Dir.    | Conn.(%)= | 38.00 |  |
|   |               | IMPERVI          | ous                   | PERVIOU | S (i)     |       |  |
| Surface Area                            | (ha)=         | 0.4              | 2                     | 0.69    |           |       |  |
| Dep. Storage                            | (mm)=         | 2.0              | 0                     | 5.00    |           |       |  |
| Average Slope                           | (%)=          | 1.0              | 0                     | 2.00    |           |       |  |
| Length                                  | (m)=          | 470.0            | 0                     | 20.00   |           |       |  |
| Mannings n                              | =             | 0.01             | 3                     | 0.250   |           |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

#### LangstaffRd\_EA\_Existing\_WestDonWatershd

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD ( 0425)| | 1 + 2 = 3 | QPEAK R.V. (mm) 32.26 27.58 (ha) (cms) 3.05 0.218 2.70 0.158 (hrs) 6.25 6.25 ID1= 1 ( 0145): + ID2= 2 ( 0420): ID = 3 ( 0425): 5.75 0.377 6.25 30.06

| CALTB             |       |         |       |                |       |
|-------------------|-------|---------|-------|----------------|-------|
| STANDHYD ( 0210)  | Area  | (ha)=   | 0.96  |                |       |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 44.00 | Dir. Conn.(%)= | 44.00 |
|                   |       |         |       |                |       |
|                   |       | IMPERVI | OUS   | PERVIOUS (i)   |       |
| Surface Area      | (ha)= | 0.4     | 2     | 0.54           |       |
| Dep. Storage      | (mm)= | 2.0     | Э     | 5.00           |       |
| Average Slope     | (%)=  | 1.0     | 9     | 2.00           |       |
| Length            | (m)=  | 470.0   | 9     | 20.00          |       |
| Mannings n        | =     | 0.01    |       | 0.250          |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | D HYETOGR | APH   |       |       |
|-------|-------|-------|----------|-----------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME    | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs     | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250     | 38.61 | 9.33  | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333     | 8.13  | 9.42  | 1.02  |
| 0.250 | 0.00  | 3.333 | 1.02     | 6.417     | 8.13  | 9.50  | 1.02  |
| 0.333 | 1.02  | 3.417 | 1.02     | 6.500     | 8.13  | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 1.02     | 6.583     | 8.13  | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03     | 6.667     | 8.13  | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03     | 6.750     | 8.13  | 9.83  | 1.02  |
| 0.667 | 1.02  | 3.750 | 2.03     | 6.833     | 3.05  | 9.92  | 1.02  |
| 0.750 | 1.02  | 3.833 | 2.03     | 6.917     | 3.05  | 10.00 | 1.02  |
| 0.833 | 1.02  | 3.917 | 2.03     | 7.000     | 3.05  | 10.08 | 1.02  |
| 0.917 | 1.02  | 4.000 | 2.03     | 7.083     | 3.05  | 10.17 | 1.02  |
| 1.000 | 1.02  | 4.083 | 1.02     | 7.167     | 3.05  | 10.25 | 1.02  |
| 1.083 | 0.00  | 4.167 | 1.02     | 7.250     | 3.05  | 10.33 | 1.02  |
| 1.167 | 0.00  | 4.250 | 1.02     | 7.333     | 3.05  | 10.42 | 1.02  |
| 1.250 | 0.00  | 4.333 | 3.05     | 7.417     | 3.05  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 3.05     | 7.500     | 3.05  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 3.05     | 7.583     | 2.03  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 3.05     | 7.667     | 2.03  | 10.75 | 1.02  |
| 1.583 | 1.02  | 4.667 | 3.05     | 7.750     | 2.03  | 10.83 | 1.02  |
| 1.667 | 1.02  | 4.750 | 3.05     | 7.833     | 3.05  | 10.92 | 1.02  |

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| LangstaffRd EA Existing WestDonWatershd |                |                |              |            |       |            |       |
|---|----------------|----------------|--------------|------------|-------|------------|-------|
| TRANSFORMED HYETOGRAPH                  |                |                |              |            |       |            |       |
| TIME                                    | RAIN           | TIME           | RAIN         |            | RAIN  |            | RAIN  |
| hrs m                                   | m/hr j         | hrs            | mm/hr        | ' hrs      | mm/hr | hrs        | mm/hr |
| 0.083                                   | 0.00 j         | 3.167          | 2.03         | 6.250      | 38.61 | 9.33       | 1.02  |
| 0.167                                   | 0.00 j         | 3.250          | 2.03         | 6.333      | 8.13  | 9.42       | 1.02  |
| 0.250                                   | 0.00 j         | 3.333          | 1.02         | 6.417      | 8.13  | 9.50       | 1.02  |
| 0.333                                   | 1.02           | 3.417          | 1.02         | 6.500      | 8.13  | 9.58       | 2.03  |
| 0.417                                   | 1.02           | 3.500          | 1.02         | 6.583      | 8.13  | 9.67       | 2.03  |
| 0.500                                   | 1.02           | 3.583          | 2.03         | 6.667      | 8.13  | 9.75       | 2.03  |
| 0.583                                   | 1.02           | 3.667          | 2.03         | 6.750      | 8.13  | 9.83       | 1.02  |
| 0.667                                   | 1.02           | 3.750          | 2.03         | 6.833      | 3.05  | 9.92       | 1.02  |
| 0.750                                   | 1.02           | 3.833          | 2.03         | 6.917      | 3.05  | 10.00      | 1.02  |
| 0.833                                   | 1.02           | 3.917          | 2.03         |            | 3.05  | 10.08      | 1.02  |
|   | 1.02           | 4.000          | 2.03         |            | 3.05  |            | 1.02  |
|   |                | 4.083          | 1.02         |            | 3.05  |            | 1.02  |
|   | 0.00           |                | 1.02         |            | 3.05  |            | 1.02  |
|   |                | 4.250          | 1.02         |            | 3.05  |            | 1.02  |
|   | 0.00           |                | 3.05         | 7.417      | 3.05  |            | 1.02  |
|   |                | 4.417          | 3.05         | 7.500      | 3.05  |            | 1.02  |
|   |                | 4.500          | 3.05         |            | 2.03  |            | 1.02  |
|   | 1.02           |                | 3.05         | 7.667      | 2.03  |            | 1.02  |
|   |                | 4.667          | 3.05         | 7.750      | 2.03  |            | 1.02  |
|   | 1.02           | 4.750          | 3.05         | 7.833      | 3.05  |            | 1.02  |
|   | 1.02           |                | 3.05         |            | 3.05  |            | 1.02  |
|   | 1.02           | 4.917          | 3.05         |            | 3.05  |            | 1.02  |
|   | 1.02           | 5.000          | 3.05         | 8.083      | 2.03  |            | 1.02  |
|   | 1.02           | 5.083          |              | 8.167      | 2.03  |            | 1.02  |
|   | 1.02           | 5.167          | 3.05         |            | 2.03  |            | 0.00  |
|   | 1.02           | 5.250          | 3.05         |            | 2.03  |            | 0.00  |
|   | 1.02           | 5.333          | 5.08         |            | 2.03  |            | 0.00  |
|   | 1.02           | 5.417          | 5.08         |            | 2.03  |            | 1.02  |
|   | 1.02           | 5.500          |              | 8.583      | 2.03  |            | 1.02  |
|   | 1.02           | 5.583          | 5.08         |            | 2.03  |            | 1.02  |
|   | 2.03  <br>2.03 | 5.667<br>5.750 | 5.08<br>5.08 |            | 2.03  |            | 1.02  |
|   | 2.03  <br>2.03 | 5.833          | 38.61        | 8.917      | 1.02  |            | 1.02  |
|   | 2.03           | 5.917          |              | 9.000      | 1.02  |            | 1.02  |
|   |                | 6.000          |              | 9.083      | 2.03  |            | 1.02  |
|   | 2.03           |                |              | 9.167      | 2.03  |            | 1.02  |
|   |                | 6.167          |              | 9.250      | 2.03  |            | 1.02  |
| 3.003                                   | 2.05           | 0.107          | 30.01        | 7.230      | 2.05  |            |       |
| Max.Eff.Inten.(mm/hr                    | ) =            | 38.61          |              | 19.37      |       |            |       |
| over (min                               |                | 10.00          |              | 20.00      |       |            |       |
| Storage Coeff. (min                     |                | 9.46           |              | 18.44 (ii) | )     |            |       |
| Unit Hyd. Tpeak (min                    |                | 10.00          |              | 20.00 ` ′  |       |            |       |
| Unit Hyd. peak (cms                     |                | 0.12           |              | 0.06       |       |            |       |
| ,, (aa                                  |                |                |              |            | *T01  | ΓALS*      |       |
| PEAK FLOW (cms                          | )=             | 0.04           |              | 0.02       |       | .062 (iii) |       |
| TIME TO PEAK (hrs                       |                | 6.25           |              | 6.42       |       | 5.25       |       |
| RUNOFF VOLUME (mm                       |                | 40.93          | :            | 15.99      |       | .46        |       |
| TOTAL RAINFALL (mm                      |                | 42.93          |              | 42.93      |       | 2.93       |       |
| RUNOFF COEFFICIENT                      | =              | 0.95           |              | 0.37       | 6     | 9.59       |       |

#### LangstaffRd\_EA\_Existing\_WestDonWatershd

| ADD HYD ( 0460)| | 1 + 2 = 3 | QPEAK (cms) 0.062 0.058 ΔRFΔ TΡΕΔΚ (ha) 1.11 0.96 ID1= 1 ( 0205): + ID2= 2 ( 0210): 6.25 26.95 ID = 3 ( 0460): 2.07 0.120 6.25 26.15

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

Area (ha)= 0.70 Total Imp(%)= 57.00 Dir. Conn.(%)= 57.00

TMPERVIOUS PERVIOUS (i) (ha)= (mm)= (%)= (m)= 0.30 5.00 2.00 25.00 Surface Area Dep. Storage Average Slope Length Mannings n 0.013 0.290

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME RAIN | TIME RAIN | TIME hrs mm/hr | hrs mm/hr | hrs 3.167 2.03 | 6.250 38.61 | 9.33 RAIN | mm/hr | MAIN | 1...mm/hr | hrs. mm/hr | hrs. mm/hr | hrs. mm/hr | hrs. 2.63 | 6.250 | 2.63 | 6.331 | 6.20 | 6.417 | 1.02 | 6.583 | 2.03 | 6.657 | 2.03 | 6.750 | 2.03 | 6.917 | 2.03 | 7.080 | 1.02 | 7.167 | 1.02 | 7.263 | 1.02 | 7.333 | 3.65 | 7.417 mm/hr 1.02 hrs 0.083 0.00 0.167 0.00 3.250 8.13 8.13 9.42 1.02 0.250 3.333 1.02 1.02 1.02 1.02 1.02 1.02 1.02 8.13 8.13 8.13 8.13 8.13 3.05 3.05 2.03 2.03 2.03 1.02 0.333 3.417 9.58 0.333 0.417 0.500 0.583 0.667 0.750 9.67 9.75 9.83 9.92 3.583 3.667 3.750 3.833 1.02 1.02 0.833 1.02 3.917 3.05 10.08 1.02 0.917 1.02 4.000 3.05 10.17 1.02 1.02 | 0.00 | 0.00 | 0.00 | 4.083 4.167 4.250 4.333 3.05 3.05 3.05 3.05 3.05 10.25 10.33 1.02

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LangstaffRd\_EA\_Existing\_WestDonWatershd = 0.013 0.250 Mannings n

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TRANSFORMED HYETOGRAPH -RAIN | mm/hr | 0.00 | 0.00 | TIME hrs 3.167 3.250 RAIN |' mm/hr |' 2.03 | 6 RAIN | TIME mm/hr | hrs 38.61 | 9.33 8.13 | 9.42 8.13 | 9.50 8.13 | 9.58 1 TIME hrs 6.250 6.333 6.417 6.500 6.583 6.667 6.750 6.833 6.917 7.000 7.083 hrs 0.083 0.167 0.250 0.00 3.333 1.02 1.02 0.333 3.417 1.02 2.03 1.02 1.02 1.02 1.02 1.02 1.02 8.13 8.13 8.13 8.13 3.05 3.05 3.05 3.05 0.417 3.500 1.02 9.67 2.03 2.03 2.03 2.03 2.03 2.03 3 583 0.583 0.667 0.750 0.833 3.583 3.667 3.750 3.833 3.917 0.917 1.02 4.000 2.03 10.17 1.02 7.167 7.250 7.333 7.417 7.500 7.583 7.667 4.083 1.000 1.02 1.02 3.05 1.02 1.02 1.02 1.02 3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05 2.03 2.03 0.00 0.00 0.00 1.02 1.083 10.33 1.02 4.167 4.250 4.333 4.417 4.500 4.583 1 167 1.250 1.333 1.417 1.02 1.02 1.02 1.02 1.02 1.583 1.02 4.667 3.05 7.750 2.03 10.83 1.02 1.667 1.02 4.750 3.05 7.833 7.917 8.000 8.083 8.167 8.250 8.333 8.417 8.500 8.583 8.667 8.750 8.833 3.05 10.92 1.02 1.02 1.02 1.02 1.02 4.833 4.917 5.000 5.083 3.05 | 3.05 | 3.05 | 3.05 | 3.05 | 3.05 3.05 2.03 2.03 2.03 1.02 1.02 1.02 1.02 1.750 11.00 11.08 11.17 11.25 11.33 1.02 5.167 1.02 5.250 3.05 2.03 11.42 2.250 1.02 5.333 5.08 2.03 11.50 0.00 2.333 1.02 5,417 5.08 2.03 1.02 5.417 5.500 5.583 5.667 5.750 5.833 1.02 1.02 2.03 2.03 5.08 5.08 5.08 5.08 2.03 2.03 2.03 1.02 1.02 11.67 11.75 11.83 11.92 12.00 2.417 1.02 2.03 38.61 2.750 8.917 1.02 9.000 9.083 9.167 2.833 2.03 5.917 38.61 1.02 12.08 1.02 2.917 2.03 6.000 38.61 2.03 12.17 1.02 2.03 6.083 38.61 2.03 12.25 38.61 | 9.250 3.083 2.03 | 6.167 2.03

over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)= 10.00 20.00 7.51 (ii) 17.98 (ii) 20.00 Unit Hyd. peak (cms)= 0.13 0.06 \*TOTALS\* 0.05 0.01 PEAK FLOW (cms)= 0.062 (iii)

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4.417 4.500 4.583 4.667 4.750 4.833 4.917 1.333 1.02 3.05 | 10.58 2.03 | 10.67 1.417 1.02 1.02 1.02 1.02 1.02 1.02 1.500 1.583 1.667 1.750 7.667 7.750 7.833 7.917 2.03 2.03 3.05 3.05 10.75 10.83 10.92 11.00 1.02 1.833 1.02 8.000 3.05 11.08 1.917 1.02 5.000 5.083 3.05 8.083 8.167 2.03 11.17 2.000 1.02 3.05 2.03 11.25 1.02 2.083 1.02 5.167 3.05 8.250 2.03 11.33 2.167 2.250 2.333 2.417 5.250 5.333 5.417 5.500 5.583 3.05 5.08 5.08 5.08 2.03 2.03 2.03 2.03 2.03 0.00 0.00 1.02 1.02 1.02 8.333 8.417 8.500 8.583 8.667 8.750 8.833 8.917 9.000 9.083 9.167 9.250 11.42 2.500 2.583 1.02 5.08 2.03 11.75 1.02 2.03 5.667 5.08 2.03 11.83 1.02 5.667 5.750 5.833 5.917 6.000 6.083 6.167 2.667 2.03 5.08 1.02 11.92 1.02 2.750 2.03 38.61 12.00 1.02 2.833 2.917 3.000 3.083 2.03 2.03 2.03 2.03 2.03 38.61 38.61 38.61 38.61 1.02 2.03 2.03 2.03 12.08 12.17 12.25 1.02 1.02 1.02 Max.Eff.Inten.(mm/hr)= 16.97 38.61 over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 10.00 7.51 (ii) 10.00 0.13 20.00 19.34 (ii) \*TOTALS\* 0.049 (iii) PEAK FLOW TIME TO PEAK (hrs)= 6.25 6.42 14.75 6.25 RUNOFF VOLUME (mm)= (mm)= NT = 40.93 TOTAL RATNEALL 42.93 42.93 42.93 RUNOFF COEFFICIENT

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 81.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

Area (ha)= 0.90 Total Imp(%)= 53.00 Dir. Conn.(%)= 53.00 IMPERVIOUS PERVIOUS (i) 0.48 2.00 1.00 320.00 0.42 5.00 2.00 Surface Area Dep. Storage Average Slope Length (mm)= (%)= (m)= 25.00

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LangstaffRd\_EA\_Existing\_WestDonWatershd
TIME TO PEAK (hrs)= 6.25 6.42 6.2
RUNOFF VOLUME (mm)= 40.93 15.99 29.2
TOTAL RAINFALL (mm)= 42.93 42.93 42.9
RUNOFF COEFFICIENT = 0.95 0.27 42.93

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 83.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COFFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD ( 0475) | 1 + 2 = 3 | (mm) 29.20 (cms) (hrs) 6.25 ID1= 1 ( 0225): + ID2= 2 ( 0230): 0.062 0.70 0.049 6.25 29.66 ID = 3 ( 0475): 1.60 0.111 6.25 29 40

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

STANDHYD ( 0220) Area (ha)= 0.65 Total Imp(%)= 46.00 Dir. Conn.(%)= 46.00 |ID= 1 DT= 5.0 min | IMPERVIOUS PERVIOUS (i) 0.30 2.00 1.00 0.35 5.00 (mm)= (%)= (m)= Dep. Storage Average Slope 2.00 Length 260.00 20.00 Mannings n 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250   | 38.61 | 9.33  | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333   | 8.13  | 9.42  | 1.02  |
| 0.250 | 0.00  | 3.333 | 1.02     | 6.417   | 8.13  | 9.50  | 1.02  |
| 0.333 | 1.02  | 3.417 | 1.02     | 6.500   | 8.13  | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 1.02     | 6.583   | 8.13  | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03     | 6.667   | 8.13  | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03     | 6.750   | 8.13  | 9.83  | 1.02  |
| 0.667 | 1.02  | 3.750 | 2.03     | 6.833   | 3.05  | 9.92  | 1.02  |
| 0.750 | 1.02  | 3.833 | 2.03     | 6.917   | 3.05  | 10.00 | 1.02  |
| 0.833 | 1.02  | 3.917 | 2.03     | 7.000   | 3.05  | 10.08 | 1.02  |

|                     | Langs | taffRd F | A Fxist | ing_WestDon | Waters | hd         |      |
|---------------------|-------|----------|---------|-------------|--------|------------|------|
| 0.917               |       | 4.000    |         | 7.083       | 3.05   |            | 1.02 |
| 1.000               |       | 4.083    | 1.02    |             | 3.05   |            | 1.02 |
| 1.083               |       | 4.167    | 1.02    |             |        | 10.33      | 1.02 |
| 1.167               |       | 4.250    |         |             | 3.05   |            | 1.02 |
| 1.250               |       | 4.333    | 3.05    |             | 3.05   |            | 1.02 |
| 1.333               |       | 4.417    |         | 7.500       |        | 10.58      | 1.02 |
| 1.417               |       | 4.500    |         | 7.583       | 2.03   |            | 1.02 |
| 1.500               | 1.02  | 4.583    | 3.05    | 7.667       | 2.03   | 10.75      | 1.02 |
| 1.583               |       | 4.667    |         | 7.750       |        | 10.83      | 1.02 |
| 1.667               |       | 4.750    |         | 7.833       | 3.05   |            | 1.02 |
| 1.750               | 1.02  | 4.833    | 3.05    | 7.917       | 3.05   | 11.00      | 1.02 |
| 1.833               | 1.02  | 4.917    | 3.05    | 8.000       | 3.05   | 11.08      | 1.02 |
| 1.917               | 1.02  | 5.000    | 3.05    | 8.083       | 2.03   | 11.17      | 1.02 |
| 2.000               | 1.02  | 5.083    | 3.05    | 8.167       | 2.03   |            | 1.02 |
| 2.083               | 1.02  | 5.167    |         | 8.250       | 2.03   | 11.33      | 0.00 |
| 2.167               | 1.02  | 5.250    | 3.05    | 8.333       | 2.03   | 11.42      | 0.00 |
| 2.250               | 1.02  | 5.333    | 5.08    | 8.417       | 2.03   | 11.50      | 0.00 |
| 2.333               | 1.02  | 5.417    | 5.08    | 8.500       | 2.03   | 11.58      | 1.02 |
| 2.417               | 1.02  | 5.500    | 5.08    | 8.583       | 2.03   | 11.67      | 1.02 |
| 2.500               | 1.02  | 5.583    | 5.08    | 8.667       | 2.03   | 11.75      | 1.02 |
| 2.583               | 2.03  | 5.667    | 5.08    | 8.750       | 2.03   | 11.83      | 1.02 |
| 2.667               | 2.03  | 5.750    | 5.08    | 8.833       | 1.02   | 11.92      | 1.02 |
| 2.750               | 2.03  | 5.833    |         | 8.917       | 1.02   | 12.00      | 1.02 |
| 2.833               | 2.03  | 5.917    |         | 9.000       | 1.02   | 12.08      | 1.02 |
| 2.917               | 2.03  | 6.000    | 38.61   | 9.083       | 2.03   | 12.17      | 1.02 |
| 3.000               | 2.03  | 6.083    | 38.61   | 9.167       | 2.03   | 12.25      | 1.02 |
| 3.083               | 2.03  | 6.167    | 38.61   | 9.250       | 2.03   | l          |      |
| Max.Eff.Inten.(mm/h |       | 38.61    |         | 19.37       |        |            |      |
| over (m             |       | 5.00     |         | 20.00       |        |            |      |
|                     | in)=  | 6.63     |         | 15.61 (ii)  |        |            |      |
| Unit Hyd. Tpeak (m: |       | 5.00     |         | 20.00       |        |            |      |
| Unit Hyd. peak (cr  | 1S)=  | 0.18     |         | 0.07        |        |            |      |
|                     |       |          |         |             |        | TALS*      |      |
|                     | 1s)=  | 0.03     |         | 0.01        |        | .042 (iii) |      |
|                     | `s)=  | 6.25     |         | 6.42        |        | 5.25       |      |
|                     | ım)=  | 40.93    |         | 15.99       |        | 7.45       |      |
|                     | ım)=  | 42.93    |         | 42.93       |        | 2.93       |      |
| RUNOFF COEFFICIENT  | =     | 0.95     |         | 0.37        | (      | 0.64       |      |
|                     |       |          |         |             |        |            |      |
| (i) CN PROCEDURE    |       |          |         |             |        |            |      |

(1) CN PROCEDURE SCLECTED FOR PERVIOUS LOSSES:

CN\* = 83.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB | STANDHYD ( 0215)| |ID= 1 DT= 5.0 min | Area (ha)= 0.58 Total Imp(%)= 57.00 Dir. Conn.(%)= 57.00

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#### \*TOTALS\* 0.04 6.25 40.93 42.93 0.95 PEAK FLOW (cms)= TIME TO PEAK (hrs)= RUNOFF VOLUME (mm)= TOTAL RAINFALL (mm)= RUNOFF COEFFICIENT = 0.042 (iii) 6.25 30.19 42.93 0.70 0.01 6.42 15.99 42.93 0.37 (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: (1) CN\* HOLDER SELECTED FOR FEATURES LOSSES() (11) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT. (111) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY. | ADD HYD ( 0470)| | 1 + 2 = 3 | QPEAK (cms) 0.042 0.042 R.V. (mm) 30.19 27.45 AREA TPEAK (ha) 0.58 0.65 (hrs) 6.25 6.25 ID1= 1 ( 0215): + ID2= 2 ( 0220): ID = 3 ( 0470): 1.23 0.084 6.25 28.74 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY. ADD HYD ( 0480)| 1 + 2 = 3 | AREA QPEAK TPEAK R.V. (ha) 1.23 (cms) 0.084 (hrs) 6.25 (mm) 28.74

| CALIB | | STANDHYD ( 0160)| |ID= 1 DT= 5.0 min | Area (ha)= 0.43 Total Imp(%)= 56.00 Dir. Conn.(%)= 56.00 IMPERVIOUS PERVIOUS (i) Surface Area (ha)= 0.24 2.00 1.00 0.19 5.00 2.00 (mm)= (%)= (m)= Dep. Storage Average Slope Length Mannings n 260 00 20 00 0.013 0.250

1.60 0.111

2.83 0.195 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ID1= 1 ( 0470): + ID2= 2 ( 0475):

ID = 3 ( 0480):

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6.25

29.40

## LangstaffRd\_EA\_Existing\_WestDonWatershd IMPERVIOUS PERVIOUS (i)

|               |       | THE LIVETOUS | 1 5 0000 (1 | , |
|---------------|-------|--------------|-------------|---|
| Surface Area  | (ha)= | 0.33         | 0.25        |   |
| Dep. Storage  | (mm)= | 2.00         | 5.00        |   |
| Average Slope | (%)=  | 1.00         | 2.00        |   |
| Length        | (m)=  | 260.00       | 30.00       |   |
| Mannings n    | =     | 0.013        | 0.250       |   |
|               |       |              |             |   |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250   | 38.61 | 9.33  | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333   | 8.13  | 9.42  | 1.02  |
| 0.250 | 0.00  | 3.333 | 1.02     | 6.417   | 8.13  | 9.50  | 1.02  |
| 0.333 | 1.02  | 3.417 | 1.02     | 6.500   | 8.13  | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 1.02     | 6.583   | 8.13  | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03     | 6.667   | 8.13  | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03     | 6.750   | 8.13  | 9.83  | 1.02  |
| 0.667 | 1.02  | 3.750 | 2.03     | 6.833   | 3.05  | 9.92  | 1.02  |
| 0.750 | 1.02  | 3.833 | 2.03     | 6.917   | 3.05  | 10.00 | 1.02  |
| 0.833 | 1.02  | 3.917 | 2.03     |         | 3.05  | 10.08 | 1.02  |
| 0.917 | 1.02  | 4.000 | 2.03     | 7.083   | 3.05  | 10.17 | 1.02  |
| 1.000 | 1.02  | 4.083 | 1.02     | 7.167   | 3.05  | 10.25 | 1.02  |
| 1.083 | 0.00  | 4.167 | 1.02     | 7.250   | 3.05  | 10.33 | 1.02  |
| 1.167 | 0.00  | 4.250 | 1.02     | 7.333   | 3.05  | 10.42 | 1.02  |
| 1.250 | 0.00  | 4.333 | 3.05     | 7.417   | 3.05  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 3.05     | 7.500   | 3.05  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 3.05     | 7.583   | 2.03  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 3.05     | 7.667   | 2.03  | 10.75 | 1.02  |
| 1.583 | 1.02  | 4.667 | 3.05     | 7.750   | 2.03  | 10.83 | 1.02  |
| 1.667 | 1.02  | 4.750 | 3.05     | 7.833   | 3.05  | 10.92 | 1.02  |
| 1.750 | 1.02  | 4.833 | 3.05     | 7.917   | 3.05  | 11.00 | 1.02  |
| 1.833 | 1.02  | 4.917 | 3.05     | 8.000   | 3.05  | 11.08 | 1.02  |
| 1.917 | 1.02  | 5.000 | 3.05     | 8.083   | 2.03  | 11.17 | 1.02  |
| 2.000 | 1.02  | 5.083 | 3.05     | 8.167   | 2.03  | 11.25 | 1.02  |
| 2.083 | 1.02  | 5.167 | 3.05     | 8.250   | 2.03  | 11.33 | 0.00  |
| 2.167 |       | 5.250 | 3.05     | 8.333   | 2.03  | 11.42 | 0.00  |
| 2.250 | 1.02  | 5.333 | 5.08     | 8.417   | 2.03  | 11.50 | 0.00  |
| 2.333 | 1.02  |       | 5.08     | 8.500   | 2.03  | 11.58 | 1.02  |
| 2.417 | 1.02  |       | 5.08     | 8.583   | 2.03  | 11.67 | 1.02  |
| 2.500 | 1.02  |       | 5.08     | 8.667   | 2.03  | 11.75 | 1.02  |
| 2.583 | 2.03  |       | 5.08     | 8.750   | 2.03  | 11.83 | 1.02  |
| 2.667 | 2.03  | 5.750 | 5.08     | 8.833   | 1.02  | 11.92 | 1.02  |
| 2.750 | 2.03  | 5.833 | 38.61    | 8.917   | 1.02  | 12.00 | 1.02  |
| 2.833 | 2.03  | 5.917 | 38.61    | 9.000   | 1.02  | 12.08 | 1.02  |
| 2.917 | 2.03  | 6.000 | 38.61    | 9.083   | 2.03  | 12.17 | 1.02  |
| 3.000 | 2.03  | 6.083 | 38.61    | 9.167   | 2.03  | 12.25 | 1.02  |
| 3.083 | 2.03  | 6.167 | 38.61    | 9.250   | 2.03  |       |       |

Max.Eff.Inten.(mm/hr)= over (min)

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 ${\tt LangstaffRd\_EA\_Existing\_WestDonWatershd}$ 

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|                |       | TR/                     | ANSFORME | D HYETOGR                        | APH   | -              |      |
|----------------|-------|-------------------------|----------|----------------------------------|-------|----------------|------|
| TIME           | RAIN  | TIME                    | RAIN     | ' TIME                           | RAIN  | TIME           | RAIN |
| hrs            |       |                         |          | hrs                              |       |                |      |
| 0.083          | 0.00  | 3.167                   | 2.03     | 6.250                            | 38.61 | 9.33           | 1.02 |
| 0.167          | 0.00  | 3.250                   | 2.03     | 6.333                            | 8.13  | 9.42           | 1.02 |
| 0.250          | 0.00  | 3.333                   | 1.02     | 6.417                            | 8.13  | 9.50           | 1.02 |
| 0.333<br>0.417 | 1.02  | 3.333<br>3.417<br>3.500 | 1.02     | 6.500                            | 8.13  | 9.58           | 2.03 |
| 0.417          | 1.02  | 3.500                   | 1.02     | 6.583                            | 8.13  | 9.67           | 2.03 |
| 0.500          | 1.02  | 3.583<br>3.667          | 2.03     | 6.667                            | 8.13  | 9.75           | 2.03 |
| 0.583          | 1.02  | 3.667                   | 2.03     | 6.750                            | 8.13  | 9.83           | 1.02 |
| 0.667          | 1.02  | 3.750                   | 2.03     | 6.833                            |       |                |      |
| 0.750<br>0.833 | 1.02  | 3.833                   | 2.03     | 6.917                            | 3.05  | 10.00          | 1.02 |
| 0.833          | 1.02  | 3.917                   | 2.03     | 7.000                            | 3.05  | 10.08          | 1.02 |
| 0.917          | 1.02  | 4.000                   | 2.03     | 7.083                            | 3.05  | 10.17          | 1.02 |
| 1.000          |       |                         |          | 7.167                            |       |                | 1.02 |
| 1.083          | 0.00  | 4.167                   | 1.02     | 7.250                            | 3.05  | 10.33          | 1.02 |
| 1.167          | 0.00  | 4.250                   | 1.02     | 7.333                            | 3.05  | 10.42          | 1.02 |
|                | 0.00  | 4.333                   | 3.05     | 7.417<br>7.500<br>7.583<br>7.667 | 3.05  |                |      |
| 1.333          | 1.02  | 4.417                   | 3.05     | 7.500                            | 3.05  | 10.58          |      |
| 1.417          | 1.02  | 4.500                   | 3.05     | 7.583                            |       | 10.67          | 1.02 |
| 1.500          | 1.02  | 4.583                   | 3.05     | 7.667                            | 2.03  | 10.75          | 1.02 |
| 1.583<br>1.667 | 1.02  | 4.667                   | 3.05     | 7.750                            | 2.03  | 10.83          | 1.02 |
|                | 1.02  | 4.750                   | 3.05     |                                  |       |                |      |
| 1.750          | 1.02  | 4.833                   | 3.05     | 7.917                            |       | 11.00          |      |
| 1.833<br>1.917 |       | 4.917                   |          | 8.000                            |       | 11.08          | 1.02 |
| 1.91/          | 1.02  | 5.000                   | 3.05     | 8.083<br>  8.167<br>  8.250      | 2.03  | 11.17          | 1.02 |
| 2.000          | 1.02  | 5.083                   | 3.05     | 8.167                            | 2.03  | 11.25          | 1.02 |
| 2.083<br>2.167 | 1.02  | 5.167                   | 3.05     | 8.333                            | 2.03  |                |      |
| 2.16/          |       |                         |          |                                  |       | 11.42          | 0.00 |
| 2.250<br>2.333 | 1.02  | 5.333                   | 5.08     | 8.417                            | 2.03  | 11.50<br>11.58 | 1.02 |
| 2.333          | 1.02  | J 5.41/                 | 5.00     | 8.583                            | 2.03  | 11.56          | 1.02 |
| 2.417<br>2.500 | 1.02  | 5.500                   | 5.00     | 8.667                            | 2.03  | 11.0/          | 1.02 |
| 2.583          | 2 02  | 5.667                   |          | i                                |       | 11.75          |      |
| 2.667          | 2.03  | 5.750                   | 5.00     | 8.750<br>8.833<br>8.917          | 1 02  | 11.03          | 1.02 |
| 2.750          | 2.03  | 5.730                   | 20 61    | 8.917                            | 1.02  | 12.00          | 1.02 |
| 2.833          |       | 5.917                   |          | 9.000                            |       | 12.08          |      |
| 2.917          | 2.03  | 6.000                   | 38 61    | 9.083                            |       | 12.00          | 1.02 |
| 3.000          | 2.03  | 6.000                   | 38 61    | 9.167                            | 2.03  | 12.25          | 1.02 |
| 3.083          | 2.03  |                         |          | 9.250                            |       | 1 12.25        | 1.02 |
| 3.003          | 2.03  | 0.107                   | 50.01    | 1 3.230                          | 2.03  | 1              |      |
| ff.Inten.(mm/  | /hr)= | 38.61                   |          | 25.09                            |       |                |      |
| over (n        | nin)  | 5.00                    |          | 15.00                            |       |                |      |
| ge Coeff. (n   | nin)= | 6.63                    | (ii)     | 14.73 (ii                        | )     |                |      |
| 2 (            |       |                         | . /      |                                  | ,     |                |      |

Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)= 0.18 0.08 \*TOTALS\* PEAK FLOW TIME TO PEAK g g1 0.034 (iii) 6.25

#### LangstaffRd\_EA\_Existing\_WestDonWatershd 1) = 40.93 20.75 32.6 1) = 42.93 42.93 42.9 RUNOFF VOLUME (mm) = TOTAL RAINFALL (mm) = RUNOFF COEFFICIENT = 32.03 0.95 0.48

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
- CN\* = 89.0 Ia = Dep. Storage (Above)
  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
  THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

Length Mannings n

| CALIB | | STANDHYD ( 0155)| |ID= 1 DT= 5.0 min | Area (ha)= 0.56 Total Imp(%)= 45.00 Dir. Conn.(%)= 45.00 IMPERVIOUS PERVIOUS (i) (ha)= (mm)= (%)= (m)= 0.25 2.00 1.00 0.31 5.00 2.00 Surface Area Dep. Storage Average Slope

0.013 NOTE: RATNEAU WAS TRANSFORMED TO 5.0 MTN. TIME STEP.

#### ---- TRANSFORMED HYETOGRAPH RAIN | TIME RAIN | TIME I mm/hr | hrs mm/hr | hrs m hrs 0.083 0.167 mm/hr hrs 3.167 mm/hr | mm/hr 6.250 6.333 6.417 6.500 6.583 6.667 6.750 6.833 6.917 7.000 7.083 7.167 7.250 7.333 7.417 7.500 7.583 9.33 0.00 2.03 38.61 1.02 3.250 2.03 8.13 İ 9.42 1.02 0.167 0.250 0.333 0.417 0.500 0.583 0.667 0.750 3.250 3.333 3.417 3.500 3.583 3.667 3.750 3.833 1.02 1.02 1.02 2.03 2.03 2.03 2.03 9.42 9.50 9.58 9.67 9.75 9.83 9.92 0.00 1.02 1.02 1.02 1.02 1.02 8.13 8.13 8.13 8.13 8.13 3.05 3.05 3.05 1.02 0.833 1.02 3.917 2.03 10.08 1.02 0.917 1.02 4.000 2.03 3.05 10.17 1.02 4.000 4.083 4.167 4.250 4.333 4.417 4.500 4.583 1.02 0.00 0.00 0.00 1.02 1.02 1.02 3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05 3.05 2.03 10.17 10.25 10.33 10.42 10.50 10.58 1.000 1.02 1.167 1.250 1.333 1.02 1.02 1.417 1.02 10.67 1.02 3.05 | 7.583 3.05 | 7.667 3.05 | 7.750 3.05 | 7.833 3.05 | 7.917 3.05 | 8.000 3.05 | 8.083 1.500 1.02 2.03 10.75 1.02 1.02 | 4.667 1.02 | 4.667 1.02 | 4.750 1.02 | 4.833 1.02 | 4.917 1.02 | 5.000 1.583 2.03 10.83 1.02 3.05 | 3.05 | 3.05 | 2.03 | 1.667 1.750 10.92 1.02 11.00 11.08 11.17

0.290

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LangstaffRd\_EA\_Existing\_WestDonWatershd

| Surface Area  | (ha)= | 3.58   | 0.23  |
|---------------|-------|--------|-------|
| Dep. Storage  | (mm)= | 2.00   | 5.00  |
| Average Slope | (%)=  | 1.00   | 2.00  |
| Length        | (m)=  | 150.00 | 40.00 |
| Mannings n    |       | 0.013  | 0.250 |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | D HYETOGR | APH   |       |       |
|-------|-------|-------|----------|-----------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME    | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs     | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250     | 38.61 | 9.33  | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333     | 8.13  | 9.42  | 1.02  |
| 0.250 | 0.00  | 3.333 | 1.02     | 6.417     | 8.13  | 9.50  | 1.02  |
| 0.333 | 1.02  | 3.417 | 1.02     | 6.500     | 8.13  | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 1.02     | 6.583     | 8.13  | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03     | 6.667     | 8.13  | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03     | 6.750     | 8.13  | 9.83  | 1.02  |
| 0.667 | 1.02  | 3.750 | 2.03     | 6.833     | 3.05  | 9.92  | 1.02  |
| 0.750 | 1.02  | 3.833 | 2.03     | 6.917     | 3.05  | 10.00 | 1.02  |
| 0.833 | 1.02  | 3.917 | 2.03     | 7.000     | 3.05  | 10.08 | 1.02  |
| 0.917 | 1.02  | 4.000 | 2.03     | 7.083     | 3.05  | 10.17 | 1.02  |
| 1.000 | 1.02  | 4.083 | 1.02     | 7.167     | 3.05  | 10.25 | 1.02  |
| 1.083 | 0.00  | 4.167 | 1.02     | 7.250     | 3.05  | 10.33 | 1.02  |
| 1.167 | 0.00  | 4.250 | 1.02     | 7.333     | 3.05  | 10.42 | 1.02  |
| 1.250 | 0.00  | 4.333 | 3.05     | 7.417     | 3.05  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 3.05     | 7.500     | 3.05  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 3.05     | 7.583     | 2.03  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 3.05     | 7.667     | 2.03  | 10.75 | 1.02  |
| 1.583 | 1.02  | 4.667 | 3.05     | 7.750     | 2.03  | 10.83 | 1.02  |
| 1.667 | 1.02  | 4.750 | 3.05     | 7.833     | 3.05  | 10.92 | 1.02  |
| 1.750 | 1.02  | 4.833 | 3.05     | 7.917     | 3.05  | 11.00 | 1.02  |
| 1.833 | 1.02  | 4.917 | 3.05     | 8.000     |       | 11.08 | 1.02  |
| 1.917 | 1.02  | 5.000 |          | 8.083     |       | 11.17 | 1.02  |
| 2.000 | 1.02  | 5.083 | 3.05     |           |       | 11.25 | 1.02  |
| 2.083 | 1.02  | 5.167 | 3.05     |           | 2.03  | 11.33 | 0.00  |
| 2.167 | 1.02  | 5.250 | 3.05     | 8.333     | 2.03  | 11.42 | 0.00  |
| 2.250 | 1.02  | 5.333 | 5.08     | 8.417     | 2.03  | 11.50 | 0.00  |
| 2.333 | 1.02  | 5.417 | 5.08     |           | 2.03  | 11.58 | 1.02  |
| 2.417 | 1.02  | 5.500 | 5.08     | 8.583     | 2.03  | 11.67 | 1.02  |
| 2.500 | 1.02  | 5.583 | 5.08     | 8.667     | 2.03  | 11.75 | 1.02  |
| 2.583 | 2.03  | 5.667 | 5.08     | 8.750     | 2.03  | 11.83 | 1.02  |
| 2.667 | 2.03  | 5.750 | 5.08     | 8.833     | 1.02  | 11.92 | 1.02  |
| 2.750 | 2.03  | 5.833 | 38.61    | 8.917     | 1.02  | 12.00 | 1.02  |
| 2.833 | 2.03  | 5.917 | 38.61    | 9.000     | 1.02  | 12.08 | 1.02  |
| 2.917 | 2.03  | 6.000 | 38.61    | 9.083     | 2.03  | 12.17 | 1.02  |
| 3.000 | 2.03  | 6.083 | 38.61    | 9.167     | 2.03  | 12.25 | 1.02  |
| 3.083 | 2.03  | 6.167 | 38.61    | 9.250     | 2.03  |       |       |
|       |       |       |          |           |       |       |       |

23.99 38.61 Max.Eff.Inten.(mm/hr)= over (min) Storage Coeff. (min)= 10 00 4.77 (ii) 8.20 (ii)

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LangstaffRd_EA_Existing_WestDonWatershd

1.02 | 5.083 | 3.05 | 8.167 | 2.03 | 1

1.02 | 5.167 | 3.05 | 8.250 | 2.03 | 1

1.02 | 5.250 | 3.05 | 8.333 | 2.03 | 1

1.02 | 5.333 | 5.08 | 8.417 | 2.03 | 1

1.02 | 5.417 | 5.08 | 8.500 | 2.03 | 1

1.02 | 5.560 | 5.08 | 8.583 | 2.03 | 1

1.02 | 5.588 | 5.08 | 8.583 | 2.03 | 1

1.02 | 5.580 | 5.08 | 8.583 | 2.03 | 1

1.02 | 5.588 | 5.08 | 8.667 | 2.03 | 1
                                  2.000
                                                      1.02
                                                                                                                            2.03 | 11.25
2.03 | 11.33
                                                                                                                                                                1.02
                                  2.083
                                  2.083
2.167
2.250
2.333
2.417
2.500
2.583
                                                                                                                                           11.42
11.50
11.58
11.67
11.75
                                                                                                                                                                0.00
0.00
1.02
1.02
                                                                     5.250
5.333
5.417
5.500
5.583
5.667
5.750
5.833
5.917
6.000
6.083
6.167
                                                      1.02
1.02
1.02
1.02
                                                                                          5.08
                                                                                                         8.667
8.750
                                                                                                                             2.03
                                                      2.03
                                                                                          5.08
                                                                                                                             2.03
                                                                                                                                           11.83
                                                                                                                                                                 1.02
                                                                                                       8.750
8.833
8.917
9.000
9.083
9.167
9.250
                                  2.667
                                                      2.03
                                                                                          5.08
                                                                                                                             1.02
                                                                                                                                           11.92
                                                                                                                                                                 1.02
                                  2.750
                                                      2.03
                                                                                        38.61
                                                                                                                             1.02
                                                                                                                                           12.00
                                                                                                                                                                 1.02
                                                     2.03 |
2.03 |
2.03 |
2.03 |
                                                                                       38.61 |
38.61 |
38.61 |
38.61 |
                                                                                                                                                                1.02
1.02
1.02
                                  2.833
                                                                                                                             1.02
                                                                                                                                           12.08
                                  2.833
2.917
3.000
3.083
         Max.Eff.Inten.(mm/hr)=
                                                                        38.61
                                                                                                     22.02
         over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                                         5.00
6.63 (ii)
                                                                                                    20.00
17.29 (ii)
                                                                         5.00
                                                                                                                                  *TOTALS*
0.038 (iii)
         PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                                        6.25
40.93
                                                                                                       6.42
                                                                                                                                        6.25
                                                                                                     18.96
                                                                                                                                     28.83
                                                                        42.93
0.95
                                                                                                     42.93
                                                                                                                                      42.93
              (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
         CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
 | ADD HYD ( 0430)|
| 1 + 2 = 3 |
                                                               AREA
                                                               (ha)
0.56
                                                                                (cms)
                                                                                                    (hrs)
                                                                                                                      (mm)
28.83
           ID1= 1 ( 0155):
+ ID2= 2 ( 0160):
                                                                             0.038
                                                                                                    6.25
                                                               0.43
                                                                              0.034
                                                                                                     6.25
                                                                                                                      32.03
            ID = 3 ( 0430):
                                                              0.99
                                                                                                    6.25
                                                                                                                      30.22
         NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
| STANDHYD ( 0150)|
|ID= 1 DT= 5.0 min |
                                                 Area (ha)= 3.81
Total Imp(%)= 94.00 Dir. Conn.(%)= 94.00
                                                                 IMPERVIOUS PERVIOUS (i)
                                                                                           Page 18
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LangstaffRd\_EA\_Existing\_WestDonWatershd

| Unit Hyd. Tpeak  | (min)= | 5.00  | 10.00 |             |
|------------------|--------|-------|-------|-------------|
| Unit Hyd. peak   | (cms)= | 0.22  | 0.13  |             |
|                  |        |       |       | *TOTALS*    |
| PEAK FLOW        | (cms)= | 0.38  | 0.01  | 0.397 (iii) |
| TIME TO PEAK     | (hrs)= | 6.25  | 6.25  | 6.25        |
| RUNOFF VOLUME    | (mm)=  | 40.93 | 19.82 | 39.66       |
| TOTAL RAINFALL   | (mm)=  | 42.93 | 42.93 | 42.93       |
| RUNOFF COEFFICIE | ENT =  | 0.95  | 0.46  | 0.92        |
|                  |        |       |       |             |

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
- (1) CN\* FINCEDORE SELECT FOR FEATURES LOSSES.

  (N\* = 88.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COEFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0440)| | 1 + 2 = 3 | QPEAK (cms) 0.397 0.072 ΔRFΔ (hrs) 6.25 6.25 (mm) 39.66 30.22 (ha) 3.81 0.99 ID1= 1 ( 0150): + ID2= 2 ( 0430): ID = 3 ( 0440): 4.80 0.469 6.25 37.71

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

Mannings n

| CALIB | | STANDHYD ( 0185) | | ID= 1 DT= 5.0 min | Area (ha)= 0.47 Total Imp(%)= 48.00 Dir. Conn.(%)= 48.00 IMPERVIOUS PERVIOUS (i) (ha)= (mm)= (%)= (m)= 0.23 2.00 1.00 240.00 0.24 5.00 2.00 20.00 Surface Area Dep. Storage Average Slope Length

0.013 NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TRANSFORMED HYETOGRAPH |              |       |                              |                            |       |  |  |  |
|------------------------|--------------|-------|------------------------------|----------------------------|-------|--|--|--|
| TIME                   | RAIN         | TIME  | RAIN   TIME                  | RAIN   TIME                | RAIN  |  |  |  |
| hrs                    | mm/hr        | hrs   | mm/hr   hrs                  | mm/hr   hrs                | mm/hr |  |  |  |
| 0.083                  | 0.00         | 3.167 | 2.03   6.250                 | 38.61   9.33               | 1.02  |  |  |  |
| 0.167                  | 0.00         | 3.250 | 2.03   6.333                 | 8.13   9.42                | 1.02  |  |  |  |
| 0.250                  | 0.00         | 3.333 | 1.02   6.417                 | 8.13   9.50                | 1.02  |  |  |  |
| 0.333                  | 1.02         | 3.417 | 1.02   6.500                 | 8.13   9.58                | 2.03  |  |  |  |
| 0.417                  | 1.02         | 3.500 | 1.02   6.583                 | 8.13   9.67                | 2.03  |  |  |  |
| 0.250<br>0.333         | 0.00<br>1.02 | 3.333 | 1.02   6.417<br>1.02   6.500 | 8.13   9.50<br>8.13   9.58 | 1.02  |  |  |  |

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0.350

|                                     | Lange        | taffRd F      | Δ Fyist | ing WestDor   | Waters | hd               |      |
|-------------------------------------|--------------|---------------|---------|---------------|--------|------------------|------|
| 0.500                               |              | 3.583         |         | 6.667         | 8.13   |                  | 2.0  |
| 0.583                               |              | 3.667         | 2.03    |               | 8.13   |                  | 1.0  |
| 0.667                               | 1.02         |               | 2.03    |               | 3.05   |                  | 1.0  |
| 0.750                               |              | 3.833         |         | 6.917         | 3.05   |                  | 1.0  |
| 0.833                               |              | 3.917         |         | 7.000         | 3.05   |                  | 1.0  |
| 0.917                               |              | 4.000         |         | 7.083         | 3.05   |                  | 1.0  |
| 1.000                               |              | 4.083         | 1.02    |               | 3.05   |                  | 1.0  |
| 1.083                               | 0.00         | 4.167         | 1.02    | 7.250         | 3.05   | 10.33            | 1.0  |
| 1.167                               | 0.00         | 4.250         | 1.02    | 7.333         | 3.05   | 10.42            | 1.0  |
| 1.250                               | 0.00         | 4.333         | 3.05    | 7.417         | 3.05   | 10.50            | 1.0  |
| 1.333                               | 1.02         | 4.417         | 3.05    | 7.500         | 3.05   | 10.58            | 1.0  |
| 1.417                               | 1.02         | 4.500         | 3.05    | 7.583         | 2.03   | 10.67            | 1.0  |
| 1.500                               | 1.02         | 4.583         | 3.05    | 7.667         | 2.03   | 10.75            | 1.0  |
| 1.583                               |              | 4.667         | 3.05    |               | 2.03   |                  | 1.0  |
| 1.667                               |              | 4.750         |         | 7.833         | 3.05   |                  | 1.0  |
| 1.750                               |              | 4.833         |         | 7.917         | 3.05   |                  | 1.0  |
| 1.833                               |              | 4.917         | 3.05    |               | 3.05   |                  | 1.0  |
| 1.917                               |              | 5.000         |         | 8.083         | 2.03   |                  | 1.0  |
| 2.000                               |              | 5.083         |         | 8.167         | 2.03   |                  | 1.0  |
| 2.083                               |              | 5.167         |         | 8.250         | 2.03   |                  | 0.0  |
| 2.167                               | 1.02         |               | 3.05    |               | 2.03   |                  | 0.0  |
| 2.250                               |              | 5.333         |         | 8.417         | 2.03   |                  | 0.00 |
| 2.333                               |              | 5.417         |         | 8.500         | 2.03   |                  | 1.0  |
| 2.417                               |              | 5.500         |         | 8.583         | 2.03   |                  | 1.0  |
| 2.500                               |              | 5.583         |         | 8.667         |        | 11.75            | 1.0  |
| 2.583                               | 2.03         |               |         | 8.750         | 2.03   |                  | 1.0  |
| 2.667                               |              | 5.750         |         | 8.833         |        | 11.92            | 1.0  |
| 2.750<br>2.833                      | 2.03         | 5.833         |         | 8.917         | 1.02   | 12.00<br>  12.08 | 1.0  |
| 2.833                               | 2.03         |               |         | 9.000         | 2.03   |                  | 1.0  |
| 3.000                               |              | 6.083         |         | 9.167         | 2.03   |                  | 1.0  |
| 3.083                               |              | 6.167         |         | 9.250         | 2.03   |                  | 1.0. |
|                                     |              | 0.107         | 30.01   | 7 3.230       | 2.03   | '                |      |
| Max.Eff.Inten.(mm/                  |              | 38.61         |         | 15.64         |        |                  |      |
| over (m                             |              | 5.00          |         | 20.00         |        |                  |      |
|                                     | in)=         |               |         | 18.29 (ii)    |        |                  |      |
| Unit Hyd. Tpeak (m                  |              | 5.00          |         | 20.00         |        |                  |      |
| Unit Hyd. peak (c                   | ms)=         | 0.19          |         | 0.06          |        |                  |      |
|                                     |              |               |         |               |        | TALS*            |      |
|                                     | ms)=         | 0.02          |         | 0.01          |        | .030 (iii        | )    |
|                                     | rs)=         | 6.25          |         | 6.42          |        | 5.25             |      |
|                                     | mm)=<br>mm)= | 40.93         |         | 13.64         |        | 5.71             |      |
| TOTAL RAINFALL ( RUNOFF COEFFICIENT |              | 42.93<br>0.95 |         | 42.93<br>0.32 |        | 2.93<br>2.62     |      |
| NONOFF CUEFFICIENT                  | =            | 0.95          |         | 0.32          | ,      | 0.02             |      |
|                                     |              |               |         |               |        |                  |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 79.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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#### LangstaffRd\_EA\_Existing\_WestDonWatershd 2.03 | 6.083 | 38.61 | 9.167 | 2.03 | 12.25 2.03 | 6.167 | 38.61 | 9.250 | 2.03 | Max.Eff.Inten.(mm/hr)= 38.61 18.46 over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)= 5.00 2.91 (ii) 5.00 0.28 20.00 16.78 (ii) 20.00 0.06 \*TOTALS\* 0.036 (iii) 6.25 24.20 (cms)= (hrs)= (mm)= (mm)= 0.02 6.25 40.93 PEAK FLOW TIME TO PEAK 6.42 15.99 RUNOFF VOLUME TOTAL RAINFALL 42.93 42.93 42.93 RUNOFF COEFFICIENT 0.95 \*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP! (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: CN\* = 83.0 Ia = Dep. Storage (Above) (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT. (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY. ADD HYD ( 0445)| 1 + 2 = 3 | QPEAK TPEAK (hrs) 6.25 6.25 ID = 3 ( 0445): 1.12 0.065 6.25 25.26 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY. | CALIB | | STANDHYD ( 0165)| |ID= 1 DT= 5.0 min | Area (ha)= 0.60 Total Imp(%)= 40.00 Dir. Conn.(%)= 40.00 IMPERVIOUS PERVIOUS (i) 0.36 5.00 2.00 20.00 Surface Area (ha)= 0.24 Dep. Storage Average Slope Length Mannings n (mm)= (%)= (m)= 1.00 0.013 NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

- TRANSFORMED HYETOGRAPH -IME RAIN | TIME RA

RAIN | TIME

RAIN | TIME

| LangstaffRd | FΑ | Fxisting | WestDonWatershd |
|-------------|----|----------|-----------------|

|          | -                              |  |   |   |
|----------|--------------------------------|--|---|---|
|          |                                |  |   |   |
| Area     | (ha)=                          | 0.65   |   |   |
| Total    | Imp(%)=                        | 33.00  | Dir. Conn.(%)=  | 33.00   |
|          |                                |  |   |   |
|          | IMPERVI                        | OUS  | PERVIOUS (i)  |   |
| (ha)=    | 0.2                            | 1  | 0.44  |   |
| ( mm ) = | 2.0                            | 0  | 5.00  |   |
| (%)=     | 1.0                            | 0  | 2.00  |   |
| (m)=     | 65.8                           | 3  | 40.00   |   |
| =        | 0.01                           | 3  | 0.250   |   |
|          |                                |  | 5.0 MTN. TTMF (   |   |
|          | (ha)=<br>(mm)=<br>(%)=<br>(m)= | Total Imp(%)=  IMPERVI (ha)= 0.2 (mm)= 2.0 (%)= 1.0 (m)= 65.8 = 0.01 | Total Imp(%) = 33.00  IMPERVIOUS (ha) = 0.21 (mm) = 2.00 (%) = 1.00 (m) = 65.83 | Total Imp(%) = 33.00 Dir. Conn.(%) =  IMPERVIOUS   PERVIOUS (1) (ha) = 0.21 0.44 (mm) = 2.00 5.00 (%) = 1.00 2.00 (m) = 65.83 40.00 = 0.013 0.250 |

| TIME  | RAIN  | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |
|-------|-------|-------|-------|--------|-------|-------|-------|
| hrs   | mm/hr | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03  | 6.250  | 38.61 | 9.33  | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03  | 6.333  | 8.13  | 9.42  | 1.02  |
| 0.250 | 0.00  | 3.333 | 1.02  | 6.417  | 8.13  | 9.50  | 1.02  |
| 0.333 | 1.02  | 3.417 | 1.02  | 6.500  | 8.13  | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 1.02  | 6.583  | 8.13  | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03  | 6.667  | 8.13  | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03  | 6.750  | 8.13  | 9.83  | 1.02  |
| 0.667 | 1.02  | 3.750 | 2.03  | 6.833  | 3.05  | 9.92  | 1.02  |
| 0.750 | 1.02  | 3.833 | 2.03  | 6.917  | 3.05  | 10.00 | 1.02  |
| 0.833 | 1.02  | 3.917 | 2.03  | 7.000  | 3.05  | 10.08 | 1.02  |
| 0.917 | 1.02  | 4.000 | 2.03  | 7.083  | 3.05  | 10.17 | 1.02  |
| 1.000 | 1.02  | 4.083 | 1.02  | 7.167  | 3.05  | 10.25 | 1.02  |
| 1.083 | 0.00  | 4.167 | 1.02  | 7.250  | 3.05  | 10.33 | 1.02  |
| 1.167 | 0.00  | 4.250 | 1.02  | 7.333  | 3.05  | 10.42 | 1.02  |
| 1 250 | 0 00  | 1 222 | 2 05  | 7 417  | 2 05  | 10 50 | 1 02  |

---- TRANSFORMED HYETOGRAPH ----

1.250 1.333 1.417 1.500 1.583 1.667 1.750 1.833 0.00 1.02 1.02 1.02 1.02 1.02 4.333 4.417 4.500 4.583 4.667 4.750 4.833 7.417 7.500 7.583 7.667 7.750 7.833 7.917 3.05 | 7.917 3.05 | 8.083 3.05 | 8.083 3.05 | 8.167 3.05 | 8.159 3.05 | 8.333 5.08 | 8.450 5.08 | 8.583 5.08 | 8.683 5.08 | 8.683 38.61 | 9.000 38.61 | 9.000 1.02 4.917 5.000 3.05 2.03 11.08 11.17 1.02 1.833 1.917 2.000 2.083 2.167 2.250 2.333 2.417 1.02 5.000 5.083 5.167 5.250 5.333 5.417 5.500 5.583 5.667 1.02 1.02 1.02 1.02 1.02 1.02 2.03 2.03 2.03 2.03 11.25 11.33 11.42 11.50 11.58 1.02 0.00 0.00 0.00 1.02 2.03 11.67 2.500 1.02 2.03 11.75 1.02 2.03 2.03 11.83 2.667 2.750 2.833 2.917 2.03 2.03 2.03 2.03 2.03 5.750 5.833 5.917 6.000 1.02 1.02 1.02 2.03 11.92 12.00 12.08 12.17 1.02 1.02 1.02 1.02

| Lan                    | rctoffEd EA | . Evict | ing WestDor | Waters | hd                  |       |
|------------------------|-------------|---------|-------------|--------|---------------------|-------|
| hrs mm/hr              |             | mm/hr   |             | mm/hr  |                     | mm/hr |
| 0.083 0.00             |             | 2.03    |             | 38.61  |                     | 1.02  |
| 0.167 0.00             |             | 2.03    |             | 8.13   |                     | 1.02  |
|                        | 3.333       | 1.02    |             | 8.13   |                     | 1.02  |
|                        | 3.417       |         | 6.500       | 8.13   |                     | 2.03  |
| 0.417 1.02             |             | 1.02    |             | 8.13   |                     | 2.03  |
|                        | 3.583       |         | 6.667       | 8.13   |                     | 2.03  |
| 0.583 1.02             |             |         | 6.750       | 8.13   |                     | 1.02  |
|                        | 3.750       |         | 6.833       | 3.05   |                     | 1.02  |
|                        | 3.833       | 2.03    |             | 3.05   |                     | 1.02  |
|                        | 3.917       | 2.03    |             | 3.05   |                     | 1.02  |
|                        | 4.000       |         | 7.083       | 3.05   |                     | 1.02  |
|                        | 4.083       | 1.02    |             | 3.05   |                     | 1.02  |
|                        | 4.167       |         | 7.250       | 3.05   |                     | 1.02  |
|                        | 4.250       | 1.02    |             | 3.05   |                     | 1.02  |
|                        | 4.333       | 3.05    |             | 3.05   |                     | 1.02  |
|                        | 4.417       | 3.05    |             | 3.05   |                     | 1.02  |
|                        | 4.500       | 3.05    |             | 2.03   |                     | 1.02  |
|                        | 4.583       | 3.05    |             | 2.03   |                     | 1.02  |
|                        | 4.667       | 3.05    |             | 2.03   |                     | 1.02  |
|                        | 4.750       | 3.05    |             | 3.05   |                     | 1.02  |
|                        | 4.833       | 3.05    |             | 3.05   |                     | 1.02  |
|                        | 4.917       | 3.05    | 8.000       | 3.05   | 11.08               | 1.02  |
|                        | 5.000       | 3.05    |             | 2.03   |                     | 1.02  |
| 2.000 1.02             | 5.083       | 3.05    | 8.167       | 2.03   | 11.25               | 1.02  |
| 2.083 1.02             | 5.167       | 3.05    | 8.250       | 2.03   | 11.33               | 0.00  |
| 2.167 1.02             |             | 3.05    | 8.333       | 2.03   | 11.42               | 0.00  |
| 2.250 1.02             | 5.333       | 5.08    | 8.417       | 2.03   | 11.50               | 0.00  |
| 2.333 1.02             | 5.417       | 5.08    | 8.500       | 2.03   | 11.58               | 1.02  |
| 2.417 1.02             | 5.500       | 5.08    | 8.583       | 2.03   | 11.67               | 1.02  |
| 2.500 1.02             | 5.583       | 5.08    | 8.667       | 2.03   | 11.75               | 1.02  |
| 2.583 2.03             | 5.667       | 5.08    | 8.750       | 2.03   | 11.83               | 1.02  |
| 2.667 2.03             | 5.750       | 5.08    | 8.833       | 1.02   | 11.92               | 1.02  |
| 2.750 2.03             |             |         | 8.917       | 1.02   | 12.00               | 1.02  |
| 2.833 2.03             | 5.917       | 38.61   | 9.000       | 1.02   |                     | 1.02  |
| 2.917 2.03             | 6.000       | 38.61   | 9.083       | 2.03   |                     | 1.02  |
| 3.000 2.03             |             |         |             | 2.03   |                     | 1.02  |
| 3.083 2.03             | 6.167       | 38.61   | 9.250       | 2.03   |                     |       |
| Max.Eff.Inten.(mm/hr)= | 38.61       |         | 19.37       |        |                     |       |
| over (min)             | 5.00        |         | 20.00       |        |                     |       |
| Storage Coeff. (min)=  | 6.48        | (ii)    | 15.46 (ii)  |        |                     |       |
| Unit Hyd. Tpeak (min)= | 5.00        |         | 20.00       |        |                     |       |
| Unit Hyd. peak (cms)=  | 0.18        |         | 0.07        |        |                     |       |
| PEAK FLOW (cms)=       | 0.03        |         | 0.01        |        | ΓALS*<br>.036 (iii) |       |
| TIME TO PEAK (hrs)=    | 6.25        |         | 6.42        |        | 5.25                |       |
| RUNOFF VOLUME (mm)=    | 40.93       |         | 15.99       |        | 5.95                |       |
| TOTAL RAINFALL (mm)=   | 42.93       |         | 42.93       |        | 2.93                |       |
| RUNOFF COEFFICIENT =   | 0.95        |         | 0.37        |        | 0.60                |       |
|                        | 0.55        |         |             | ,      |                     |       |

LangstaffRd\_EA\_Existing\_WestDonWatershd
CN\* = 83.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

IMPERVIOUS PERVIOUS (i) Surface Area Dep. Storage Average Slope Length Mannings n (ha)= (mm)= (%)= (m)= 0.25 2.00 1.00 250.00 0.18 5.00 2.00 20.00

0.013 NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TRANSFORMED HYETOGRAPH |       |       |       |        |       |       |       |  |  |
|------------------------|-------|-------|-------|--------|-------|-------|-------|--|--|
| TIME                   | RAIN  | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |  |
| hrs                    | mm/hr | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |  |
| 0.083                  | 0.00  | 3.167 | 2.03  | 6.250  | 38.61 | 9.33  | 1.02  |  |  |
| 0.167                  | 0.00  | 3.250 | 2.03  | 6.333  | 8.13  | 9.42  | 1.02  |  |  |
| 0.250                  | 0.00  | 3.333 | 1.02  | 6.417  | 8.13  | 9.50  | 1.02  |  |  |
| 0.333                  | 1.02  | 3.417 | 1.02  | 6.500  | 8.13  | 9.58  | 2.03  |  |  |
| 0.417                  | 1.02  | 3.500 | 1.02  | 6.583  | 8.13  | 9.67  | 2.03  |  |  |
| 0.500                  | 1.02  | 3.583 | 2.03  | 6.667  | 8.13  | 9.75  | 2.03  |  |  |
| 0.583                  | 1.02  | 3.667 | 2.03  | 6.750  | 8.13  | 9.83  | 1.02  |  |  |
| 0.667                  | 1.02  | 3.750 | 2.03  | 6.833  | 3.05  | 9.92  | 1.02  |  |  |
| 0.750                  | 1.02  | 3.833 | 2.03  | 6.917  | 3.05  | 10.00 | 1.02  |  |  |
| 0.833                  | 1.02  | 3.917 | 2.03  | 7.000  | 3.05  | 10.08 | 1.02  |  |  |
| 0.917                  | 1.02  | 4.000 | 2.03  | 7.083  | 3.05  | 10.17 | 1.02  |  |  |
| 1.000                  | 1.02  | 4.083 | 1.02  | 7.167  | 3.05  | 10.25 | 1.02  |  |  |
| 1.083                  | 0.00  | 4.167 | 1.02  | 7.250  | 3.05  | 10.33 | 1.02  |  |  |
| 1.167                  | 0.00  | 4.250 | 1.02  | 7.333  | 3.05  | 10.42 | 1.02  |  |  |
| 1.250                  | 0.00  | 4.333 | 3.05  | 7.417  | 3.05  | 10.50 | 1.02  |  |  |
| 1.333                  | 1.02  | 4.417 | 3.05  | 7.500  | 3.05  | 10.58 | 1.02  |  |  |
| 1.417                  | 1.02  | 4.500 | 3.05  | 7.583  | 2.03  | 10.67 | 1.02  |  |  |
| 1.500                  | 1.02  | 4.583 | 3.05  | 7.667  | 2.03  | 10.75 | 1.02  |  |  |
| 1.583                  | 1.02  | 4.667 | 3.05  | 7.750  | 2.03  | 10.83 | 1.02  |  |  |
| 1.667                  | 1.02  | 4.750 | 3.05  | 7.833  | 3.05  | 10.92 | 1.02  |  |  |
| 1.750                  | 1.02  | 4.833 | 3.05  | 7.917  | 3.05  | 11.00 | 1.02  |  |  |
| 1.833                  | 1.02  | 4.917 | 3.05  | 8.000  | 3.05  | 11.08 | 1.02  |  |  |
| 1.917                  | 1.02  | 5.000 | 3.05  | 8.083  | 2.03  | 11.17 | 1.02  |  |  |
| 2.000                  | 1.02  | 5.083 | 3.05  | 8.167  | 2.03  | 11.25 | 1.02  |  |  |
| 2.083                  | 1.02  | 5.167 | 3.05  | 8.250  | 2.03  | 11.33 | 0.00  |  |  |
| 2.167                  | 1.02  | 5.250 | 3.05  | 8.333  | 2.03  | 11.42 | 0.00  |  |  |
| 2.250                  | 1.02  | 5.333 | 5.08  | 8.417  | 2.03  | 11.50 | 0.00  |  |  |
| 2.333                  | 1.02  | 5.417 | 5.08  | 8.500  | 2.03  | 11.58 | 1.02  |  |  |
| 2.417                  | 1.02  | 5.500 | 5.08  | 8.583  | 2.03  | 11.67 | 1.02  |  |  |

0.250

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### ${\tt LangstaffRd\_EA\_Existing\_WestDonWatershd}$

| CALIB             |       |         |       |                |       |
|-------------------|-------|---------|-------|----------------|-------|
| STANDHYD ( 0190)  | Area  | (ha)=   | 0.86  |                |       |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 42.00 | Dir. Conn.(%)= | 42.00 |
|                   |       |         |       |                |       |
|                   |       | IMPERVI | OUS   | PERVIOUS (i)   |       |
| Surface Area      | (ha)= | 0.3     | 5     | 0.50           |       |
| Dep. Storage      | (mm)= | 2.0     | 3     | 5.00           |       |
| Average Slope     | (%)=  | 1.0     | 3     | 2.00           |       |
| Length            | (m)=  | 340.0   | 3     | 50.00          |       |
| Mannings n        | =     | 0.01    | 3     | 0.250          |       |
|                   |       |         |       |                |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TP     | VNZEUBWEI | D HYETOGR | ΛDH   | _     |       |
|-------|-------|--------|-----------|-----------|-------|-------|-------|
| TIME  | RAIN  | l TIME | RAIN      | l' TIME   | RAIN  |       | RAIN  |
| hrs   | mm/hr | hrs    | mm/hr     | l' hrs    | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167  | 2.03      | 6.250     | 38.61 | 9.33  | 1.02  |
| 0.167 | 0.00  | 3.250  | 2.03      | 6.333     | 8.13  | 9.42  | 1.02  |
| 0.250 | 0.00  | 3.333  | 1.02      | 6.417     | 8.13  | 9.50  | 1.02  |
| 0.333 | 1.02  | 3.417  | 1.02      | 6.500     | 8.13  | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500  | 1.02      | 6.583     | 8.13  | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583  | 2.03      | 6.667     | 8.13  | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667  | 2.03      | 6.750     | 8.13  | 9.83  | 1.02  |
| 0.667 | 1.02  | 3.750  | 2.03      | 6.833     | 3.05  | 9.92  | 1.02  |
| 0.750 | 1.02  | 3.833  | 2.03      | 6.917     | 3.05  | 10.00 | 1.02  |
| 0.833 | 1.02  | 3.917  | 2.03      | 7.000     | 3.05  | 10.08 | 1.02  |
| 0.917 | 1.02  | 4.000  | 2.03      | 7.083     | 3.05  | 10.17 | 1.02  |
| 1.000 | 1.02  | 4.083  | 1.02      | 7.167     | 3.05  | 10.25 | 1.02  |
| 1.083 | 0.00  | 4.167  | 1.02      | 7.250     | 3.05  | 10.33 | 1.02  |
| 1.167 | 0.00  | 4.250  | 1.02      | 7.333     | 3.05  | 10.42 | 1.02  |
| 1.250 | 0.00  | 4.333  | 3.05      | 7.417     | 3.05  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417  | 3.05      | 7.500     | 3.05  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500  | 3.05      | 7.583     | 2.03  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583  | 3.05      | 7.667     | 2.03  | 10.75 | 1.02  |
| 1.583 | 1.02  | 4.667  | 3.05      | 7.750     | 2.03  | 10.83 | 1.02  |
| 1.667 | 1.02  | 4.750  | 3.05      | 7.833     | 3.05  | 10.92 | 1.02  |
| 1.750 | 1.02  | 4.833  | 3.05      | 7.917     | 3.05  | 11.00 | 1.02  |
| 1.833 | 1.02  | 4.917  | 3.05      | 8.000     | 3.05  | 11.08 | 1.02  |
| 1.917 | 1.02  | 5.000  | 3.05      | 8.083     | 2.03  | 11.17 | 1.02  |
| 2.000 | 1.02  | 5.083  | 3.05      | 8.167     | 2.03  | 11.25 | 1.02  |
| 2.083 | 1.02  | 5.167  | 3.05      | 8.250     | 2.03  | 11.33 | 0.00  |
| 2.167 | 1.02  | 5.250  | 3.05      | 8.333     | 2.03  | 11.42 | 0.00  |
| 2.250 | 1.02  | 5.333  | 5.08      | 8.417     | 2.03  | 11.50 | 0.00  |
| 2.333 | 1.02  | 5.417  | 5.08      | 8.500     | 2.03  | 11.58 | 1.02  |
| 2.417 | 1.02  | 5.500  | 5.08      | 8.583     | 2.03  | 11.67 | 1.02  |
| 2.500 | 1.02  | 5.583  | 5.08      | 8.667     | 2.03  | 11.75 | 1.02  |
| 2.583 | 2.03  | 5.667  | 5.08      | 8.750     | 2.03  | 11.83 | 1.02  |
| 2.667 | 2.03  | 5.750  | 5.08      | 8.833     | 1.02  | 11.92 | 1.02  |
| 2.750 | 2.03  | 5.833  | 38.61     | 8.917     | 1.02  | 12.00 | 1.02  |
| 2.833 | 2.03  | 5.917  | 38.61     | 9.000     | 1.02  | 12.08 | 1.02  |
| 2.917 | 2.03  | 6.000  | 38.61     | 9.083     | 2.03  | 12.17 | 1.02  |

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| 2 500 1  | 92 I 5 5  | Rd_EA_Exis<br>83 5.08 | 1 8 667   | 2 03  | l 11 75   | 1 0 |
|--|-----------|-----------------------|-----------|-------|-----------|-----|
| 2 583 2  | 03   5.6  | 67 5.08               | 8   8 750 | 2.03  | 111.73    | 1.0 |
| 2.583 2.<br>2.667 2.   | .03   5.7 | 50 5.08               | 8 8.833   | 1.02  | 11.92     | 1.0 |
| 2.750 2  | .03   5.8 | 33 38.61              | 8.917     | 1.02  | 12.00     | 1.0 |
| 2.833 2.   | .03   5.9 | 17 38.61              | 9.000     | 1.02  | 12.08     | 1.0 |
| 2.917 2.   | .03   6.0 | 00 38.61              | 9.083     | 2.03  | 12.17     | 1.0 |
| 3.000 2.   | .03   6.0 | 83 38.61              | 9.167     | 2.03  | 12.25     | 1.0 |
| 2.750 2<br>2.833 2<br>2.917 2<br>3.000 2<br>3.083 2  | .03   6.1 | 67 38.61              | 9.250     | 2.03  | 1         |     |
| Max.Eff.Inten.(mm/hr): over (min) Storage Coeff. (min): Unit Hyd. Tpeak (min): Unit Hyd. peak (cms): | = 38      | .61                   | 25.09     |       |           |     |
| over (min)   | 5         | .00                   | 15.00     |       |           |     |
| Storage Coett. (min):  | = 6       | .48 (11)              | 14.5/ (   | 11)   |           |     |
| Unit Hyd neak (min)  | - 3       | 18                    | 0 08      |       |           |     |
|  |           |                       |           |       | TALS*     |     |
| PEAK FLOW (cms):   | = A       | .03                   | 0.01      | 9     | .035 (iii | )   |
| TIME TO PEAK (hrs):  | = 6       | .25                   | 6.33      |       | 6 25      | ,   |
| RUNOFF VOLUME (mm):  | = 40      | .93                   | 20.75     | 3     | 2.23      |     |
| PEAK FLOW (cms):<br>TIME TO PEAK (hrs):<br>RUNOFF VOLUME (mm):<br>TOTAL RAINFALL (mm):               | = 42      | .93                   | 42.93     | 4     | 2.23      |     |
| RUNOFF COEFFICIENT =   | = 0       | .95                   | 0.48      |       | 0.75      |     |
| ADD HYD ( 0450) <br>  1 + 2 = 3  | AREA      | OPEAK                 | TPEAK     | R.V.  |           |     |
|  | (ha)      | (cms)                 | (hrs)     | (mm)  |           |     |
| ID1= 1 ( 0165):  | 0.60      | 0.036                 | 6.25      | 25.95 |           |     |
| + ID2= 2 ( 0170):  | 0.43      | 0.035                 | 6.25      | 32.23 |           |     |
| ID = 3 ( 0450):  |           |                       |           |       |           |     |
| NOTE: PEAK FLOWS DO N  |           |                       |           |       |           |     |
|  |           |                       |           |       |           |     |
| ADD HYD ( 0450)  |           |                       |           |       |           |     |
| 3 + 2 = 1  | AREA      | QPEAK                 | TPEAK     | R.V.  |           |     |
| TD4 2 ( 0450)  | (ha)      | (cms)                 | (hrs)     | (mm)  |           |     |
| ID1= 3 ( 0450):<br>+ ID2= 2 ( 0445):   | 1.03      | 0.0/1                 | 6.25      | 28.57 |           |     |
| + 1D2= 2 ( 0445):  | 1.12      | 0.065                 | 6.25      | 25.26 |           |     |
| ID = 1 ( 0450):  |           |                       |           |       |           |     |
| NOTE: PEAK FLOWS DO N  |           |                       |           |       |           |     |
|  |           |                       |           |       |           |     |
|  |           | Pag                   | e 26      |       |           |     |

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LangstaffRd EA Existing WestDonWatershd

| 3.00            | 0 2.03  | 6.083 | 38.61   9.167   | 2.03   12.25 | 1.02 |
|-----------------|---------|-------|-----------------|--------------|------|
| 3.08            | 3 2.03  | 6.167 | 38.61   9.250   | 2.03         |      |
|                 |         |       |                 |              |      |
| Max.Eff.Inten.( | mm/hr)= | 38.61 | 17.44           |              |      |
| over            | (min)   | 10.00 | 25.00           |              |      |
| Storage Coeff.  | (min)=  | 7.79  | (ii) 24.01 (ii) |              |      |
| Unit Hyd. Tpeak | (min)=  | 10.00 | 25.00           |              |      |
| Unit Hyd. peak  | (cms)=  | 0.13  | 0.05            |              |      |
|                 |         |       |                 | *TOTALS*     |      |
| PEAK FLOW       | (cms)=  | 0.04  | 0.01            | 0.048 (iii)  |      |
| TIME TO PEAK    | (hrs)=  | 6.25  | 6.50            | 6.25         |      |
| RUNOFF VOLUME   | (mm)=   | 40.93 | 15.99           | 26.45        |      |
| TOTAL RAINFALL  | (mm)=   | 42.93 | 42.93           | 42.93        |      |
| RUNOFF COEFFICI | ENT =   | 0.95  | 0.37            | 0.62         |      |
|                 |         |       |                 |              |      |
|                 |         |       |                 |              |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

Area (ha)= 0.79 Total Imp(%)= 42.00 Dir. Conn.(%)= 42.00

IMPERVIOUS PERVIOUS (i) Surface Area Dep. Storage Average Slope Length Mannings n 0.33 2.00 1.00 340.00 0.013 9.46 5.00 2.00 20.00 0.250 (ha)= (mm)= (%)= (m)=

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TRANSFORMED HYETOGRAPH |       |       |       |        |       |       |       |  |  |  |  |
|------------------------|-------|-------|-------|--------|-------|-------|-------|--|--|--|--|
| TIME                   | RAIN  | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |  |  |  |
| hrs                    | mm/hr | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |  |  |  |
| 0.083                  | 0.00  | 3.167 | 2.03  | 6.250  | 38.61 | 9.33  | 1.02  |  |  |  |  |
| 0.167                  | 0.00  | 3.250 | 2.03  | 6.333  | 8.13  | 9.42  | 1.02  |  |  |  |  |
| 0.250                  | 0.00  | 3.333 | 1.02  | 6.417  | 8.13  | 9.50  | 1.02  |  |  |  |  |
| 0.333                  | 1.02  | 3.417 | 1.02  | 6.500  | 8.13  | 9.58  | 2.03  |  |  |  |  |
| 0.417                  | 1.02  | 3.500 | 1.02  | 6.583  | 8.13  | 9.67  | 2.03  |  |  |  |  |
| 0.500                  | 1.02  | 3.583 | 2.03  | 6.667  | 8.13  | 9.75  | 2.03  |  |  |  |  |
| 0.583                  | 1.02  | 3.667 | 2.03  | 6.750  | 8.13  | 9.83  | 1.02  |  |  |  |  |
| 0.667                  | 1.02  | 3.750 | 2.03  | 6.833  | 3.05  | 9.92  | 1.02  |  |  |  |  |
| 0.750                  | 1.02  | 3.833 | 2.03  | 6.917  | 3.05  | 10.00 | 1.02  |  |  |  |  |
| 0.833                  | 1.02  | 3.917 | 2.03  | 7.000  | 3.05  | 10.08 | 1.02  |  |  |  |  |
| 0.917                  | 1.02  | 4.000 | 2.03  | 7.083  | 3.05  | 10.17 | 1.02  |  |  |  |  |
| 1.000                  | 1.02  | 4.083 | 1.02  | 7.167  | 3.05  | 10.25 | 1.02  |  |  |  |  |
| Page 28                |       |       |       |        |       |       |       |  |  |  |  |

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LangstaffRd_EA_Existing_WestDonWatershd
0.00 | 4.167 | 1.02 | 7.250 | 3.05 | 14
0.00 | 4.250 | 1.02 | 7.333 | 3.05 | 14
0.00 | 4.350 | 1.02 | 7.333 | 3.05 | 14
0.00 | 4.333 | 3.05 | 7.447 | 3.05 | 14
1.02 | 4.417 | 3.05 | 7.590 | 3.05 | 14
1.02 | 4.500 | 3.05 | 7.583 | 2.03 | 14
1.02 | 4.583 | 3.05 | 7.667 | 2.03 | 14
1.02 | 4.583 | 3.05 | 7.750 | 2.03 | 14
1.02 | 4.583 | 3.05 | 7.750 | 2.03 | 14
1.02 | 4.333 | 3.05 | 7.750 | 2.03 | 14
1.02 | 4.750 | 3.05 | 7.833 | 3.05 | 17
1.02 | 4.917 | 3.05 | 8.000 | 3.05 | 12
1.02 | 5.083 | 3.05 | 8.167 | 2.03 | 12
1.02 | 5.083 | 3.05 | 8.167 | 2.03 | 12
1.02 | 5.167 | 3.05 | 8.250 | 2.03 | 12
1.02 | 5.533 | 5.08 | 8.417 | 2.03 | 12
1.02 | 5.533 | 5.08 | 8.417 | 2.03 | 12
1.02 | 5.583 | 5.08 | 8.667 | 2.03 | 12
1.02 | 5.583 | 5.08 | 8.667 | 2.03 | 12
1.02 | 5.583 | 5.08 | 8.667 | 2.03 | 12
1.02 | 5.583 | 5.08 | 8.667 | 2.03 | 12
1.02 | 5.590 | 5.08 | 8.590 | 2.03 | 12
1.02 | 5.575 | 5.08 | 8.833 | 2.03 | 12
1.02 | 5.583 | 5.08 | 8.167 | 2.03 | 12
1.03 | 5.675 | 5.08 | 8.833 | 2.03 | 12
1.03 | 5.675 | 5.08 | 8.833 | 2.03 | 12
1.03 | 5.675 | 5.08 | 8.833 | 2.03 | 12
1.03 | 5.667 | 5.08 | 8.833 | 2.03 | 12
1.03 | 5.667 | 5.08 | 8.833 | 2.03 | 12
1.03 | 5.667 | 5.08 | 8.833 | 2.03 | 12
1.03 | 5.667 | 5.08 | 8.833 | 2.03 | 12
1.03 | 5.667 | 5.08 | 8.833 | 2.03 | 12
1.03 | 5.667 | 5.08 | 8.833 | 2.03 | 12
1.03 | 5.667 | 5.08 | 8.833 | 2.03 | 12
1.03 | 5.667 | 5.08 | 8.833 | 2.03 | 12
1.03 | 5.667 | 5.08 | 8.833 | 2.03 | 12
1.03 | 5.667 | 5.08 | 8.833 | 2.03 | 12
1.03 | 5.667 | 5.08 | 8.833 | 2.03 | 12
1.03 | 5.667 | 5.08 | 8.833 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2.03 | 2
                                                                                      1.083
                                                                                                                                                                                                                                                                                                                                                                                                                   3.05 | 10.33
3.05 | 10.42
                                                                                         1.167
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               1.02
                                                                                      1.250
1.333
1.417
1.500
1.583
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             1.02
1.02
1.02
1.02
1.02
                                                                                                                                                                                                                                                                                                                                                                                                                                                                          10.50
                                                                                         1.667
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               1.02
                                                                                         1.750
                                                                                                                                                                                                                                                                                                                                                                                                                                                                          11.00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               1.02
                                                                                         1.833
                                                                                                                                                                                                                                                                                                                                                                                                                                                                          11.08
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               1.02
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               1.02
1.02
0.00
0.00
0.00
1.02
                                                                                         1.917
2.000
2.083
2.167
                                                                                                                                                                                                                                                                                                                                                                                                                                                                          11.17
                                                                                                                                                                                                                                                                                                                                                                                                                                                                          11.50
                                                                                         2.250
                                                                                         2.333
                                                                                                                                                                                                                                                                                                                                                                                                                                                                          11.58
                                                                                         2.417
                                                                                                                                                                                                                                                                                                                                                                                                                                                                          11.67
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               1.02
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               1.02
                                                                                                                                                                                                                                                                                                                                                                                                                                                                       11.83
11.92
12.00
12.08
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               1.02
1.02
1.02
1.02
                                                                                         2.583
                                                                                         2.917
                                                                                                                                                                                                                                                                                                                                                                                                                                                                       12.17
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               1.02
                                                                                                                                                                                                                                                                                                                                                                                                                                                                       12.25
                                                                                         3.083
Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                                                                                                                                                                                         38.61
10.00
7.79 (ii)
10.00
                                                                                                                                                                                                                                                                                                                                 19.37
                                                                                                                                                                                                                                                                                                                             19.37
20.00
16.77 (ii)
20.00
                                                                                                                                                                                                                               0.13
                                                                                                                                                                                                                                                                                                                                     0.06
                                                                                                                                                                                                                                                                                                                                                                                                                                     *TOTALS*
  PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                                                                                                                                                                                           0.03
6.25
40.93
42.93
0.95
                                                                                                                                                                                                                                                                                                                                                                                                                                                TOTALS*

0.048 (iii)

6.25

26.45

42.93

0.62
                                                                                                                                                                                                                                                                                                                                     0.02
                                                                                                                                                                                                                                                                                                                               6.42
15.99
42.93
0.37
```

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
- (i) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD ( 0455)| 1 + 2 = 3 | ARFA OPFAK TPFAK (cms) 0.048 0.048 (hrs) 6.25 6.25

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#### LangstaffRd EA Existing WestDonWaters 1.02 | 4.667 | 3.05 | 7.750 | 2.03 1.02 | 4.750 | 3.05 | 7.833 | 3.05 1.02 | 4.833 | 3.05 | 7.833 | 3.05 1.02 | 4.833 | 3.05 | 7.917 | 3.05 1.02 | 5.083 | 3.05 | 8.060 | 3.65 1.02 | 5.083 | 3.05 | 8.167 | 2.03 1.02 | 5.253 | 3.05 | 8.250 | 2.03 1.02 | 5.253 | 3.05 | 8.250 | 2.03 1.02 | 5.250 | 3.05 | 8.333 | 2.03 1.02 | 5.250 | 3.05 | 8.333 | 2.03 1.02 | 5.250 | 3.05 | 8.333 | 2.03 1.02 | 5.353 | 5.08 | 8.417 | 2.03 1.02 | 5.583 | 5.08 | 8.500 | 2.03 1.02 | 5.583 | 5.08 | 8.500 | 2.03 1.02 | 5.583 | 5.08 | 8.500 | 2.03 1.02 | 5.583 | 5.08 | 8.853 | 2.03 1.02 | 5.333 | 5.08 | 8.850 | 2.03 1.02 | 5.583 | 5.08 | 8.850 | 2.03 1.02 | 5.583 | 5.08 | 8.850 | 2.03 1.03 | 5.750 | 5.08 | 8.833 | 1.02 2.03 | 5.060 | 3.661 | 9.000 | 1.02 2.03 | 6.000 | 38.61 | 9.083 | 2.03 2.03 | 6.063 | 38.61 | 9.167 | 2.03 2.03 | 6.167 | 38.61 | 9.250 | 2.03 1.583 1.667 1.750 1.02 1.02 1.02 11.00 1.833 1.917 11.17 1.02 1 02 2.083 2.167 2.250 2.333 11.25 11.33 11.42 11.50 11.58 2.417 11.67 1.02 1.02 2.583 11.83 1.02 2 667 2.03 | 5.750 2.03 | 5.833 2.03 | 5.917 2.03 | 6.000 2.03 | 6.083 2.03 | 6.167 2.750 2.833 2.917 12.00 12.08 12.17 12.25 1.02 1.02 1.02 1.02 3.083 Max.Eff.Inten.(mm/hr)= 38.61 15.64 over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)= 5.00 6.60 (ii) 5.00 0.18 25.00 21.43 (ii) 25.00 0.05 0.85 6.25 41.93 42.93 0.98 0.886 (iii) 6.25 0.05 (cms)= TIME TO PEAK (hrs)= RUNOFF VOLUME (mm)= TOTAL RAINFALL (mm)= RUNOFF COEFFICIENT = 6.50 13.64 42.93 0.32 36.27

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB | STANDHYD ( 0350)| |ID= 1 DT= 5.0 min |

Area (ha)= 0.90 Total Imp(%)= 70.00 Dir. Conn.(%)= 70.00 IMPERVIOUS PERVIOUS (i) (ha)= (mm)= (%)= (m)= 0.63 1.00 1.00 0.27 5.00 2.00 Surface Area Dep. Storage Average Slope Mannings n 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

#### LangstaffRd\_EA\_Existing\_WestDonWatershd

ID = 3 ( 0455): 1.65 0.096 6.25 26.45

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD ( 0458)| | 1 + 2 = 3 | AREA QPEAK TPEAK R.V. (ha) 2.15 1.65 (cms) 0.136 0.096 (hrs) 6.25 6.25 (mm) 26.84 26.45 6.25

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

I CALTB | STANDHYD ( 0300)| |ID= 1 DT= 5.0 min | Area (ha)= 10.00 Total Imp(%)= 80.00 Dir. Conn.(%)= 80.00 IMPERVIOUS PERVIOUS (i) 8.00 1.00 1.00 Surface Area (ha)= 2.00 5.00 Dep. Storage Average Slope Length Mannings n (mm)= (%)= (m)= 2 00 258.20 0.013

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TRANSFORMED HYFTOGRAPH NSFORMED HYETOGR RAIN | TIME mm/hr | hrs 2.03 | 6.250 2.03 | 6.333 1.02 | 6.417 1.02 | 6.500 1.02 | 6.583 2.03 | 6.667 2.03 | 6.667 TIME hrs 3.167 3.250 3.333 3.417 APH ---
RAIN | TIME

mm/hr | hrs

38.61 | 9.33

8.13 | 9.42

8.13 | 9.50 TIME RAIN | RATN 71ME hrs 0.083 0.167 0.250 0.333 71ME hrs 9.33 9.42 9.50 9.58 1.02 8.13 0.417 1.02 3.500 8.13 9.67 9.75 2.03 0.500 0.583 0.667 0.750 0.833 0.917 1.02 2.03 | 6.667 2.03 | 6.750 2.03 | 6.833 2.03 | 6.917 2.03 | 7.000 2.03 | 7.083 1.02 | 7.167 1.02 | 7.250 1.02 | 7.333 3.05 | 7.417 3.05 | 7.500 3.05 | 7.583 3.05 | 7.667 8.13 2.03 1.02 1.02 1.02 1.02 1.02 1.02 8.13 8.13 3.05 3.05 3.05 3.05 3.05 9.83 9.92 10.00 10.08 10.17 3.667 3.750 3.833 3.917 4.000 4.083 4.167 4.250 4.333 4.417 4.500 4.583 1.02 1.02 1.02 1.02 1.02 1.000 10.25 1.02 1.083 0.00 3.05 10.33 1.02 1.167 0.00 3.05 10.42 1.02 1.250 1.333 1.417 1.500 0.00 1.02 1.02 1.02 3.05 | 3.05 | 2.03 | 2.03 | 10.50 10.58 10.67 10.75 1.02 1.02 1.02 1.02

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#### LangstaffRd EA Existing WestDonWatershd

| Langstaffkd_EA_EXisting_westDonwatersnd |       |                |       |            |               |       |      |  |  |  |  |
|---|-------|----------------|-------|------------|---------------|-------|------|--|--|--|--|
|   |       |                |       |            |               |       |      |  |  |  |  |
| TRANSFORMED HYETOGRAPH                  |       |                |       |            |               |       |      |  |  |  |  |
| TIME                                    | RAIN  | TIME           | RAIN  | ' TIME     | RAIN          |       | RAIN |  |  |  |  |
| hrs                                     | mm/hr | hrs            |       | ' hrs      | mm/hr         |       |      |  |  |  |  |
|   |       |                |       |            |               |       |      |  |  |  |  |
| 0.083                                   |       | 3.167          | 2.03  | 6.250      | 38.61<br>8.13 |       | 1.02 |  |  |  |  |
| 0.167                                   | 0.00  |                |       |            | 8.13          |       |      |  |  |  |  |
| 0.250                                   |       |                |       | 6.417      |               |       | 1.02 |  |  |  |  |
| 0.333<br>0.417                          |       | 3.417          |       | 6.500      | 8.13          |       | 2.03 |  |  |  |  |
| 0.417                                   |       | 3.583          |       | 6.667      | 8.13          |       | 2.03 |  |  |  |  |
| 0.583                                   |       | 3.667          |       | 6.750      | 8.13          |       | 1.02 |  |  |  |  |
| 0.667                                   |       | 3.750          |       | 6.833      | 3.05          |       | 1.02 |  |  |  |  |
| 0.750                                   |       |                |       | 6.917      |               | 10.00 | 1.02 |  |  |  |  |
| 0.833                                   |       | 3.917          |       | 7.000      | 3.05          |       | 1.02 |  |  |  |  |
| 0.917                                   | 1.02  | 4.000          | 2.03  | 7.083      |               | 10.00 | 1.02 |  |  |  |  |
| 1.000                                   |       | 4.083          | 1 02  | 1 7 107    | 3.05          |       | 1.02 |  |  |  |  |
| 1.083                                   | 0.00  | 4.167          | 1.02  | 7.250      |               | 10.23 | 1.02 |  |  |  |  |
| 1.167                                   |       |                | 1 02  | 7.333      | 3.05          |       | 1.02 |  |  |  |  |
| 1 250                                   | 0 00  | 1 222          | 3 05  | 7.417      |               | 10.50 | 1.02 |  |  |  |  |
| 1.333                                   | 1.02  | 4.333          | 3.05  | 7.500      | 3.05          |       | 1.02 |  |  |  |  |
| 1.417                                   | 1 02  | 4.500          |       | 7.583      |               | 10.67 | 1.02 |  |  |  |  |
| 1.500                                   | 1.02  | 4.500          | 3.05  |            | 2.03          |       | 1.02 |  |  |  |  |
| 1.583                                   | 1 02  | 4.667          |       | 7.750      |               | 10.73 | 1.02 |  |  |  |  |
| 1.667                                   | 1.02  | 4.007          | 3.05  |            | 3.05          |       | 1.02 |  |  |  |  |
| 1.750                                   | 1 02  | 4.833          |       | 7.917      |               | 11.00 | 1.02 |  |  |  |  |
|   | 1.02  |                | 3.05  |            | 3.05          |       | 1.02 |  |  |  |  |
| 1.917                                   |       | 5.000          |       | 8.083      | 2.03          |       | 1.02 |  |  |  |  |
| 2.000                                   |       | 5.083          |       | 8.167      |               |       | 1.02 |  |  |  |  |
| 2.083                                   |       | 5.167          |       | 8.250      | 2.03          |       | 0.00 |  |  |  |  |
| 2.167                                   |       | 5.250          |       | 8.333      | 2.03          |       | 0.00 |  |  |  |  |
| 2.250                                   |       | 5.333          |       | 8.417      | 2.03          |       | 0.00 |  |  |  |  |
| 2.333                                   |       |                |       | 8.500      | 2.03          |       | 1.02 |  |  |  |  |
| 2.417                                   | 1.02  | 5.500          | 5.08  | i 8.583    | 2.03          |       | 1.02 |  |  |  |  |
| 2.500                                   | 1.02  | 5.583          | 5.08  | 8.667      |               | 11.75 | 1.02 |  |  |  |  |
| 2.583                                   |       | 5.667          |       | 8.750      | 2.03          | 11.83 | 1.02 |  |  |  |  |
| 2.667                                   |       | 5.750          |       | 8.833      |               | 11.92 | 1.02 |  |  |  |  |
| 2.750                                   |       |                |       | 8.917      | 1.02          | 12.00 | 1.02 |  |  |  |  |
| 2.833                                   | 2.03  | 5.833<br>5.917 | 38.61 | 9.000      |               | 12.08 | 1.02 |  |  |  |  |
| 2.917                                   | 2.03  | 6.000          | 38.61 | 9.083      | 2.03          |       | 1.02 |  |  |  |  |
| 3.000                                   | 2.03  | 6.000          | 38.61 | 9.167      |               | 12.25 | 1.02 |  |  |  |  |
| 3.083                                   |       | 6.167          |       |            | 2.03          |       |      |  |  |  |  |
|   |       |                |       |            |               |       |      |  |  |  |  |
| Max.Eff.Inten.(mm/                      | /hr)= | 38.61          |       | 15.64      |               |       |      |  |  |  |  |
| over (m                                 |       | 5.00           |       | 20.00      |               |       |      |  |  |  |  |
|   | nin)= | 3.21           | (ii)  | 18.03 (ii) |               |       |      |  |  |  |  |
| Unit Hyd. Tpeak (m                      | nin)= | 5.00           |       | 20.00      |               |       |      |  |  |  |  |
|   | ms)=  | 0.27           |       | 0.06       |               |       |      |  |  |  |  |
|   |       |                |       |            | ****          | TALC* |      |  |  |  |  |

\*TOTALS\* 0.07 0.01 0.074 (iii) 6.25 6.42 6.25 41 93 42.93 42.93

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PEAK FLOW

TIME TO PEAK

RUNOFF VOLUME

TOTAL RAINFALL

(cms)=

(hrs)= (mm)= (mm)=

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 79.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0375)                         |       |       |       |       |
|---|-------|-------|-------|-------|
| 1 + 2 = 3                               | AREA  | QPEAK | TPEAK | R.V.  |
|   | (ha)  | (cms) | (hrs) | (mm)  |
| ID1= 1 ( 0300):                         | 10.00 | 0.886 | 6.25  | 36.27 |
| + ID2= 2 ( 0350):                       | 0.90  | 0.074 | 6.25  | 33.43 |
| ======================================= |       |       |       |       |
| ID = 3 ( 0375):                         | 10.90 | 0.960 | 6.25  | 36.03 |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY. ..... OU NO. APOCOUL DASCILUNG IF ANY.

| READ STORM       | Filenar  |                  |           | .zhao\App | D        |           |        |
|------------------|----------|------------------|-----------|-----------|----------|-----------|--------|
| !                |          |                  | Local\Te  |           |          |           |        |
| Ptotal= 55.37 mm | Comment  | 278a<br>:s: 5yr- |           | 9-4519-98 | 19-16449 | 000a1c25\ | 526be1 |
|                  | Commerri | .s. 5yı -        | 12111 303 |           |          |           |        |
| TIME             | RAIN     | TIME             | RAIN      | ' TIME    | RAIN     | TIME      | RAIN   |
| hrs              | mm/hr    | hrs              | mm/hr     | ' hrs     | mm/hr    | hrs       | mm/h   |
| 0.25             | 0.00     | 3.50             | 3.05      | 6.75      | 10.16    | 10.00     | 2.03   |
| 0.50             | 1.02     | 3.75             | 2.03      | 7.00      | 5.08     | 10.25     | 1.02   |
| 0.75             | 1.02     | 4.00             | 2.03      | 7.25      | 4.06     | 10.50     | 1.02   |
| 1.00             | 1.02     | 4.25             | 2.03      | 7.50      | 3.05     | 10.75     | 1.02   |
| 1.25             | 1.02     | 4.50             | 4.06      | 7.75      | 3.05     | 11.00     | 2.03   |
| 1.50             | 1.02     | 4.75             | 4.06      | 8.00      | 4.06     | 11.25     | 1.02   |
| 1.75             | 2.03     | 5.00             | 4.06      | 8.25      | 3.05     | 11.50     | 1.02   |
| 2.00             | 1.02     | 5.25             | 3.05      | 8.50      | 2.03     | 11.75     | 1.02   |
| 2.25             | 1.02     | 5.50             | 7.11      | 8.75      | 2.03     | 12.00     | 1.02   |
| 2.50             | 2.03     | 5.75             | 7.11      | 9.00      | 3.05     | 12.25     | 1.02   |
| 2.75             | 2.03     | 6.00             | 49.78     | 9.25      | 2.03     |           |        |
| 3.00             | 2.03     | 6.25             | 49.78     | 9.50      | 1.02     |           |        |
| 3.25             | 2.03     | 6.50             | 9.14      | 9.75      | 2.03     |           |        |

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## ${\tt LangstaffRd\_EA\_Existing\_WestDonWatershd}$

| Max.Eff.Inten.(r | mm/hr)= | 49.78     | 31.75      |             |
|------------------|---------|-----------|------------|-------------|
| over             | (min)   | 10.00     | 25.00      |             |
| Storage Coeff.   | (min)=  | 9.20 (ii) | 20.36 (ii) |             |
| Unit Hyd. Tpeak  | (min)=  | 10.00     | 25.00      |             |
| Unit Hyd. peak   | (cms)=  | 0.12      | 0.05       |             |
|                  |         |           |            | *TOTALS*    |
| PEAK FLOW        | (cms)=  | 0.25      | 0.06       | 0.299 (iii) |
| TIME TO PEAK     | (hrs)=  | 6.25      | 6.50       | 6.25        |
| RUNOFF VOLUME    | (mm)=   | 53.37     | 27.66      | 43.60       |
| TOTAL RAINFALL   | (mm)=   | 55.37     | 55.37      | 55.37       |
| RUNOFF COFFETCTI | FNT =   | a 96      | 0 50       | a 79        |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 86.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB   | Area<br>Total                       | (ha)= 1.27<br>Imp(%)= 52.00                           |  | 52.00 |
|---|-------------------------------------|---|--|-------|
| Surface Area<br>Dep. Storage<br>Average Slope<br>Length<br>Mannings n | (ha)=<br>(mm)=<br>(%)=<br>(m)=<br>= | IMPERVIOUS<br>0.66<br>2.00<br>1.00<br>503.00<br>0.013 | PERVIOUS (i)<br>0.61<br>5.00<br>2.00<br>25.00<br>0.250 |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TRANSFORMED HYETOGRAPH |       |       |       |        |       |       |       |  |
|------------------------|-------|-------|-------|--------|-------|-------|-------|--|
| TIME                   | RAIN  | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |
| hrs                    | mm/hr | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |
| 0.083                  | 0.00  | 3.167 | 2.03  | 6.250  | 49.78 | 9.33  | 1.02  |  |
| 0.167                  | 0.00  | 3.250 | 2.03  | 6.333  | 9.14  | 9.42  | 1.02  |  |
| 0.250                  | 0.00  | 3.333 | 3.05  | 6.417  | 9.14  | 9.50  | 1.02  |  |
| 0.333                  | 1.02  | 3.417 | 3.05  | 6.500  | 9.14  | 9.58  | 2.03  |  |
| 0.417                  | 1.02  | 3.500 | 3.05  | 6.583  | 10.16 | 9.67  | 2.03  |  |
| 0.500                  | 1.02  | 3.583 | 2.03  | 6.667  | 10.16 | 9.75  | 2.03  |  |
| 0.583                  | 1.02  | 3.667 | 2.03  | 6.750  | 10.16 | 9.83  | 2.03  |  |
| 0.667                  | 1.02  | 3.750 | 2.03  | 6.833  | 5.08  | 9.92  | 2.03  |  |
| 0.750                  | 1.02  | 3.833 | 2.03  | 6.917  | 5.08  | 10.00 | 2.03  |  |
| 0.833                  | 1.02  | 3.917 | 2.03  | 7.000  | 5.08  | 10.08 | 1.02  |  |
| 0.917                  | 1.02  | 4.000 | 2.03  | 7.083  | 4.06  | 10.17 | 1.02  |  |
| 1.000                  | 1.02  | 4.083 | 2.03  | 7.167  | 4.06  | 10.25 | 1.02  |  |
| 1.083                  | 1.02  | 4.167 | 2.03  | 7.250  | 4.06  | 10.33 | 1.02  |  |
| 1.167                  | 1.02  | 4.250 | 2.03  | 7.333  | 3.05  | 10.42 | 1.02  |  |

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# LangstaffRd\_EA\_Existing\_WestDonWatershd

| STANDHYD ( 0145)  | area  | (na)=   | 3.05  |                |       |  |
|-------------------|-------|---------|-------|----------------|-------|--|
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 62.00 | Dir. Conn.(%)= | 62.00 |  |
|                   |       |         |       |                |       |  |
|                   |       | IMPERVI | OUS   | PERVIOUS (i)   |       |  |
| Surface Area      | (ha)= | 1.8     | 9     | 1.16           |       |  |
| Dep. Storage      | (mm)= | 2.0     | 0     | 5.00           |       |  |
| Average Slope     | (%)=  | 1.0     | 0     | 2.00           |       |  |
| Length            | (m)=  | 531.0   | 0     | 40.00          |       |  |
| Mannings n        | ` ′=  | 0.01    | 3     | 0.250          |       |  |
|                   |       |         |       |                |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO  $\,$  5.0 MIN. TIME STEP.

|                |       | TRA            | ANSFORME       | HYETOGR        | APH   |                |       |
|----------------|-------|----------------|----------------|----------------|-------|----------------|-------|
| TIME           | RAIN  | TIME           | RAIN           | ' TIME         | RAIN  | TIME           | RAIN  |
| hrs            | mm/hr | hrs            | mm/hr          | ' hrs          | mm/hr | hrs            | mm/hr |
| 0.083          | 0.00  | 3.167          | 2.03           | 6.250          | 49.78 | 9.33           | 1.02  |
| 0.167          | 0.00  | 3.250          | 2.03           | 6.333          | 9.14  | 9.42           | 1.02  |
| 0.250          | 0.00  | 3.333          | 3.05           | 6.417          | 9.14  | 9.50           | 1.02  |
| 0.333          | 1.02  | 3.417          | 3.05           | 6.500          | 9.14  | 9.58           | 2.03  |
| 0.417          | 1.02  | 3.500          | 3.05           | 6.583          | 10.16 | 9.67           | 2.03  |
| 0.500          | 1.02  | 3.583          | 2.03           | 6.667          | 10.16 | 9.75           | 2.03  |
| 0.583          | 1.02  | 3.667          | 2.03           | 6.750          | 10.16 | 9.83           | 2.03  |
| 0.667          | 1.02  | 3.750          | 2.03           | 6.833          | 5.08  | 9.92           | 2.03  |
| 0.750          |       | 3.833          | 2.03           | 6.917          | 5.08  | 10.00          | 2.03  |
| 0.833          | 1.02  | 3.917          | 2.03           | 7.000          | 5.08  | 10.08          | 1.02  |
| 0.917          | 1.02  | 4.000          | 2.03           | 7.083          | 4.06  | 10.17          | 1.02  |
| 1.000          | 1.02  | 4.083          | 2.03           | 7.167          | 4.06  | 10.25          | 1.02  |
| 1.083          |       | 4.167          | 2.03           | 7.250          | 4.06  |                | 1.02  |
| 1.167          |       | 4.250          | 2.03           | 7.333          | 3.05  | 10.42          | 1.02  |
| 1.250          |       | 4.333          | 4.06           | 7.417          | 3.05  | 10.50          | 1.02  |
| 1.333          | 1.02  | 4.417          | 4.06           | 7.500          | 3.05  | 10.58          | 1.02  |
| 1.417          | 1.02  | 4.500          | 4.06           | 7.583          | 3.05  | 10.67          | 1.02  |
| 1.500          | 1.02  | 4.583          | 4.06           | 7.667          | 3.05  | 10.75          | 1.02  |
| 1.583          |       | 4.667          | 4.06           | 7.750          | 3.05  | 10.83          | 2.03  |
| 1.667          |       | 4.750          | 4.06           | 7.833          | 4.06  | 10.92          | 2.03  |
| 1.750          | 2.03  |                | 4.06           | 7.917          | 4.06  | 11.00          | 2.03  |
| 1.833          | 1.02  | 4.917          | 4.06           | 8.000          | 4.06  | 11.08          | 1.02  |
| 1.917          |       | 5.000          | 4.06           | 8.083          | 3.05  | 11.17          | 1.02  |
| 2.000          | 1.02  | 5.083          | 3.05           | 8.167          | 3.05  | 11.25          | 1.02  |
| 2.083          | 1.02  | 5.167          | 3.05           | 8.250          | 3.05  | 11.33          | 1.02  |
| 2.167          | 1.02  | 5.250          | 3.05           | 8.333          | 2.03  | 11.42          | 1.02  |
| 2.250          | 1.02  | 5.333          | 7.11<br>7.11   | 8.417          | 2.03  | 11.50<br>11.58 | 1.02  |
| 2.333          | 2.03  | 5.417          | 7.11           | 8.500          | 2.03  |                | 1.02  |
| 2.417          | 2.03  |                |                | 8.583          | 2.03  | 11.67          | 1.02  |
| 2.500          | 2.03  | 5.583          | 7.11<br>7.11   | 8.667          | 2.03  | 11.75          | 1.02  |
| 2.583          | 2.03  | 5.667          |                | 8.750          | 2.03  | 11.83          | 1.02  |
| 2.667<br>2.750 | 2.03  | 5.750<br>5.833 | 7.11<br>49.78  | 8.833<br>8.917 | 3.05  | 11.92          | 1.02  |
|                |       |                |                |                |       |                |       |
| 2.833          | 2.03  | 5.917          | 49.78          | 9.000          | 3.05  | 12.08          | 1.02  |
| 2.917          | 2.03  | 6.000<br>6.083 | 49.78<br>49.78 | 9.083<br>9.167 | 2.03  | 12.17          |       |
| 3.000<br>3.083 | 2.03  | 6.167          | 49.78          |                | 2.03  |                | 1.02  |
| 5.083          | 2.03  | 0.16/          | 49.78          | 9.250          | 2.03  | l              |       |

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|           |       | Langs   | taffRd_E |       | ing_WestD |      | hd    |      |
|-----------|-------|---------|----------|-------|-----------|------|-------|------|
|           | 1.256 |         |          |       | 7.417     |      |       | 1.02 |
|           | 1.333 |         |          |       |           |      |       | 1.02 |
|           | 1.417 |         | 4.500    | 4.06  | 7.583     |      |       | 1.02 |
|           | 1.500 | 1.02    | 4.583    | 4.06  | 7.667     | 3.05 | 10.75 | 1.02 |
|           | 1.583 | 2.03    | 4.667    | 4.06  | 7.750     | 3.05 | 10.83 | 2.03 |
|           | 1.667 | 7 2.03  | 4.750    | 4.06  | 7.833     | 4.06 | 10.92 | 2.03 |
|           | 1.756 | 2.03    | 4.833    | 4.06  | 7.917     | 4.06 | 11.00 | 2.03 |
|           | 1.833 | 1.02    | 4.917    | 4.06  | 8.000     | 4.06 | 11.08 | 1.02 |
|           | 1.917 | 7 1.02  | 5.000    | 4.06  | 8.083     | 3.05 | 11.17 | 1.02 |
|           | 2.000 | 1.02    | 5.083    | 3.05  | 8.167     | 3.05 | 11.25 | 1.02 |
|           | 2.083 | 1.02    | 5.167    | 3.05  | 8.250     | 3.05 | 11.33 | 1.02 |
|           | 2.167 | 7 1.02  | 5.250    | 3.05  | 8.333     | 2.03 | 11.42 | 1.02 |
|           | 2.256 | 1.02    | 5.333    | 7.11  | 8.417     | 2.03 | 11.50 | 1.02 |
|           | 2.333 | 2.03    | 5.417    | 7.11  | 8.500     | 2.03 | 11.58 | 1.02 |
|           | 2.417 | 7 2.03  | 5.500    | 7.11  | 8.583     | 2.03 | 11.67 | 1.02 |
|           | 2.500 | 2.03    | 5.583    | 7.11  | 8.667     | 2.03 | 11.75 | 1.02 |
|           | 2.583 | 2.03    | 5.667    | 7.11  | 8.750     | 2.03 | 11.83 | 1.02 |
|           | 2.667 | 7 2.03  | 5.750    | 7.11  | 8.833     | 3.05 | 11.92 | 1.02 |
|           | 2.756 | 2.03    | 5.833    | 49.78 | 8.917     | 3.05 | 12.00 | 1.02 |
|           | 2.833 | 2.03    | 5.917    | 49.78 | 9.000     | 3.05 | 12.08 | 1.02 |
|           | 2.917 | 7 2.03  | 6.000    | 49.78 | 9.083     | 2.03 | 12.17 | 1.02 |
|           | 3.000 | 2.03    | 6.083    | 49.78 | 9.167     | 2.03 | 12.25 | 1.02 |
|           | 3.083 | 2.03    | 6.167    | 49.78 | 9.250     | 2.03 | İ     |      |
|           |       |         |          |       |           |      |       |      |
| ax.Ett.Ir |       | nm/hr)= |          |       | 29.56     |      |       |      |
|           |       | (min)   | 10.00    |       | 20.00     |      |       |      |
| torage Co |       |         |          | (ii)  | 17.57 (i  | 1)   |       |      |
| nit Hyd.  |       |         | 10.00    |       | 20.00     |      |       |      |
|           |       | (cmc)-  | a 12     |       | 0 06      |      |       |      |

| over             | (min)  | 10.00    | 20.00         |             |
|------------------|--------|----------|---------------|-------------|
| Storage Coeff.   | (min)= | 8.90 (ii | i) 17.57 (ii) |             |
| Unit Hyd. Tpeak  | (min)= | 10.00    | 20.00         |             |
| Unit Hyd. peak   | (cms)= | 0.12     | 0.06          |             |
|                  |        |          |               | *TOTALS*    |
| PEAK FLOW        | (cms)= | 0.09     | 0.03          | 0.115 (iii) |
| TIME TO PEAK     | (hrs)= | 6.25     | 6.42          | 6.25        |
| RUNOFF VOLUME    | (mm)=  | 53.37    | 24.78         | 39.64       |
| TOTAL RAINFALL   | (mm)=  | 55.37    | 55.37         | 55.37       |
| RUNOFF COEFFICIE | ENT =  | 0.96     | 0.45          | 0.72        |
|                  |        |          |               |             |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |         |       |        |           |       |  |
|-------------------|-------|---------|-------|--------|-----------|-------|--|
| STANDHYD ( 0135)  | Area  | (ha)=   | 1.43  |        |           |       |  |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 40.00 | Dir.   | Conn.(%)= | 40.00 |  |
|                   |       |         |       |        |           |       |  |
|                   |       | IMPERVI | OUS   | PERVIO | JS (i)    |       |  |
| Surface Area      | (ha)= | 0.5     | 7     | 0.86   | 5         |       |  |
| Dep. Storage      | (mm)= | 2.0     | 0     | 5.00   | 9         |       |  |
| Average Slope     | (%)=  | 1.0     | 0     | 2.00   | 9         |       |  |
|                   |       |         |       |        |           |       |  |

LangstaffRd\_EA\_Existing\_WestDonWatershd )= 503.00 30.00 = 0.013 0.250 Length (m)= 503.00 = 0.013 Mannings n

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|                  |         | TR      | ANSFORME | D HYETOGRA              | APH   | -                |      |
|------------------|---------|---------|----------|-------------------------|-------|------------------|------|
| TIMI             | E RAIN  |         |          |                         |       |                  |      |
| hr               |         |         |          | ' hrs                   |       |                  |      |
| 0.08             |         | 3.167   |          | 6.250                   |       |                  | 1.02 |
| 0.16             |         | 3.250   |          | 6.333                   |       |                  | 1.02 |
| 0.250            | 0.00    | 3.333   | 3.05     | 6.417                   | 9.14  |                  | 1.02 |
| 0.33             | 3 1.02  | 3.417   | 3.05     | 6.500                   | 9.14  |                  | 2.03 |
| 0.41             | 1.02    | 1 3.300 | 5.05     | 6.583                   |       |                  | 2.03 |
| 0.500            | 0 1.02  | 3.583   | 2.03     | 6.667                   |       |                  | 2.03 |
| 0.58             |         | 3.667   | 2.03     | 6.750                   | 10.16 | 9.83             |      |
| 0.66             |         | 3.750   | 2.03     | 6.833                   | 5.08  | 9.92             | 2.03 |
| 0.75             | 1.02    | 3.833   | 2.03     | 6.917                   | 5.08  | 10.00            | 2.03 |
| 0.83             | 3 1.02  | 3.917   | 2.03     | 7.000                   | 3.00  | 10.00            | 1.02 |
| 0.91             | 7 1.02  | 4.000   | 2.03     |                         |       | 10.17            |      |
| 1.000            | 1.02    | 4.083   | 2.03     | 7.167                   |       | 10.25            |      |
| 1.08             | 3 1.02  | 4.167   | 2.03     | 7.250                   |       | 10.33            | 1.02 |
| 1.16             | 7 1.02  | 4.250   | 2.03     | 7.333                   | 3.05  | 10.42            | 1.02 |
| 1.250            | 1.02    | 4.333   | 4.06     | 7.417                   | 3.05  | 10.50            | 1.02 |
| 1.33             | 3 1.02  | 4.417   | 4.06     | 7.500                   |       | 10.58            | 1.02 |
| 1.41             |         | 4.500   |          | 7.583                   |       | 10.67            |      |
| 1.500            |         | 4.583   |          | 7.667                   |       | 10.75            | 1.02 |
| 1.58             |         | 4.667   | 4.06     | 7.750                   | 3.05  | 10.83            | 2.03 |
| 1.66             |         | 4.750   | 4.06     | 7.833                   | 4.06  | 10.92            | 2.03 |
| 1.750            | 2.03    | 4.833   | 4.06     | 7.917                   |       | 11.00            | 2.03 |
| 1.83             |         | 4.917   |          | 8.000                   |       | 11.08            |      |
| 1.91             | / 1.02  | 5.000   |          | 8.083<br>8.167          |       | 11.17            | 1.02 |
| 2.000            | 1.02    | 5.083   | 3.05     | 8.16/                   | 3.05  | 11.25            | 1.02 |
| 2.08             | 3 1.02  | 5.16/   | 5.05     | 1 0.230                 | 5.05  | 11.33            | 1.02 |
| 2.16             |         |         |          |                         |       | 11.42            | 1.02 |
| 2.250            |         | 5.333   |          | 8.417                   |       | 11.50            |      |
| 2.33             |         | 5.417   |          | 8.500<br>8.583          |       | 11.58<br>  11.67 | 1.02 |
| 2.50             |         | 5.583   | 7.11     | 8.583<br>8.667<br>8.750 | 2.03  | 11.07            | 1.02 |
|                  |         |         | 7.11     | 8.750                   | 2.03  | 11.75            | 1.02 |
| 2.58             |         | 5.667   |          |                         |       | 11.03            |      |
| 2.750            |         | 5.833   |          | 8.833                   |       | 12.00            | 1.02 |
| 2.73             |         |         |          |                         |       | 12.00            | 1.02 |
| 2.91             | 2.03    | 0.917   | 49.76    | 9.000                   | 2.02  | 12.00            | 1.02 |
| 3.00             | 2.03    | 0.000   | 49.76    | 9.000<br>9.083<br>9.167 | 2.03  | 12.17            | 1.02 |
|                  |         |         |          | 9.167                   |       |                  | 1.02 |
| 3.08             | 2.03    | 0.10/   | 49.78    | 9.250                   | 2.03  | l                |      |
| Max.Eff.Inten.(r | mm/hr)= | 49.78   |          | 30.62                   |       |                  |      |
|                  | (min)   | 10.00   |          | 20.00                   |       |                  |      |
| Storage Coeff.   | (min)=  | 8.90    | (ii)     | 18.44 (ii               | )     |                  |      |
| Unit Hyd. Tpeak  |         | 10.00   |          | 20.00                   |       |                  |      |
| Unit Hyd. peak   |         | 0.12    |          | 0.06                    |       |                  |      |
| ,                | . ,     |         |          |                         | *TO   | TΔI S*           |      |

\*TOTALS\*

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|                  | Langs    |       |       | ing_WestDo |       |           |      |
|------------------|----------|-------|-------|------------|-------|-----------|------|
| TIMI             | E RAIN   |       | RAIN  |            | RAIN  |           | RAIN |
| hr               |          |       | mm/hr |            | mm/hr |           |      |
| 0.08             |          |       |       | 6.250      | 49.78 |           | 1.02 |
| 0.16             |          | 3.250 |       | 6.333      | 9.14  |           | 1.02 |
| 0.25             |          | 3.333 |       | 6.417      | 9.14  |           | 1.02 |
| 0.33             |          | 3.417 |       | 6.500      | 9.14  |           | 2.03 |
| 0.41             |          | 3.500 |       | 6.583      | 10.16 |           | 2.03 |
| 0.500            |          | 3.583 |       | 6.667      | 10.16 |           | 2.03 |
| 0.58             |          | 3.667 |       | 6.750      | 10.16 |           | 2.03 |
| 0.66             |          | 3.750 |       | 6.833      | 5.08  |           | 2.03 |
| 0.75             |          | 3.833 |       | 6.917      |       | 10.00     | 2.03 |
| 0.83             |          | 3.917 |       | 7.000      | 5.08  |           | 1.02 |
| 0.03             |          | 4.000 |       | 7.083      |       | 10.17     | 1.02 |
| 1.000            |          | 4.083 |       | 7.167      |       | 10.25     | 1.02 |
| 1.08             |          | 4.167 |       | 7.250      | 4.06  |           | 1.02 |
| 1.16             |          | 4.250 | 2.03  |            |       | 10.42     | 1.02 |
| 1.250            |          | 4.333 | 4.06  |            |       | 10.50     | 1.02 |
| 1.33             |          | 4.417 |       | 7.500      | 3.05  |           | 1.02 |
| 1.41             |          | 4.500 | 4.06  |            |       | 10.67     | 1.02 |
| 1.500            |          | 4.583 |       | 7.667      |       | 10.75     | 1.02 |
| 1.58             |          | 4.667 |       | 7.750      |       | 10.73     | 2.03 |
| 1.66             |          | 4.750 | 4.06  |            |       | 10.03     | 2.03 |
| 1.750            |          | 4.833 |       | 7.917      | 4.06  |           | 2.03 |
| 1.83             |          | 4.917 |       | 8.000      |       | 11.08     | 1.02 |
| 1.91             |          | 5.000 |       | 8.083      |       | 11.17     | 1.02 |
| 2.000            |          | 5.083 |       | 8.167      |       | 11.25     | 1.02 |
| 2.08             |          | 5.167 |       | 8.250      |       | 11.33     | 1.02 |
| 2.16             |          | 5.250 |       | 8.333      |       | 11.42     | 1.02 |
| 2.250            |          | 5.333 |       | 8.417      | 2.03  |           | 1.02 |
| 2.33             |          | 5.417 |       | 8.500      |       | 11.58     | 1.02 |
| 2.41             |          | 5.500 |       | 8.583      |       | 11.67     | 1.02 |
| 2.500            |          |       |       | 8.667      |       | 11.75     | 1.02 |
| 2.58             |          | 5.667 |       | 8.750      |       | 11.83     | 1.02 |
| 2.66             |          | 5.750 |       | 8.833      | 3.05  |           | 1.02 |
| 2.750            |          | 5.833 |       | 8.917      |       | 12.00     | 1.02 |
| 2.83             |          | 5.917 |       | 9.000      |       | 12.08     | 1.02 |
| 2.91             |          | 6.000 |       | 9.083      |       | 12.17     | 1.02 |
| 3.000            |          |       |       | 9.167      |       | 12.25     | 1.02 |
| 3.08             | 3 2.03   | 6.167 |       | 9.250      | 2.03  |           |      |
|                  |          |       |       |            |       |           |      |
| Max.Eff.Inten.(r | mm/hr)=  | 49.78 |       | 29.56      |       |           |      |
| over             | (min)    | 10.00 |       | 20.00      |       |           |      |
| Storage Coeff.   | (min)=   | 8.55  | (ii)  | 16.13 (ii  | )     |           |      |
| Unit Hyd. Tpeak  |          | 10.00 |       | 20.00      |       |           |      |
| Unit Hyd. peak   | (cms)=   | 0.12  |       | 0.06       |       |           |      |
|                  |          |       |       |            |       | TALS*     |      |
| PEAK FLOW        | (cms)=   | 0.06  |       | 0.03       |       | .082 (iii | )    |
| TIME TO PEAK     | (hrs)=   | 6.25  |       | 6.42       |       | 5.25      |      |
| RUNOFF VOLUME    | ( mm ) = | 53.37 |       | 24.78      |       | 7.35      |      |
| TOTAL RAINFALL   | ( mm ) = | 55.37 |       | 55.37      |       | 5.37      |      |
| RUNOFF COEFFICI  | ENT =    | 0.96  |       | 0.45       | (     | 9.67      |      |
|                  |          |       |       |            |       |           |      |

LangstaffRd\_EA\_Existing\_WestDonWatershd :)= 0.08 0.05 0.11 :)= 6.25 6.42 6.2 :)= 53.37 25.69 36.7 :)= 55.37 55.37 55.3 = 0.96 0.46 0.6 La
PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = ershd 0.116 (iii) 6.25 36.76 55.37 0.66 (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: CN\* = 84.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (OT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY. | ADD HYD ( 0420)| | 1 + 2 = 3 | QPEAK (cms) 0.116 0.115 R.V. (mm) 36.76 39.64 AREA TPEAK ID = 3 ( 0420): 2.70 0.231 6.25 38.11 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY. ADD HYD ( 0425) | 1 + 2 = 3 | QPEAK (cms) 0.299 0.231 R.V. (mm) 43.60 (ha) 3.05 (hrs) 6.25 ID1= 1 ( 0145): + ID2= 2 ( 0420): 6.25 38.11 ID = 3 ( 0425): 5.75 0.530 6.25 41.02 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY. Area (ha)= 0.96 Total Imp(%)= 44.00 Dir. Conn.(%)= 44.00 IMPERVIOUS 0.42 2.00 1.00 PERVIOUS (i) 0.54 5.00 2.00 Surface Area Dep. Storage Average Slope Length (ha)= (mm)= (%)= (m)= 470.00 20.00 Mannings n 0.013 0.250

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NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

## ${\tt LangstaffRd\_EA\_Existing\_WestDonWatershd}$

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
- (1) CN\* PROCEDURE SELECTED FOR FEXTURES 103 L035-5.

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |         |       |         |           |       |
|-------------------|-------|---------|-------|---------|-----------|-------|
| STANDHYD ( 0205)  | Area  | (ha)=   | 1.11  |         |           |       |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 38.00 | Dir.    | Conn.(%)= | 38.00 |
|                   |       |         |       |         |           |       |
|                   |       | IMPERVI | OUS   | PERVIOU | S (i)     |       |
| Surface Area      | (ha)= | 0.4     | 2     | 0.69    |           |       |
| Dep. Storage      | (mm)= | 2.0     | 0     | 5.00    |           |       |
| Average Slope     | (%)=  | 1.0     | 0     | 2.00    |           |       |
| Length            | (m)=  | 470.0   | 0     | 20.00   |           |       |
| Mannings n        | =     | 0.01    | 3     | 0.250   |           |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TRA   | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250   | 49.78 | 9.33  | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333   | 9.14  | 9.42  | 1.02  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417   | 9.14  | 9.50  | 1.02  |
| 0.333 | 1.02  | 3.417 | 3.05     | 6.500   | 9.14  | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05     | 6.583   | 10.16 | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03     | 6.667   | 10.16 | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03     | 6.750   | 10.16 | 9.83  | 2.03  |
| 0.667 | 1.02  | 3.750 | 2.03     | 6.833   | 5.08  | 9.92  | 2.03  |
| 0.750 | 1.02  | 3.833 | 2.03     | 6.917   | 5.08  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 2.03     | 7.000   | 5.08  | 10.08 | 1.02  |
| 0.917 | 1.02  | 4.000 | 2.03     | 7.083   | 4.06  | 10.17 | 1.02  |
| 1.000 | 1.02  | 4.083 | 2.03     | 7.167   | 4.06  | 10.25 | 1.02  |
| 1.083 | 1.02  | 4.167 | 2.03     | 7.250   | 4.06  | 10.33 | 1.02  |
| 1.167 | 1.02  | 4.250 | 2.03     | 7.333   | 3.05  | 10.42 | 1.02  |
| 1.250 | 1.02  | 4.333 | 4.06     | 7.417   | 3.05  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 4.06     | 7.500   | 3.05  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 4.06     | 7.583   | 3.05  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 4.06     | 7.667   | 3.05  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 4.06     | 7.750   | 3.05  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 4.06     | 7.833   | 4.06  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 4.06     | 7.917   | 4.06  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 4.06     | 8.000   | 4.06  | 11.08 | 1.02  |
| 1.917 | 1.02  | 5.000 | 4.06     | 8.083   | 3.05  | 11.17 | 1.02  |
| 2.000 | 1.02  | 5.083 | 3.05     | 8.167   | 3.05  | 11.25 | 1.02  |
| 2.083 | 1.02  | 5.167 | 3.05     | 8.250   | 3.05  | 11.33 | 1.02  |
| 2.167 | 1.02  | 5.250 | 3.05     | 8.333   | 2.03  | 11.42 | 1.02  |
| 2.250 | 1.02  | 5.333 | 7.11     | 8.417   | 2.03  | 11.50 | 1.02  |

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LangstaffRd EA Existing WestDonWatershd
2.03 | 5.417 | 7.11 | 8.500 | 2.03 | 1
2.03 | 5.500 | 7.11 | 8.500 | 2.03 | 1
2.03 | 5.583 | 7.11 | 8.667 | 2.03 | 1
2.03 | 5.675 | 7.11 | 8.750 | 2.03 | 1
2.03 | 5.750 | 7.11 | 8.833 | 3.05 | 1
2.03 | 5.833 | 49.78 | 8.917 | 3.05 | 1
2.03 | 5.917 | 49.78 | 9.000 | 3.05 | 1
2.03 | 5.030 | 49.78 | 9.003 | 2.03 | 1
2.03 | 6.000 | 49.78 | 9.003 | 2.03 | 1
2.03 | 6.0167 | 49.78 | 9.250 | 2.03 |
                                                                                                                                                  nWatershd
2.03 | 11.58
2.03 | 11.67
2.03 | 11.75
2.03 | 11.83
3.05 | 11.92
3.05 | 12.00
3.05 | 12.08
2.03 | 12.25
2.03 |
                                        2.333
                                        2.417
                                                                                                                                                                                              1.02
                                        2.583
2.667
2.750
2.833
                                                                                                                                                                                             1.02
1.02
1.02
1.02
1.02
                                        2.917
                                                                                                                                                                                              1.02
                                        3.000
                                        3.083
         Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                                                   49.78
10.00
8.55 (ii)
10.00
0.12
                                                                                                                      29.56
20.00
16.13 (ii)
20.00
0.06
                                                                                                                                                          *TOTALS*
           PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                                                     0.06
6.25
53.37
55.37
0.96
                                                                                                                                                             0.089 (iii)
6.25
35.64
55.37
0.64
                                                                                                                         0.04
                                                                                                                       6.42
24.78
55.37
0.45
           ADD HYD ( 0460)|
1 + 2 = 3 |
                                                                         AREA
(ha)
1.11
0.96
                                                                                            QPEAK
(cms)
0.089
0.082
                                                                                                                      TPEAK
(hrs)
6.25
6.25
                                                                                                                                           R.V.
(mm)
35.64
37.35
             ID1= 1 ( 0205):
+ ID2= 2 ( 0210):
                ID = 3 ( 0460):
                                                                        2.07
                                                                                         0.171
                                                                                                                     6.25
                                                                                                                                            36.43
          NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
Area (ha)= 0.70
Total Imp(%)= 57.00 Dir. Conn.(%)= 57.00
                                                                             IMPERVIOUS
                                                                                                                 PERVIOUS (i)
           Surface Area
Dep. Storage
Average Slope
Length
                                                        (ha)=
(mm)=
(%)=
(m)=
                                                                                  0.40
2.00
1.00
320.00
                                                                                                                      0.30
5.00
2.00
25.00
```

|                 | Lang:  | LangstaffRd_EA_Existing_WestDonWatershd |       |       |  |  |  |
|-----------------|--------|---|-------|-------|--|--|--|
| TIME TO PEAK    | (hrs)= | 6.25                                    | 6.42  | 6.25  |  |  |  |
| RUNOFF VOLUME   | (mm)=  | 53.37                                   | 23.08 | 40.33 |  |  |  |
| TOTAL RAINFALL  | (mm)=  | 55.37                                   | 55.37 | 55.37 |  |  |  |
| RUNOFF COEFFICE | ENT =  | 0.96                                    | 0.42  | 0.73  |  |  |  |

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| I CALTB           |       |         |       |                |       |
|-------------------|-------|---------|-------|----------------|-------|
| STANDHYD ( 0225)  | Area  | (ha)=   | 0.90  |                |       |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 53.00 | Dir. Conn.(%)= | 53.00 |
|                   |       |         |       |                |       |
|                   |       | IMPERVI | OUS   | PERVIOUS (i)   |       |
| Surface Area      | (ha)= | 0.4     | В     | 0.42           |       |
| Dep. Storage      | (mm)= | 2.0     | а     | 5.00           |       |
| Average Slope     | (%)=  | 1.0     | a     | 2.00           |       |
| Length            | (m)=  | 320.0   | а     | 25.00          |       |
| Mannings n        | ` =   | 0.01    | 3     | 0.250          |       |
|                   |       |         |       |                |       |
|                   |       |         |       |                |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250   | 49.78 | 9.33  | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333   | 9.14  | 9.42  | 1.02  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417   | 9.14  | 9.50  | 1.02  |
| 0.333 | 1.02  | 3.417 | 3.05     | 6.500   | 9.14  | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05     | 6.583   | 10.16 | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03     | 6.667   | 10.16 | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03     | 6.750   | 10.16 | 9.83  | 2.03  |
| 0.667 | 1.02  | 3.750 | 2.03     | 6.833   | 5.08  | 9.92  | 2.03  |
| 0.750 | 1.02  | 3.833 | 2.03     | 6.917   | 5.08  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 2.03     | 7.000   | 5.08  | 10.08 | 1.02  |
| 0.917 | 1.02  | 4.000 | 2.03     | 7.083   | 4.06  | 10.17 | 1.02  |
| 1.000 | 1.02  | 4.083 | 2.03     | 7.167   | 4.06  | 10.25 | 1.02  |
| 1.083 | 1.02  | 4.167 | 2.03     | 7.250   | 4.06  | 10.33 | 1.02  |
| 1.167 | 1.02  | 4.250 | 2.03     | 7.333   | 3.05  | 10.42 | 1.02  |
| 1.250 | 1.02  | 4.333 | 4.06     | 7.417   | 3.05  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 4.06     | 7.500   | 3.05  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 4.06     | 7.583   | 3.05  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 4.06     | 7.667   | 3.05  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 4.06     | 7.750   | 3.05  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 4.06     | 7.833   | 4.06  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 4.06     | 7.917   | 4.06  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 4.06     | 8.000   | 4.06  | 11.08 | 1.02  |

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LangstaffRd\_EA\_Existing\_WestDonWatershd = 0.013 0.290 Mannings n

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|                 |         | TRA   | ANSFORME | ED HYETOGRA | ΔPH     |            |       |
|-----------------|---------|-------|----------|-------------|---------|------------|-------|
| TIME            | RAIN    |       | RAIN     |             | RAIN    |            | RAIN  |
| hrs             |         |       | mm/hr    | ' hrs       | mm/hr   |            | mm/hr |
| 0.083           |         | 3.167 | 2.03     | 6.250       | 49.78 l |            | 1.02  |
| 0.167           | 7 0.00  | 3.250 | 2.03     | 6.333       | 9.14    | 9.42       | 1.02  |
| 0.256           | 0.00    | 3.333 | 3.05     | 6.417       | 9.14    |            | 1.02  |
| 0.333           | 3 1.02  | 3.417 | 3.05     | 6.500       | 9.14    | 9.58       | 2.03  |
| 0.417           | 7 1.02  | 3.500 | 3.05     | 6.583       | 10.16   | 9.67       | 2.03  |
| 0.506           | 1.02    | 3.583 | 2.03     | 6.667       | 10.16   | 9.75       | 2.03  |
| 0.583           | 3 1.02  | 3.667 | 2.03     | 6.750       | 10.16   | 9.83       | 2.03  |
| 0.667           | 7 1.02  | 3.750 | 2.03     | 6.833       | 5.08    | 9.92       | 2.03  |
| 0.756           | 1.02    | 3.833 | 2.03     | 6.917       | 5.08    | 10.00      | 2.03  |
| 0.833           | 3 1.02  | 3.917 | 2.03     | 7.000       | 5.08    | 10.08      | 1.02  |
| 0.917           |         | 4.000 |          | 7.083       | 4.06    |            | 1.02  |
| 1.000           |         | 4.083 |          | 7.167       | 4.06    |            | 1.02  |
| 1.083           | 3 1.02  | 4.167 | 2.03     | 7.250       | 4.06    | 10.33      | 1.02  |
| 1.167           |         | 4.250 |          | 7.333       | 3.05    |            | 1.02  |
| 1.256           |         | 4.333 |          | 7.417       | 3.05    |            | 1.02  |
| 1.333           |         | 4.417 | 4.06     |             | 3.05    |            | 1.02  |
| 1.417           |         | 4.500 | 4.06     |             | 3.05    |            | 1.02  |
| 1.500           |         | 4.583 | 4.06     |             | 3.05    |            | 1.02  |
| 1.583           |         | 4.667 | 4.06     |             | 3.05    |            | 2.03  |
| 1.667           |         | 4.750 |          | 7.833       | 4.06    |            | 2.03  |
| 1.756           |         | 4.833 |          | 7.917       | 4.06    |            | 2.03  |
| 1.83            |         | 4.917 |          | 8.000       | 4.06    |            | 1.02  |
| 1.917           |         | 5.000 | 4.06     |             | 3.05    |            | 1.02  |
| 2.000           |         | 5.083 |          | 8.167       | 3.05    |            | 1.02  |
| 2.083           |         | 5.167 | 3.05     |             | 3.05    |            | 1.02  |
| 2.167           |         | 5.250 |          | 8.333       | 2.03    |            | 1.02  |
| 2.256           |         | 5.333 |          | 8.417       | 2.03    |            | 1.02  |
| 2.333<br>2.417  |         | 5.417 | 7.11     | 8.500       | 2.03    |            | 1.02  |
| 2.506           |         | 5.583 |          | 8.667       | 2.03    |            | 1.02  |
| 2.583           |         | 5.667 |          | 8.750       | 2.03    |            | 1.02  |
| 2.667           |         | 5.750 |          | 8.833       | 3.05    |            | 1.02  |
| 2.756           |         | 5.833 |          | 8.917       | 3.05    |            | 1.02  |
| 2.833           |         |       | 49.78    |             | 3.05    |            | 1.02  |
| 2.917           |         | 6.000 |          | 9.083       | 2.03    |            | 1.02  |
| 3.000           |         |       |          | 9.167       | 2.03    |            | 1.02  |
| 3.083           |         | 6.167 |          | 9.250       | 2.03    |            | 1.02  |
| Max.Eff.Inten.( | nm/hr)= | 49.78 |          | 27.57       |         |            |       |
| over            | (min)   | 5.00  |          | 20.00       |         |            |       |
| Storage Coeff.  | (min)=  | 6.79  | (ii)     | 16.53 (ii)  |         |            |       |
| Unit Hyd. Tpeak | (min)=  | 5.00  |          | 20.00       |         |            |       |
| Unit Hyd. peak  | (cms)=  | 0.18  |          | 0.06        |         |            |       |
| DEAK FLOW       | (ama)   | 0.05  |          | 0.01        |         | TALS*      |       |
| PEAK FLOW       | (cms)=  | 0.05  |          | 0.01        | 0.      | .068 (iii) |       |
|                 |         |       | Page     | 42          |         |            |       |

| Lang                   | staffRd E | A Exist: | ing_WestDon | Waters | hd         |      |
|------------------------|-----------|----------|-------------|--------|------------|------|
| 1.917 1.02             | I 5.000   | 4.06     |             | 3.05   | 11.17      | 1.02 |
| 2.000 1.02             | 5.083     | 3.05     | 8.167       | 3.05   | 11.25      | 1.02 |
| 2.083 1.02             | 5.167     | 3.05     | 8.250       | 3.05   | 11.33      | 1.02 |
| 2.167 1.02             | 5.250     | 3.05     | 8.333       | 2.03   | 11.42      | 1.02 |
| 2.250 1.02             | 5.333     | 7.11     | 8.417       | 2.03   | 11.50      | 1.02 |
| 2.333 2.03             | 5.417     | 7.11     | 8.500       | 2.03   | 11.58      | 1.02 |
| 2.417 2.03             | 5.500     | 7.11     | 8.583       | 2.03   | 11.67      | 1.02 |
| 2.500 2.03             | 5.583     | 7.11     | 8.667       | 2.03   | 11.75      | 1.02 |
| 2.583 2.03             | 5.667     | 7.11     | 8.750       | 2.03   | 11.83      | 1.02 |
| 2.667 2.03             | 5.750     | 7.11     | 8.833       | 3.05   | 11.92      | 1.02 |
| 2.750 2.03             | 5.833     | 49.78    | 8.917       | 3.05   | 12.00      | 1.02 |
| 2.833 2.03             | 5.917     | 49.78    | 9.000       | 3.05   | 12.08      | 1.02 |
| 2.917 2.03             | 6.000     | 49.78    | 9.083       | 2.03   | 12.17      | 1.02 |
| 3.000 2.03             | 6.083     | 49.78    | 9.167       | 2.03   | 12.25      | 1.02 |
| 3.083 2.03             | 6.167     | 49.78    | 9.250       | 2.03   |            |      |
| Max.Eff.Inten.(mm/hr)= | 49.78     |          | 29.56       |        |            |      |
| over (min)             | 5.00      |          | 20.00       |        |            |      |
| Storage Coeff. (min)=  |           |          | 15.45 (ii)  |        |            |      |
| Unit Hyd. Tpeak (min)= | 5.00      |          | 20.00       |        |            |      |
| Unit Hyd. peak (cms)=  | 0.18      |          | 0.07        |        |            |      |
| onic nya. peak (cms)=  | 0.10      |          | 0.07        | *T01   | TALS*      |      |
| PEAK FLOW (cms)=       | 0.07      |          | 0.02        | 0.     | .086 (iii) |      |
| TIME TO PEAK (hrs)=    | 6.25      |          | 6.42        |        | 5.25       |      |
| RUNOFF VOLUME (mm)=    | 53.37     |          | 24.78       | 39     | 9.92       |      |
| TOTAL RAINFALL (mm)=   | 55.37     |          | 55.37       | 55     | 5.37       |      |
| RUNOFF COEFFICIENT =   | 0.96      |          | 0.45        | 6      | 9.72       |      |

-----

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0475)   |      |       |       |       |
|-------------------|------|-------|-------|-------|
| 1 + 2 = 3         | AREA | QPEAK | TPEAK | R.V.  |
|                   | (ha) | (cms) | (hrs) | (mm)  |
| ID1= 1 ( 0225):   | 0.90 | 0.086 | 6.25  | 39.92 |
| + ID2= 2 ( 0230): | 0.70 | 0.068 | 6.25  | 40.33 |
|                   |      |       |       |       |
| ID = 3 ( 0475):   | 1.60 | 0.154 | 6.25  | 40.10 |
|                   |      |       |       |       |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB             |           |          |         |           |       |
|-------------------|-----------|----------|---------|-----------|-------|
| STANDHYD ( 0220)  | Area (    | ha)= 0.  | 65      |           |       |
| ID= 1 DT= 5.0 min | Total Imp | (%)= 46. | 00 Dir. | Conn.(%)= | 46.00 |
|                   |           |          |         |           |       |

# LangstaffRd\_EA\_Existing\_WestDonWatershd IMPERVIOUS PERVIOUS (i)

| Surface Area  | (ha)= | 0.30   | 0.35  |
|---------------|-------|--------|-------|
| Dep. Storage  | (mm)= | 2.00   | 5.00  |
| Average Slope | (%)=  | 1.00   | 2.00  |
| Length        | (m)=  | 260.00 | 20.00 |
| Mannings n    | =     | 0.013  | 0.250 |
|               |       |        |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250   | 49.78 | 9.33  | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333   | 9.14  | 9.42  | 1.02  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417   | 9.14  | 9.50  | 1.02  |
| 0.333 | 1.02  | 3.417 | 3.05     | 6.500   | 9.14  | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05     | 6.583   | 10.16 | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03     | 6.667   | 10.16 | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03     | 6.750   | 10.16 | 9.83  | 2.03  |
| 0.667 | 1.02  | 3.750 | 2.03     | 6.833   | 5.08  | 9.92  | 2.03  |
| 0.750 | 1.02  | 3.833 | 2.03     | 6.917   | 5.08  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 2.03     | 7.000   | 5.08  | 10.08 | 1.02  |
| 0.917 | 1.02  | 4.000 | 2.03     | 7.083   | 4.06  | 10.17 | 1.02  |
| 1.000 | 1.02  | 4.083 | 2.03     | 7.167   | 4.06  | 10.25 | 1.02  |
| 1.083 | 1.02  | 4.167 | 2.03     | 7.250   | 4.06  | 10.33 | 1.02  |
| 1.167 | 1.02  | 4.250 | 2.03     | 7.333   | 3.05  | 10.42 | 1.02  |
| 1.250 | 1.02  | 4.333 | 4.06     | 7.417   | 3.05  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 4.06     | 7.500   | 3.05  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 4.06     | 7.583   | 3.05  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 4.06     | 7.667   | 3.05  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 4.06     | 7.750   | 3.05  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 4.06     | 7.833   | 4.06  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 4.06     | 7.917   | 4.06  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 4.06     | 8.000   | 4.06  | 11.08 | 1.02  |
| 1.917 | 1.02  | 5.000 | 4.06     | 8.083   | 3.05  | 11.17 | 1.02  |
| 2.000 | 1.02  | 5.083 | 3.05     | 8.167   | 3.05  | 11.25 | 1.02  |
| 2.083 | 1.02  | 5.167 | 3.05     | 8.250   | 3.05  | 11.33 | 1.02  |
| 2.167 | 1.02  | 5.250 | 3.05     | 8.333   | 2.03  | 11.42 | 1.02  |
| 2.250 | 1.02  | 5.333 | 7.11     | 8.417   | 2.03  | 11.50 | 1.02  |
| 2.333 | 2.03  | 5.417 | 7.11     | 8.500   | 2.03  | 11.58 | 1.02  |
| 2.417 | 2.03  | 5.500 | 7.11     | 8.583   | 2.03  | 11.67 | 1.02  |
| 2.500 | 2.03  | 5.583 | 7.11     | 8.667   | 2.03  | 11.75 | 1.02  |
| 2.583 | 2.03  | 5.667 | 7.11     | 8.750   | 2.03  | 11.83 | 1.02  |
| 2.667 | 2.03  | 5.750 | 7.11     | 8.833   | 3.05  | 11.92 | 1.02  |
| 2.750 | 2.03  | 5.833 | 49.78    | 8.917   | 3.05  | 12.00 | 1.02  |
| 2.833 | 2.03  | 5.917 | 49.78    | 9.000   | 3.05  | 12.08 | 1.02  |
| 2.917 | 2.03  | 6.000 | 49.78    | 9.083   | 2.03  | 12.17 | 1.02  |
| 3.000 | 2.03  | 6.083 | 49.78    | 9.167   | 2.03  | 12.25 | 1.02  |
| 3.083 | 2.03  | 6.167 | 49.78    | 9.250   | 2.03  |       |       |
|       |       |       |          |         |       |       |       |

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Max.Eff.Inten.(mm/hr)= over (min)

|   | Lange                        | +~EED4 F                         | A F., dated         | na Heat          | Danilahana  | L al     |      |
|---|------------------------------|----------------------------------|---------------------|------------------|---|----------|------|
| 4 500   | Langs                        | LATTRU_E                         | W_EXIZE             | ing_west         | DonWaters   | 10 75    | 4 00 |
| 1.500   | 1.02                         | 4.583                            | 4.06                | 7.667            | 3.05  | 10.75    | 1.02 |
| 1.583   | 2.03                         | 4.66/                            | 4.06                | /./50            | 3.05  | 10.83    | 2.03 |
| 1.667   | 2.03                         | 4.750                            | 4.06                | 7.833            | 4.06  | 10.92    | 2.03 |
| 1.750   | 2.03                         | 4.833                            | 4.06                | 7.917            | 4.06  | 11.00    | 2.03 |
| 1.833   | 1.02                         | 4.917                            | 4.06                | 8.000            | 4.06  | 11.08    | 1.02 |
| 1.917   | 1.02                         | 5.000                            | 4.06                | 8.083            | 3.05  | 11.17    | 1.02 |
| 2.000   | 1.02                         | 5.083                            | 3.05                | 8.167            | 3.05  | 11.25    | 1.02 |
| 2.083   | 1.02                         | 5.167                            | 3.05                | 8.250            | 3.05  | 11.33    | 1.02 |
| 2.167   | 1.02                         | 5.250                            | 3.05                | 8.333            | 2.03  | 11.42    | 1.02 |
| 2.250   | 1.02                         | 5.333                            | 7.11                | 8.417            | 2.03  | 11.50    | 1.02 |
| 2.333   | 2.03 İ                       | 5.417                            | 7.11                | 8.500            | 2.03  | 11.58    | 1.02 |
| 2.417   | 2.03                         | 5.500                            | 7.11                | 8.583            | 2.03  | 11.67    | 1.02 |
| 2 500   | 2 03                         | 5 583                            | 7 11                | 8 667            | 2 03  | 11 75    | 1 02 |
| 2 583   | 2 03                         | 5 667                            | 7 11                | 8 750            | 2 03  | 11 83    | 1 02 |
| 2.505   | 2.03                         | 5.007<br>E 7EA                   | 7 11                | 0.750            | 2.05  | 11.03    | 1.02 |
| 2.007   | 2.03                         | E 000                            | 40.70               | 0.033            | 3.05  | 12.00    | 1.02 |
| 2.730   | 2.03                         | 5.033                            | 40.70               | 0.517            | 3.03  | 12.00    | 1.02 |
| 2.033   | 2.03                         | 5.917                            | 49.76               | 9.000            | 3.05  | 12.00    | 1.02 |
| 2.91/   | 2.03                         | 6.000                            | 49.78               | 9.083            | 2.03  | 12.1/    | 1.02 |
| 3.000   | 2.03                         | 6.083                            | 49.78               | 9.16/            | 2.03  | 12.25    | 1.02 |
| 3.083   | 2.03                         | 6.167                            | 49.78               | 9.250            | DonWatersi 3.05 3.05 3.05 4.06 4.06 4.06 3.05 3.05 3.05 3.05 3.05 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03 |          |      |
| Max.Eff.Inten.(mm/<br>over (m<br>Storage Coeff. (m<br>Unit Hyd. Tpeak (m<br>Unit Hyd. peak (co  | hr)=                         | 49.78                            |                     | 29.56            |   |          |      |
| over (m   | in)                          | 5.00                             |                     | 20.00            |   |          |      |
| Storage Coeff (m  | in)=                         | 5 99                             | (ii)                | 15 66 (i         | ii)   |          |      |
| Unit Hyd Theak (m   | in)-                         | 5 00                             | (11)                | 20.00 (2         | /   |          |      |
| Unit Hyd. Tpeak (m  | mc)-                         | 0.10                             |                     | 0.00             |   |          |      |
|   |                              |                                  |                     |                  |   | ALS*     |      |
| DEAK FLOW (a)   |                              | 0.05                             |                     | 0.01             | 101   | ALS /iii | `    |
| TIME TO DEAK (L   | ms)-                         | 6.05                             |                     | 6.01             | ٠.  | 058 (iii | ,    |
| TIME TO PEAK (II  | 1.2)=                        | 0.25                             |                     | 0.42             |   | 0.25     |      |
| KUNUFF VULUME (   | mm)=                         | 53.37                            |                     | 24./8            | 41  | 1.06     |      |
| PEAK FLOW (CI<br>TIME TO PEAK (h<br>RUNOFF VOLUME (I<br>TOTAL RAINFALL (I<br>RUNOFF COEFFICIENT | mm ) =                       | 55.37                            |                     | 55.3/            | 55  | 3.37     |      |
| RUNOFF COEFFICIENT  | =                            | 0.96                             |                     | 0.45             | 6   | 1.74     |      |
| (i) CN PROCEDURE<br>CN* = 83.<br>(ii) TIME STEP (D<br>THAN THE STO<br>(iii) PEAK FLOW DO        | 0 Ia<br>T) SHOUL<br>RAGE COE | = Dep. S<br>D BE SMA<br>FFICIENT | storage<br>ALLER OR | (Above)<br>EQUAL |   |          |      |
| (111) . E.M LOW DO  | 1                            |                                  |                     |                  |   |          |      |
|   |                              |                                  |                     |                  |   |          |      |
|   |                              |                                  |                     |                  |   |          |      |
| ADD HVD ( 9479)   |                              |                                  |                     |                  |   |          |      |
| 1 + 2 = 3   | ΛR                           | FΔ OF                            | PFΔK .              | TΡΕΔΚ            | R V   |          |      |
| ID1= 1 ( 0215)  | An<br>/h                     | 12) (c                           | ruc)                | (hre)            | (mm)  |          |      |
| TD1= 1 ( 031E)  |                              | 10 p                             | .1115 /             | (111.2)          | 41 06   |          |      |
| 101= 1 ( 0215)  | . 0.                         | 50 0.0                           | 100                 | 0.25             | 41.00   |          |      |
| + ID2= 2 ( 0220)  |                              |                                  |                     |                  |   |          |      |
| ID = 3 ( 0470)  |                              |                                  |                     |                  |   |          |      |
| NOTE: DEAK TOOLS  | DO NOT -                     | NCLUBE -                         |                     | c                | ,   |          |      |
| NOTE: PEAK FLOWS  | DO NOT I                     | NCLUDE B                         | SASEFLOW:           | > 1F AN          | r.<br>  |          |      |
|   |                              |                                  |                     |                  |   |          |      |

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|                  | Langst | affRd_EA_Exis | ting_WestDonW | latershd    |
|------------------|--------|---------------|---------------|-------------|
| Storage Coeff.   | (min)= | 5.99 (ii)     | 13.57 (ii)    |             |
| Unit Hyd. Tpeak  | (min)= | 5.00          | 15.00         |             |
| Unit Hyd. peak   | (cms)= | 0.19          | 0.08          |             |
|                  |        |               |               | *TOTALS*    |
| PEAK FLOW        | (cms)= | 0.04          | 0.02          | 0.061 (iii) |
| TIME TO PEAK     | (hrs)= | 6.25          | 6.33          | 6.25        |
| RUNOFF VOLUME    | (mm)=  | 53.37         | 24.78         | 37.92       |
| TOTAL RAINFALL   | (mm)=  | 55.37         | 55.37         | 55.37       |
| RUNOFF COEFFICIE | ENT =  | 0.96          | 0.45          | 0.68        |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
   CN\* = 83.0 Ia = Dep. Storage (Above)
  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
   THAN THE STORAGE COFFFICIENT.
  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |         |       |        |           |       |  |
|-------------------|-------|---------|-------|--------|-----------|-------|--|
| STANDHYD ( 0215)  | Area  | (ha)=   | 0.58  |        |           |       |  |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 57.00 | Dir.   | Conn.(%)= | 57.00 |  |
|                   |       |         |       |        |           |       |  |
|                   |       | IMPERVI | OUS   | PERVIO | JS (i)    |       |  |
| Surface Area      | (ha)= | 0.3     | 3     | 0.2    | 5         |       |  |
| Dep. Storage      | (mm)= | 2.0     | 0     | 5.00   | 9         |       |  |
| Average Slope     | (%)=  | 1.0     | 0     | 2.00   | 9         |       |  |
| Length            | (m)=  | 260.0   | 0     | 30.00  | 9         |       |  |
| Mannings n        | ` =   | 0.01    | 3     | 0.25   | 9         |       |  |
|                   |       |         |       |        |           |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       |       | NCFORME | LIVETOCE |       |       |       |
|-------|-------|-------|---------|----------|-------|-------|-------|
|       |       |       |         | HYETOGR  |       |       |       |
| TIME  | RAIN  | TIME  | RAIN    | ' TIME   | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr   | ' hrs    | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03    | 6.250    | 49.78 | 9.33  | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03    | 6.333    | 9.14  | 9.42  | 1.02  |
| 0.250 | 0.00  | 3.333 | 3.05    | 6.417    | 9.14  | 9.50  | 1.02  |
| 0.333 | 1.02  | 3.417 | 3.05    | 6.500    | 9.14  | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05    | 6.583    | 10.16 | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03    | 6.667    | 10.16 | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03    | 6.750    | 10.16 | 9.83  | 2.03  |
| 0.667 | 1.02  | 3.750 | 2.03    | 6.833    | 5.08  | 9.92  | 2.03  |
| 0.750 | 1.02  | 3.833 | 2.03    | 6.917    | 5.08  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 2.03    | 7.000    | 5.08  | 10.08 | 1.02  |
| 0.917 | 1.02  | 4.000 | 2.03    | 7.083    | 4.06  | 10.17 | 1.02  |
| 1.000 | 1.02  | 4.083 | 2.03    | 7.167    | 4.06  | 10.25 | 1.02  |
| 1.083 | 1.02  | 4.167 | 2.03    | 7.250    | 4.06  | 10.33 | 1.02  |
| 1.167 | 1.02  | 4.250 | 2.03    | 7.333    | 3.05  | 10.42 | 1.02  |
| 1.250 | 1.02  | 4.333 | 4.06    | 7.417    | 3.05  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 4.06    | 7.500    | 3.05  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 4.06    | 7.583    | 3.05  | 10.67 | 1.02  |
|       |       |       |         |          |       |       |       |

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 ${\tt LangstaffRd\_EA\_Existing\_WestDonWatershd}$ 

| ADD HYD ( 0480)   | AREA | QPEAK | TPEAK | R.V.  |
|-------------------|------|-------|-------|-------|
| 1 + 2 = 3         | (ha) | (cms) | (hrs) | (mm)  |
| ID1= 1 ( 0470):   | 1.23 | 0.119 | 6.25  | 39.40 |
| + ID2= 2 ( 0475): | 1.60 | 0.154 | 6.25  | 40.10 |
| ID = 3 ( 0480):   | 2.83 | 0.272 | 6.25  | 39.80 |

| NOTE: PEAK FLOW   | טעו טע פ                            | INCLUDE  | DASEFI        | LOWS IF ANT.   |       |  |
|---|-------------------------------------|--|---------------|--|-------|--|
| CALIB  <br>  STANDHYD ( 0160) <br> ID= 1 DT= 5.0 min                  | Area<br>Total                       | (ha)=<br>Imp(%)=                                   | 0.43<br>56.00 | Dir. Conn.(%)=   | 56.00 |  |
| Surface Area<br>Dep. Storage<br>Average Slope<br>Length<br>Mannings n | (ha)=<br>(mm)=<br>(%)=<br>(m)=<br>= | IMPERVIO<br>0.2-<br>2.00<br>1.00<br>260.00<br>0.01 | 4<br>0<br>0   | PERVIOUS (i)<br>0.19<br>5.00<br>2.00<br>20.00<br>0.250 |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250   | 49.78 | 9.33  | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333   | 9.14  | 9.42  | 1.02  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417   | 9.14  | 9.50  | 1.02  |
| 0.333 | 1.02  | 3.417 | 3.05     | 6.500   | 9.14  | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05     | 6.583   | 10.16 | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03     | 6.667   | 10.16 | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03     | 6.750   | 10.16 | 9.83  | 2.03  |
| 0.667 | 1.02  | 3.750 | 2.03     | 6.833   | 5.08  | 9.92  | 2.03  |
| 0.750 | 1.02  | 3.833 | 2.03     | 6.917   | 5.08  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 2.03     | 7.000   | 5.08  | 10.08 | 1.02  |
| 0.917 | 1.02  | 4.000 | 2.03     | 7.083   | 4.06  | 10.17 | 1.02  |
| 1.000 | 1.02  | 4.083 | 2.03     | 7.167   | 4.06  | 10.25 | 1.02  |
| 1.083 | 1.02  | 4.167 | 2.03     | 7.250   | 4.06  | 10.33 | 1.02  |
| 1.167 | 1.02  | 4.250 | 2.03     | 7.333   | 3.05  | 10.42 | 1.02  |
| 1.250 | 1.02  | 4.333 | 4.06     | 7.417   | 3.05  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 4.06     | 7.500   | 3.05  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 4.06     | 7.583   | 3.05  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 4.06     | 7.667   | 3.05  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 4.06     | 7.750   | 3.05  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 4.06     | 7.833   | 4.06  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 4.06     | 7.917   | 4.06  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 4.06     | 8.000   | 4.06  | 11.08 | 1.02  |
| 1.917 | 1.02  | 5.000 | 4.06     | 8.083   | 3.05  | 11.17 | 1.02  |

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|                  | Langs    | taffRd_E | A_Exist | ing_WestDon | Waters | hd         |      |
|------------------|----------|----------|---------|-------------|--------|------------|------|
| 2.000            | 1.02     | 5.083    | 3.05    | 8.167       | 3.05   | 11.25      | 1.02 |
| 2.083            | 1.02     | 5.167    | 3.05    | 8.250       | 3.05   | 11.33      | 1.02 |
| 2.167            | 1.02     | 5.250    | 3.05    | 8.333       | 2.03   | 11.42      | 1.02 |
| 2.250            | 1.02     | 5.333    | 7.11    | 8.417       | 2.03   | 11.50      | 1.02 |
| 2.333            | 2.03     | 5.417    | 7.11    | 8.500       | 2.03   | 11.58      | 1.02 |
| 2.417            | 2.03     | 5.500    | 7.11    | 8.583       | 2.03   | 11.67      | 1.02 |
| 2.500            | 2.03     | 5.583    | 7.11    | 8.667       | 2.03   | 11.75      | 1.02 |
| 2.583            | 2.03     | 5.667    | 7.11    | 8.750       | 2.03   | 11.83      | 1.02 |
| 2.667            | 2.03     | 5.750    | 7.11    | 8.833       | 3.05   | 11.92      | 1.02 |
| 2.750            | 2.03     | 5.833    | 49.78   | 8.917       | 3.05   | 12.00      | 1.02 |
| 2.833            | 2.03     | 5.917    | 49.78   | 9.000       | 3.05   | 12.08      | 1.02 |
| 2.917            | 2.03     | 6.000    | 49.78   | 9.083       | 2.03   | 12.17      | 1.02 |
| 3.000            | 2.03     | 6.083    | 49.78   | 9.167       | 2.03   | 12.25      | 1.02 |
| 3.083            | 2.03     | 6.167    | 49.78   | 9.250       | 2.03   | ĺ          |      |
| Max.Eff.Inten.(m | m/hn)_   | 49.78    |         | 36.58       |        |            |      |
| over             |          | 5.00     |         | 15.00       |        |            |      |
|                  | (min)=   |          | (ii)    | 12.95 (ii)  |        |            |      |
| Unit Hyd. Tpeak  |          | 5.00     | (11)    | 15.00       |        |            |      |
|                  | (mii)-   | 0.19     |         | 0.08        |        |            |      |
| onite nyu. peak  | (CIIIS)- | 0.15     |         | 0.00        | ****   | TALS*      |      |
| PEAK FLOW        | (cms)=   | 0.03     |         | 0.01        |        | .047 (iii) |      |
|                  | (hrs)=   | 6.25     |         | 6.33        |        | 6.25       |      |
| RUNOFF VOLUME    | (mm)=    | 53.37    |         | 31.03       |        | 3.53       |      |
| TOTAL RAINFALL   | (mm)=    | 55.37    |         | 55.37       |        | 5.37       |      |
| RUNOFF COEFFICIE |          | 0.96     |         | 0.56        |        | 0.79       |      |
| NUMBER COEFFICIE | IV I =   | 0.96     |         | 0.30        | ,      | 0.75       |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 89.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

Area (ha)= 0.56 Total Imp(%)= 45.00 Dir. Conn.(%)= 45.00 IMPERVIOUS PERVIOUS (i) Surface Area Dep. Storage Average Slope 0.25 2.00 1.00 260.00 0.013 0.31 5.00 2.00 25.00 0.290 (mm)= (%)= (m)= Mannings n

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ---RAIN | TIME RAIN | TIME RAIN | TIME
mm/hr | hrs mm/hr | hrs mm/hr | hrs

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(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

AREA (ha) 0.56 QPEAK (cms) 0.055 0.047 TPEAK (hrs) 6.25 R.V. (mm) 39.80 ID1= 1 ( 0155): + ID2= 2 ( 0160): 0.43 6.25 43.53 ID = 3 ( 0430): 0.99 0.102 6.25 41.42

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB ' STANDHYD ( 0150) Area (ha)= 3.81 Total Imp(%)= 94.00 Dir. Conn.(%)= 94.00 |ID= 1 DT= 5.0 min | IMPERVIOUS 3.58 2.00 1.00 PERVIOUS (i) 0.23 5.00 2.00 (ha)= (mm)= (%)= (m)= Surface Area Dep. Storage Average Slope Length 150.00 40.00 Mannings n 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TRANSFORMED HYETOGRAPH ---
IME RAIN TIME RAIN TIME

INS mm/hr mes mm/hr hrs

167 2.03 6.259 49.78 9.33

250 2.03 6.333 9.14 9.42

333 3.05 6.417 9.14 9.59

417 3.05 6.590 9.14 9.58

500 3.05 6.583 10.16 9.67 RAIN | TIME TIME MAIN | 1...mm/hr | hrs.mm/hr | hrs.mm/hr | hrs.mm/hr | hrs.mm/hr | hrs.mm/hr | hrs.mm/hr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.mhr | hrs.m mm/hr | 0.00 | 0.00 | 0.00 | 1.02 | 1.02 | hrs 0.083 hrs 3.167 mm/hr 1.02 0.167 0.250 0.333 0.417 0.500 0.583 9.33 9.42 9.50 9.58 9.67 9.75 9.83 3.250 3.333 3.417 3.500 3.583 1.02 1.02 2.03 2.03 2.03 10.16 10.16 1.02 3.667 3.750 2.03 0.667 1.02 5.08 9.92 2.03 0.750 3.833 2.03 1.02 | 3.833 1.02 | 3.917 1.02 | 4.000 1.02 | 4.083 1.02 | 4.167 1.02 | 4.250 1.02 | 4.417 1.02 | 4.500 1.02 | 4.583 5.08 5.08 4.06 4.06 4.06 3.05 3.05 | 3.05 | 3.05 | 0.833 0.917 1.000 1.083 1.02 1.02 1.02 1.02 1.02 1.167 10.42 1.250 10.50 1.02 1.333 10.58 1.02 1 417 1 02

|                  |         |       |              | ing_WestDo |       |            |      |
|------------------|---------|-------|--------------|------------|-------|------------|------|
| 0.083            |         |       |              |            | 49.78 |            | 1.02 |
| 0.16             |         | 3.250 | 2.03         |            | 9.14  |            | 1.02 |
| 0.250            |         |       |              |            | 9.14  |            | 1.02 |
| 0.33             |         | 3.417 | 3.05         |            | 9.14  |            | 2.03 |
| 0.41             |         | 3.500 | 3.05         |            | 10.16 |            | 2.03 |
| 0.500            |         | 3.583 | 2.03         |            | 10.16 |            | 2.03 |
| 0.583            |         |       | 2.03         |            | 10.16 |            | 2.03 |
| 0.66             |         |       | 2.03         |            | 5.08  |            | 2.03 |
| 0.750            |         |       | 2.03         |            | 5.08  |            | 2.03 |
| 0.83             |         |       | 2.03         |            | 5.08  |            | 1.02 |
| 0.91             |         | 4.000 | 2.03         |            | 4.06  |            | 1.02 |
| 1.000            |         | 4.083 | 2.03         |            | 4.06  |            | 1.02 |
| 1.08             |         |       | 2.03         |            | 4.06  |            | 1.02 |
| 1.16             |         | 4.250 | 2.03         |            | 3.05  |            | 1.02 |
| 1.250            |         | 4.333 | 4.06         |            | 3.05  |            | 1.02 |
| 1.33             |         | 4.417 | 4.06         |            | 3.05  |            | 1.02 |
| 1.41             |         | 4.500 | 4.06         |            | 3.05  |            | 1.02 |
| 1.500            |         | 4.583 | 4.06         |            | 3.05  |            | 1.02 |
| 1.58             |         | 4.667 | 4.06         |            | 3.05  |            | 2.03 |
| 1.66             |         | 4.750 | 4.06         |            | 4.06  |            | 2.03 |
| 1.750            |         | 4.833 | 4.06         |            | 4.06  |            | 2.03 |
| 1.83             |         | 4.917 | 4.06         |            | 4.06  |            | 1.02 |
| 1.91             |         | 5.000 | 4.06         |            | 3.05  |            | 1.02 |
| 2.000            |         |       | 3.05         |            | 3.05  |            | 1.02 |
| 2.08             |         |       | 3.05         |            | 3.05  |            | 1.02 |
| 2.16             |         |       | 3.05         |            | 2.03  |            | 1.02 |
| 2.256            |         |       | 7.11<br>7.11 | 8.417      | 2.03  |            | 1.02 |
| 2.41             |         |       | 7.11         |            | 2.03  |            | 1.02 |
| 2.500            |         | 5.500 | 7.11         |            | 2.03  |            | 1.02 |
| 2.58             |         | 5.667 | 7.11         |            | 2.03  |            | 1.02 |
| 2.66             |         | 5.750 |              | 8.833      | 3.05  |            | 1.02 |
| 2.756            |         |       | 49.78        |            | 3.05  |            | 1.02 |
| 2.83             |         | 5.917 | 49.78        |            | 3.05  |            | 1.02 |
| 2.91             |         | 6.000 | 49.78        |            | 2.03  |            | 1.02 |
| 3.000            |         | 6.083 |              |            |       | 12.17      | 1.02 |
| 3.08             |         | 6.167 | 49.78        |            | 2.03  |            | 1.02 |
| 5.00.            | 2.03    | 0.107 | 45.70        | 7 3.230    | 2.03  | '          |      |
| Max.Eff.Inten.(r | nm/hr)= | 49.78 |              | 34.06      |       |            |      |
|                  | (min)   | 5.00  |              | 15.00      |       |            |      |
| Storage Coeff.   | (min)=  | 5.99  | (ii)         | 14.94 (ii) |       |            |      |
| Unit Hyd. Tpeak  | (min)=  | 5.00  | . ,          | 15.00      |       |            |      |
| Unit Hyd. peak   | (cms)=  | 0.19  |              | 0.08       |       |            |      |
|                  |         |       |              |            | *T0   | TALS*      |      |
| PEAK FLOW        | (cms)=  | 0.03  |              | 0.02       | 0     | .055 (iii) | 1    |
| TIME TO PEAK     | (hrs)=  | 6.25  |              | 6.33       |       | 5.25       |      |
| RUNOFF VOLUME    | (mm)=   | 53.37 |              | 28.73      |       | 9.80       |      |
| TOTAL RAINFALL   | (mm)=   | 55.37 |              | 55.37      |       | 5.37       |      |
| RUNOFF COEFFICIE | NT =    | 0.96  |              | 0.52       | (     | 3.72       |      |
|                  |         |       |              |            |       |            |      |

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  $CN^* = 87.0$  Ia = Dep. Storage (Above)

```
LangstaffRd_EA_Existing_WestDd
2.03 | 4.667 | 4.06 | 7.750
2.03 | 4.750 | 4.06 | 7.833
2.03 | 4.833 | 4.06 | 7.917
                                    1.583
1.667
1.750
                                                                                                                                    4.06
                                                                                                                                                                         2.03
                                                                                                                                                   11.00
                                     1.833
                                                          1.02
                                                                         4.917
                                                                                                               8.000
                                    1.833
1.917
2.000
2.083
2.167
2.250
2.333
2.417
                                                          1.02
                                                                         5.000
                                                                                               4.06
                                                                                                               8.083
8.167
                                                                                                                                    3.05
                                                                                                                                                   11.17
                                                                                                                                                                         1.02
                                                          1 02
                                                                          5 083
                                                                                               3 05
                                                         1.02
1.02
1.02
1.02
2.03
2.03
2.03
                                                                         5.167
5.250
5.333
5.417
                                                                                                              8.167
8.250
8.333
8.417
8.500
8.583
                                                                                                                                                   11.25
11.33
11.42
11.50
11.58
                                                                                                                                                                         1.02
1.02
1.02
1.02
1.02
                                                                          5.500
5.583
                                                                                               7.11
                                                                                                                                    2.03
                                                                                                                                                    11.67
                                     2.500
                                                                                               7.11
                                                                                                               8.667
                                                                                                                                    2.03
                                                                                                                                                                         1.02
                                     2.500
2.583
2.667
2.750
2.833
2.917
                                                         2.03
2.03
2.03
2.03
2.03
2.03
2.03
                                                                         5.583
5.667
5.750
5.833
5.917
6.000
6.083
                                                                                                             8.667
8.750
8.833
8.917
9.000
9.083
9.167
9.250
                                                                                                                                   2.03
3.05
3.05
3.05
2.03
2.03
                                                                                                                                                   11.75
11.83
11.92
12.00
12.08
12.17
12.25
                                                                                                                                                                         1.02
1.02
1.02
1.02
1.02
1.02
                                                                                               7.11
                                                                                            7.11
7.11
49.78
49.78
49.78
49.78
                                    3.083
                                                                         6.167
                                                                                            49.78
          Max.Eff.Inten.(mm/hr)=

over (min)

Storage Coeff. (min)=

Unit Hyd. Tpeak (min)=

Unit Hyd. peak (cms)=
                                                                            49.78
                                                                                                           35.30
                                                                              5.00
4.31 (ii)
5.00
0.23
                                                                                                          10.00
7.41 (ii)
10.00
                                                                                                            0.13
                                                                                                                                         *TOTALS*
                                                                                                                                            0.515 (iii)
6.25
51.96
55.37
                                                                              0.49
           PEAK FLOW
                                                                                                            0.02
6.25
                                                (cms)=
           TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                                              6.25
                                                                            53.37
55.37
0.96
                                                                                                          29.85
55.37
0.54
***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
           (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN* = 88.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COFFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
AREA
(ha)
3.81
0.99
              ID = 3 ( 0440):
                                                                4.80 0.617
                                                                                                        6.25
                                                                                                                            49.79
           NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

#### LangstaffRd\_EA\_Existing\_WestDonWatershd

| CALIB  <br>  STANDHYD ( 0185) <br> ID= 1 DT= 5.0 min |       | (ha)=<br>Imp(%)= 4 | 0.47<br>8.00 | Dir. Conn.(%)= | 48.00 |
|--|-------|--------------------|--------------|----------------|-------|
|  |       |                    |              |                |       |
|  |       | IMPERVIOU:         | S P          | PERVIOUS (i)   |       |
| Surface Area   | (ha)= | 0.23               |              | 0.24           |       |
| Dep. Storage   | (mm)= | 2.00               |              | 5.00           |       |
| Average Slope  | (%)=  | 1.00               |              | 2.00           |       |
| Length   | (m)=  | 240.00             |              | 20.00          |       |
| Mannings n   | =     | 0.013              |              | 0.350          |       |
|  |       |                    |              |                |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250   | 49.78 | 9.33  | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333   | 9.14  | 9.42  | 1.02  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417   | 9.14  | 9.50  | 1.02  |
| 0.333 | 1.02  | 3.417 | 3.05     | 6.500   | 9.14  | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05     | 6.583   | 10.16 | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03     | 6.667   | 10.16 | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03     | 6.750   | 10.16 | 9.83  | 2.03  |
| 0.667 | 1.02  | 3.750 | 2.03     | 6.833   | 5.08  | 9.92  | 2.03  |
| 0.750 | 1.02  | 3.833 | 2.03     | 6.917   | 5.08  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 2.03     | 7.000   | 5.08  | 10.08 | 1.02  |
| 0.917 | 1.02  | 4.000 | 2.03     | 7.083   | 4.06  | 10.17 | 1.02  |
| 1.000 | 1.02  | 4.083 | 2.03     | 7.167   | 4.06  | 10.25 | 1.02  |
| 1.083 | 1.02  | 4.167 | 2.03     | 7.250   | 4.06  | 10.33 | 1.02  |
| 1.167 | 1.02  | 4.250 | 2.03     | 7.333   | 3.05  | 10.42 | 1.02  |
| 1.250 | 1.02  | 4.333 | 4.06     | 7.417   | 3.05  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 4.06     | 7.500   | 3.05  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 4.06     | 7.583   | 3.05  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 4.06     | 7.667   | 3.05  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 4.06     | 7.750   | 3.05  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 4.06     | 7.833   | 4.06  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 4.06     | 7.917   | 4.06  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 4.06     | 8.000   | 4.06  | 11.08 | 1.02  |
| 1.917 | 1.02  | 5.000 | 4.06     | 8.083   | 3.05  | 11.17 | 1.02  |
| 2.000 | 1.02  | 5.083 | 3.05     | 8.167   | 3.05  | 11.25 | 1.02  |
| 2.083 | 1.02  | 5.167 | 3.05     | 8.250   | 3.05  | 11.33 | 1.02  |
| 2.167 | 1.02  | 5.250 | 3.05     | 8.333   | 2.03  | 11.42 | 1.02  |
| 2.250 | 1.02  | 5.333 | 7.11     | 8.417   | 2.03  | 11.50 | 1.02  |
| 2.333 | 2.03  | 5.417 | 7.11     | 8.500   | 2.03  | 11.58 | 1.02  |
| 2.417 | 2.03  | 5.500 | 7.11     | 8.583   | 2.03  | 11.67 | 1.02  |
| 2.500 | 2.03  | 5.583 | 7.11     | 8.667   | 2.03  | 11.75 | 1.02  |
| 2.583 | 2.03  | 5.667 | 7.11     | 8.750   | 2.03  | 11.83 | 1.02  |
| 2.667 | 2.03  | 5.750 | 7.11     | 8.833   | 3.05  | 11.92 | 1.02  |
| 2.750 | 2.03  | 5.833 | 49.78    | 8.917   | 3.05  | 12.00 | 1.02  |
| 2.833 | 2.03  | 5.917 | 49.78    | 9.000   | 3.05  | 12.08 | 1.02  |
| 2.917 | 2.03  | 6.000 | 49.78    | 9.083   | 2.03  | 12.17 | 1.02  |
|       |       |       |          |         |       |       |       |

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|                      | Langst | affRd_E       | A_Exist | ing_WestDon         | Waters | hd    |      |
|----------------------|--------|---------------|---------|---------------------|--------|-------|------|
| 1.083                | 1.02   | 4.167         | 2.03    |                     | 4.06   |       | 1.02 |
| 1.167                | 1.02   | 4.250         | 2.03    | 7.333               | 3.05   | 10.42 | 1.02 |
| 1.250                | 1.02   | 4.333         | 4.06    | 7.417               | 3.05   | 10.50 | 1.02 |
| 1.333                | 1.02   | 4.417         | 4.06    | 7.500               | 3.05   | 10.58 | 1.02 |
| 1.417                | 1.02   | 4.500         | 4.06    | 7.583               | 3.05   | 10.67 | 1.02 |
| 1.500                | 1.02   | 4.583         | 4.06    | 7.667               | 3.05   | 10.75 | 1.02 |
| 1.583                | 2.03   | 4.667         | 4.06    | 7.750               | 3.05   | 10.83 | 2.03 |
| 1.667                | 2.03   | 4.750         | 4.06    | 7.833               | 4.06   | 10.92 | 2.03 |
| 1.750                | 2.03   | 4.833         | 4.06    | 7.917               | 4.06   | 11.00 | 2.03 |
| 1.833                | 1.02   | 4.917         | 4.06    | 8.000               | 4.06   | 11.08 | 1.02 |
| 1.917                | 1.02   | 5.000         | 4.06    | 8.083               | 3.05   | 11.17 | 1.02 |
| 2.000                | 1.02   | 5.083         | 3.05    | 8.167               | 3.05   | 11.25 | 1.02 |
| 2.083                | 1.02   | 5.167         | 3.05    | 8.250               | 3.05   | 11.33 | 1.02 |
| 2.167                | 1.02   | 5.250         | 3.05    | 8.333               | 2.03   | 11.42 | 1.02 |
| 2.250                | 1.02   | 5.333         | 7.11    | 8.417               | 2.03   | 11.50 | 1.02 |
| 2.333                | 2.03   | 5.417         | 7.11    | 8.500               | 2.03   | 11.58 | 1.02 |
| 2.417                | 2.03   | 5.500         | 7.11    | 8.583               | 2.03   | 11.67 | 1.02 |
| 2.500                | 2.03   | 5.583         | 7.11    | 8.667               | 2.03   | 11.75 | 1.02 |
| 2.583                | 2.03   | 5.667         | 7.11    | 8.750               | 2.03   | 11.83 | 1.02 |
| 2.667                | 2.03   | 5.750         | 7.11    | 8.833               | 3.05   | 11.92 | 1.02 |
| 2.750                | 2.03   | 5.833         | 49.78   | 8.917               | 3.05   | 12.00 | 1.02 |
| 2.833                | 2.03   | 5.917         | 49.78   | 9.000               | 3.05   | 12.08 | 1.02 |
| 2.917                | 2.03   | 6.000         | 49.78   | 9.083               | 2.03   | 12.17 | 1.02 |
| 3.000                | 2.03   | 6.083         | 49.78   | 9.167               | 2.03   | 12.25 | 1.02 |
| 3.083                | 2.03   | 6.167         | 49.78   | 9.250               | 2.03   | j     |      |
| M FSS T ( (b         | - \    | 40.70         |         | 20. 42              |        |       |      |
| Max.Eff.Inten.(mm/h  |        | 49.78<br>5.00 |         | 28.42               |        |       |      |
| over (min            |        |               |         | 15.00               |        |       |      |
| Storage Coeff. (min  |        | 2.63<br>5.00  | (11)    | 14.30 (ii)<br>15.00 |        |       |      |
| Unit Hyd. Tpeak (min |        | 9 20          |         | 0 08                |        |       |      |

Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)= \*TOTALS\*
0.054 (iii)
6.25
34.20
55.37 PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 0.03 6.25 53.37 55.37 0.96 0.03 6.33 24.78 55.37 0.45

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0445)| | 1 + 2 = 3 | AREA QPEAK TPEAK R.V. (ha) (cms) (hrs) (mm) 0.65 0.054 6.25 34.20 ID1= 1 ( 0180):

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|                  | Langs   | taffRd E | A Exist | ing WestDon | Watershd     |      |
|------------------|---------|----------|---------|-------------|--------------|------|
| 3.000            | 2.03    | 6.083    | 49.78   | 9.167       | 2.03   12.25 | 1.02 |
| 3.083            | 3 2.03  | 6.167    | 49.78   | 9.250       | 2.03         |      |
| Max.Eff.Inten.(m | nm/hn)_ | 49.78    |         | 25.73       |              |      |
|                  |         |          |         |             |              |      |
| over             | (min)   | 5.00     |         | 20.00       |              |      |
| Storage Coeff.   | (min)=  | 5.71     | (ii)    | 15.52 (ii)  |              |      |
| Unit Hyd. Tpeak  | (min)=  | 5.00     |         | 20.00       |              |      |
| Unit Hyd. peak   | (cms)=  | 0.20     |         | 0.07        |              |      |
|                  |         |          |         |             | *TOTALS*     |      |
| PEAK FLOW        | (cms)=  | 0.03     |         | 0.01        | 0.041 (iii)  |      |
| TIME TO PEAK     | (hrs)=  | 6.25     |         | 6.42        | 6.25         |      |
| RUNOFF VOLUME    | (mm)=   | 53.37    |         | 21.52       | 36.79        |      |
| TOTAL RAINFALL   | (mm)=   | 55.37    |         | 55.37       | 55.37        |      |
| RUNOFF COEFFICIE | ENT =   | 0.96     |         | 0.39        | 0.66         |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 79.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |         |       |                |         |
|-------------------|-------|---------|-------|----------------|---------|
| STANDHYD ( 0180)  | Area  | (ha)=   | 0.65  |                |         |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 33.00 | Dir. Conn.(%)= | = 33.00 |
|                   |       |         |       |                |         |
|                   |       | IMPERVI | OUS   | PERVIOUS (i)   |         |
| Surface Area      | (ha)= | 0.2     | 1     | 0.44           |         |
| Dep. Storage      | (mm)= | 2.0     | 0     | 5.00           |         |
| Average Slope     | (%)=  | 1.0     | 0     | 2.00           |         |
| Length            | (m)=  | 65.8    | 3     | 40.00          |         |
| Mannings n        | =     | 0.01    | 3     | 0.250          |         |
|                   |       |         |       |                |         |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TRANSFORMED HYETOGRAPH |       |       |       |        |       |       |       |  |  |
|------------------------|-------|-------|-------|--------|-------|-------|-------|--|--|
| TIME                   | RAIN  | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |  |
| hrs                    | mm/hr | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |  |
| 0.083                  | 0.00  | 3.167 | 2.03  | 6.250  | 49.78 | 9.33  | 1.02  |  |  |
| 0.167                  | 0.00  | 3.250 | 2.03  | 6.333  | 9.14  | 9.42  | 1.02  |  |  |
| 0.250                  | 0.00  | 3.333 | 3.05  | 6.417  | 9.14  | 9.50  | 1.02  |  |  |
| 0.333                  | 1.02  | 3.417 | 3.05  | 6.500  | 9.14  | 9.58  | 2.03  |  |  |
| 0.417                  | 1.02  | 3.500 | 3.05  | 6.583  | 10.16 | 9.67  | 2.03  |  |  |
| 0.500                  | 1.02  | 3.583 | 2.03  | 6.667  | 10.16 | 9.75  | 2.03  |  |  |
| 0.583                  | 1.02  | 3.667 | 2.03  | 6.750  | 10.16 | 9.83  | 2.03  |  |  |
| 0.667                  | 1.02  | 3.750 | 2.03  | 6.833  | 5.08  | 9.92  | 2.03  |  |  |
| 0.750                  | 1.02  | 3.833 | 2.03  | 6.917  | 5.08  | 10.00 | 2.03  |  |  |
| 0.833                  | 1.02  | 3.917 | 2.03  | 7.000  | 5.08  | 10.08 | 1.02  |  |  |
| 0.917                  | 1.02  | 4.000 | 2.03  | 7.083  | 4.06  | 10.17 | 1.02  |  |  |
| 1.000                  | 1.02  | 4.083 | 2.03  | 7.167  | 4.06  | 10.25 | 1.02  |  |  |

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|   |            |        | Langstaff | Rd_EA_Ex | isting_Wes | tDonWater | shd |
|---|------------|--------|-----------|----------|------------|-----------|-----|
| + | - ID2= 2 ( | 0185): | 0.47      | 0.041    | 6.25       | 36.79     |     |
|   | ID = 3 (   | 0445): | 1.12      | 0.095    | 6.25       | 35.29     |     |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB  <br>  STANDHYD ( 0165) <br> ID= 1 DT= 5.0 min | Area<br>Total | (ha)= 0.6<br>Imp(%)= 40.0 |              | 40.00 |
|--|---------------|---------------------------|--------------|-------|
|  |               | 1 ( )                     |              |       |
|  |               | IMPERVIOUS                | PERVIOUS (i) |       |
| Surface Area   | (ha)=         | 0.24                      | 0.36         |       |
| Dep. Storage   | (mm)=         | 2.00                      | 5.00         |       |
| Average Slope  | (%)=          | 1.00                      | 2.00         |       |
| Length   | (m)=          | 250.00                    | 20.00        |       |
| Mannings n   | =             | 0.013                     | 0.250        |       |
|  |               |                           |              |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| : | KAINFAL                | L WAS I | KANSFURME | : טוט | o.0 MIN. | ITME SIE | :Р.   |       |  |  |
|---|------------------------|---------|-----------|-------|----------|----------|-------|-------|--|--|
|   |                        |         |           |       |          |          |       |       |  |  |
|   | TRANSFORMED HYETOGRAPH |         |           |       |          |          |       |       |  |  |
|   | TIME                   | RAIN    | TIME      | RAIN  | ' TIME   | RAIN     | TIME  | RAIN  |  |  |
|   | hrs                    | mm/hr   | hrs       | mm/hr | ' hrs    | mm/hr    | hrs   | mm/hr |  |  |
|   | 0.083                  | 0.00    | 3.167     | 2.03  | 6.250    | 49.78    | 9.33  | 1.02  |  |  |
|   | 0.167                  | 0.00    | 3.250     | 2.03  | 6.333    | 9.14     | 9.42  | 1.02  |  |  |
|   | 0.250                  | 0.00    | 3.333     | 3.05  | 6.417    | 9.14     | 9.50  | 1.02  |  |  |
|   | 0.333                  | 1.02    | 3.417     | 3.05  | 6.500    | 9.14     | 9.58  | 2.03  |  |  |
|   | 0.417                  | 1.02    |           | 3.05  |          | 10.16    | 9.67  | 2.03  |  |  |
|   | 0.500                  | 1.02    |           | 2.03  |          | 10.16    |       | 2.03  |  |  |
|   | 0.583                  | 1.02    |           | 2.03  |          | 10.16    | 9.83  | 2.03  |  |  |
|   | 0.667                  | 1.02    | 3.750     | 2.03  | 6.833    | 5.08     | 9.92  | 2.03  |  |  |
|   | 0.750                  | 1.02    | 3.833     | 2.03  | 6.917    | 5.08     | 10.00 | 2.03  |  |  |
|   | 0.833                  | 1.02    | 3.917     | 2.03  | 7.000    | 5.08     | 10.08 | 1.02  |  |  |
|   | 0.917                  | 1.02    | 4.000     | 2.03  | 7.083    | 4.06     | 10.17 | 1.02  |  |  |
|   | 1.000                  | 1.02    | 4.083     | 2.03  | 7.167    | 4.06     | 10.25 | 1.02  |  |  |
|   | 1.083                  | 1.02    |           | 2.03  | 7.250    | 4.06     | 10.33 | 1.02  |  |  |
|   | 1.167                  | 1.02    |           | 2.03  | 7.333    | 3.05     | 10.42 | 1.02  |  |  |
|   | 1.250                  | 1.02    |           | 4.06  | 7.417    | 3.05     | 10.50 | 1.02  |  |  |
|   | 1.333                  | 1.02    | 4.417     | 4.06  | 7.500    | 3.05     | 10.58 | 1.02  |  |  |
|   | 1.417                  | 1.02    |           | 4.06  | 7.583    | 3.05     | 10.67 | 1.02  |  |  |
|   | 1.500                  | 1.02    | 4.583     | 4.06  | 7.667    | 3.05     | 10.75 | 1.02  |  |  |
|   | 1.583                  | 2.03    | 4.667     | 4.06  | 7.750    | 3.05     | 10.83 | 2.03  |  |  |
|   | 1.667                  | 2.03    | 4.750     | 4.06  | 7.833    | 4.06     | 10.92 | 2.03  |  |  |
|   | 1.750                  | 2.03    |           | 4.06  | 7.917    | 4.06     | 11.00 | 2.03  |  |  |
|   | 1.833                  | 1.02    | 4.917     | 4.06  |          | 4.06     | 11.08 | 1.02  |  |  |
|   | 1.917                  | 1.02    | 5.000     | 4.06  |          | 3.05     |       | 1.02  |  |  |
|   | 2.000                  | 1.02    | 5.083     | 3.05  | 8.167    | 3.05     | 11.25 | 1.02  |  |  |
|   | 2.083                  | 1.02    | 5.167     | 3.05  | 8.250    | 3.05     | 11.33 | 1.02  |  |  |
|   | 2.167                  | 1.02    | 5.250     | 3.05  | 8.333    | 2.03     | 11.42 | 1.02  |  |  |
|   | 2.250                  | 1.02    | 5.333     | 7.11  | 8.417    | 2.03     | 11.50 | 1.02  |  |  |
|   | 2.333                  | 2.03    | 5.417     | 7.11  | 8.500    | 2.03     | 11.58 | 1.02  |  |  |
|   | 2.417                  | 2.03    | 5.500     | 7.11  | 8.583    | 2.03     | 11.67 | 1.02  |  |  |
|   |                        |         |           |       |          |          |       |       |  |  |

|                  | Langs   | taffRd_E | A_Exist: | ing_WestDon |           |       |      |
|------------------|---------|----------|----------|-------------|-----------|-------|------|
| 2.500            | 0 2.03  | 5.583    | 7.11     | 8.667       | 2.03   11 | 1.75  | 1.02 |
| 2.58             | 3 2.03  | 5.667    | 7.11     | 8.750       | 2.03   11 | 1.83  | 1.02 |
| 2.66             | 7 2.03  | 5.750    | 7.11     | 8.833       | 3.05   11 | 1.92  | 1.02 |
| 2.75             | 0 2.03  | 5.833    | 49.78    | 8.917       | 3.05   12 | 2.00  | 1.02 |
| 2.83             | 3 2.03  | 5.917    | 49.78    | 9.000       | 3.05   12 | 2.08  | 1.02 |
| 2.91             | 7 2.03  | 6.000    | 49.78    | 9.083       | 2.03   12 | 2.17  | 1.02 |
| 3.000            |         |          | 49.78    |             |           | 2.25  | 1.02 |
| 3.08             |         | 6.167    |          |             | 2.03      |       |      |
| 3100.            | 2.03    | 01207    | 43170    | 1 31230     | 2.05      |       |      |
| Max.Eff.Inten.(r | mm/hr)= | 49.78    |          | 29.56       |           |       |      |
| over             | (min)   | 5.00     |          | 15.00       |           |       |      |
| Storage Coeff.   | (min)=  | 5.85     | (ii)     | 13.43 (ii)  |           |       |      |
| Unit Hyd. Tpeak  |         | 5.00     |          | 15.00       |           |       |      |
| Unit Hyd. peak   |         | 0.20     |          | 0.08        |           |       |      |
| onize nyar peak  | (63)    | 0.20     |          | 0.00        | *TOTALS   | *     |      |
| PEAK FLOW        | (cms)=  | 0.03     |          | 0.02        | 0.054     | (iii) |      |
| TIME TO PEAK     | (hrs)=  | 6.25     |          | 6.33        | 6.25      |       |      |
| RUNOFF VOLUME    | (mm)=   | 53.37    |          | 24.78       | 36.26     |       |      |
| TOTAL RAINFALL   | (mm)=   | 55.37    |          | 55.37       | 55.37     |       |      |
| RUNOFF COEFFICI  |         | 0.96     |          | 0.45        | 0.65      |       |      |
| KUNOFF CUEFFICI  | LINI -  | 0.50     |          | 0.43        | 0.0.      | ,     |      |
|                  |         |          |          |             |           |       |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |         |       |         |           |       |  |
|-------------------|-------|---------|-------|---------|-----------|-------|--|
| STANDHYD ( 0170)  | Area  | (ha)=   | 0.43  |         |           |       |  |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 57.00 | Dir.    | Conn.(%)= | 57.00 |  |
|                   |       |         |       |         |           |       |  |
|                   |       | IMPERVI | 0US   | PERVIOL | JS (i)    |       |  |
| Surface Area      | (ha)= | 0.2     | 5     | 0.18    | 3         |       |  |
| Dep. Storage      | (mm)= | 2.0     | 0     | 5.00    | )         |       |  |
| Average Slope     | (%)=  | 1.0     | a     | 2.00    |           |       |  |
|                   |       |         |       |         |           |       |  |
| Length            | (m)=  | 250.0   | U     | 20.00   | ,         |       |  |
| Mannings n        | =     | 0.01    | 3     | 0.250   | )         |       |  |
|                   |       |         |       |         |           |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       | TRANSFORMED HYETOGRAPH |       |       |        |       |      |       |  |  |  |
|-------|------------------------|-------|-------|--------|-------|------|-------|--|--|--|
| TIME  | RAIN                   | TIME  | RAIN  | ' TIME | RAIN  | TIME | RAIN  |  |  |  |
| hrs   | mm/hr                  | hrs   | mm/hr | ' hrs  | mm/hr | hrs  | mm/hr |  |  |  |
| 0.083 | 0.00                   | 3.167 | 2.03  | 6.250  | 49.78 | 9.33 | 1.02  |  |  |  |
| 0.167 | 0.00                   | 3.250 | 2.03  | 6.333  | 9.14  | 9.42 | 1.02  |  |  |  |
| 0.250 | 0.00                   | 3.333 | 3.05  | 6.417  | 9.14  | 9.50 | 1.02  |  |  |  |
| 0.333 | 1.02                   | 3.417 | 3.05  | 6.500  | 9.14  | 9.58 | 2.03  |  |  |  |
| 0.417 | 1.02                   | 3.500 | 3.05  | 6.583  | 10.16 | 9.67 | 2.03  |  |  |  |
| 0.500 | 1.02                   | 3.583 | 2.03  | 6.667  | 10.16 | 9.75 | 2.03  |  |  |  |

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| LangstaffRd_ | EA_ | Existing | WestDonWatershd |
|--------------|-----|----------|-----------------|

| ADD HYD ( 0450) <br>  1 + 2 = 3 | AREA         | QPEAK          | TPEAK         | R.V.          |
|---------------------------------|--------------|----------------|---------------|---------------|
| ID1= 1 ( 0165):                 | (ha)<br>0.60 | (cms)<br>0.054 | (hrs)<br>6.25 | (mm)<br>36.20 |
| + ID2= 2 ( 0170):               | 0.43         | 0.048          | 6.25          | 43.75         |
| TD = 3 ( 0450):                 | 1 03         | a 101          | 6 25          | 30 35         |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD ( 0450) <br>  3 + 2 = 1  <br> | AREA<br>(ha)<br>1.03<br>1.12 | QPEAK<br>(cms)<br>0.101<br>0.095 | TPEAK<br>(hrs)<br>6.25<br>6.25 | R.V.<br>(mm)<br>39.35<br>35.29 |
|---------------------------------------|------------------------------|----------------------------------|--------------------------------|--------------------------------|
| ID = 1 ( 0450):                       | 2.15                         | 0.197                            | 6.25                           | 37.24                          |

| NOTE: PEAK FLOW   | 5 DO NO1                       | INCLUDE BA                                   | SEFLOWS IF ANY.                               |       |
|---|--------------------------------|--|---|-------|
| CALIB   | Area<br>Total                  | (ha)= 6<br>Imp(%)= 42                        | 0.86<br>2.00 Dir. Conn.(%)=                   | 42.00 |
| Surface Area<br>Dep. Storage<br>Average Slope<br>Length | (ha)=<br>(mm)=<br>(%)=<br>(m)= | IMPERVIOUS<br>0.36<br>2.00<br>1.00<br>340.00 | PERVIOUS (i)<br>0.50<br>5.00<br>2.00<br>50.00 |       |
| Mannings n  | =                              | 0.013  | 0.250   |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TRANSFORMED HYETOGRAPH |       |       |       |        |       |       |       |  |
|------------------------|-------|-------|-------|--------|-------|-------|-------|--|
| TIME                   | RAIN  | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |
| hrs                    | mm/hr | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |
| 0.083                  | 0.00  | 3.167 | 2.03  | 6.250  | 49.78 | 9.33  | 1.02  |  |
| 0.167                  | 0.00  | 3.250 | 2.03  | 6.333  | 9.14  | 9.42  | 1.02  |  |
| 0.250                  | 0.00  | 3.333 | 3.05  | 6.417  | 9.14  | 9.50  | 1.02  |  |
| 0.333                  | 1.02  | 3.417 | 3.05  | 6.500  | 9.14  | 9.58  | 2.03  |  |
| 0.417                  | 1.02  | 3.500 | 3.05  | 6.583  | 10.16 | 9.67  | 2.03  |  |
| 0.500                  | 1.02  | 3.583 | 2.03  | 6.667  | 10.16 | 9.75  | 2.03  |  |
| 0.583                  | 1.02  | 3.667 | 2.03  | 6.750  | 10.16 | 9.83  | 2.03  |  |
| 0.667                  | 1.02  | 3.750 | 2.03  | 6.833  | 5.08  | 9.92  | 2.03  |  |
| 0.750                  | 1.02  | 3.833 | 2.03  | 6.917  | 5.08  | 10.00 | 2.03  |  |
| 0.833                  | 1.02  | 3.917 | 2.03  | 7.000  | 5.08  | 10.08 | 1.02  |  |
| 0.917                  | 1.02  | 4.000 | 2.03  | 7.083  | 4.06  | 10.17 | 1.02  |  |
| 1.000                  | 1.02  | 4.083 | 2.03  | 7.167  | 4.06  | 10.25 | 1.02  |  |

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| 0.583                        |       | 3.667    |       | ing_WestDo | 10.16 |           |    |
|------------------------------|-------|----------|-------|------------|-------|-----------|----|
| 0.667                        |       | 3.750    |       | 6.833      | 5.08  |           |    |
| 0.750                        |       | 3.833    |       | 6.917      |       | 10.00     |    |
| 0.833                        |       | 3.917    | 2.03  |            | 5.08  |           |    |
| 0.917                        |       | 4.000    |       | 7.083      |       | 10.00     |    |
| 1.000                        |       | 4.083    |       | 7.167      |       | 10.25     |    |
| 1.083                        |       | 4.167    |       | 7.250      |       | 10.33     |    |
| 1.167                        |       | 4.250    |       | 7.333      | 3.05  |           |    |
| 1.250                        |       | 4.333    |       | 7.417      |       | 10.50     |    |
| 1.333                        |       | 4.417    |       | 7.500      |       | 10.58     |    |
| 1.417                        |       | 4.500    |       | 7.583      |       | 10.67     |    |
| 1.500                        |       | 4.583    |       | 7.667      |       | 10.75     |    |
| 1.583                        |       | 4.667    |       | 7.750      | 3.05  |           |    |
| 1.667                        |       | 4.750    |       | 7.833      |       | 10.92     |    |
| 1.750                        |       | 4.833    |       | 7.917      |       | 11.00     |    |
| 1.833                        |       | 4.917    |       | 8.000      |       | 11.08     |    |
| 1.917                        |       | 5.000    |       | 8.083      |       | 11.17     |    |
| 2.000                        |       | 5.083    |       | 8.167      |       | 11.25     |    |
| 2.083                        |       | 5.167    |       | 8.250      |       | 11.33     |    |
| 2.167                        |       | 5.250    |       | 8.333      |       | 11.42     |    |
| 2.250                        |       | 5.333    |       | 8.417      |       | 11.50     |    |
| 2.333                        |       | 5.417    |       | 8.500      |       | 11.58     |    |
| 2.417                        |       | 5.500    |       | 8.583      |       | 11.67     |    |
| 2,500                        |       | 5.583    |       | 8.667      |       | 11.75     |    |
| 2.583                        |       | 5.667    | 7.11  | 8.750      | 2.03  | 11.83     |    |
| 2.667                        | 2.03  | 5.750    | 7.11  | 8.833      | 3.05  | 11.92     |    |
| 2.750                        | 2.03  | 5.833    | 49.78 | 8.917      | 3.05  | 12.00     |    |
| 2.833                        | 2.03  | 5.917    | 49.78 | 9.000      | 3.05  | 12.08     |    |
| 2.917                        | 2.03  | 6.000    | 49.78 | 9.083      | 2.03  | 12.17     |    |
| 3.000                        | 2.03  | 6.083    | 49.78 | 9.167      | 2.03  | 12.25     |    |
| 3.083                        | 2.03  | 6.167    | 49.78 | 9.250      | 2.03  | İ         |    |
| Max.Eff.Inten.(mm,           | /hr)= | 49.78    |       | 36.58      |       |           |    |
| over (r                      | nin)  | 5.00     |       | 15.00      |       |           |    |
|                              | nin)= | 5.85     | (ii)  | 12.81 (ii) |       |           |    |
| Unit Hyd. Tpeak (r           | nin)= | 5.00     |       | 15.00      |       |           |    |
| Unit Hyd. peak (             | ms)=  | 0.20     |       | 0.08       |       |           |    |
|                              |       |          |       |            |       | TALS*     |    |
|                              | :ms)= | 0.03     |       | 0.01       |       | .048 (iii | .) |
|                              | ırs)= | 6.25     |       | 6.33       |       | 6.25      |    |
|                              | (mm)= | 53.37    |       | 31.03      |       | 3.75      |    |
|                              | (mm)= | 55.37    |       | 55.37      |       | 5.37      |    |
| RUNOFF COEFFICIEN            | =     | 0.96     |       | 0.56       | •     | 0.79      |    |
| //\ a ======                 |       |          |       |            |       |           |    |
| (i) CN PROCEDURI<br>CN* = 89 |       | = Dep. S |       |            |       |           |    |

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THAN THE STORAGE COEFFICIENT. (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
LangstaffRd_EA_Existing_WestDonWatershd
1.02 | 4.167 | 2.03 | 7.250 | 4.06 | 10.33 | 1.02 | 4.250 | 2.03 | 7.250 | 4.06 | 10.33 | 1.02 | 4.250 | 2.03 | 7.333 | 3.05 | 10.42 | 1.02 | 4.333 | 4.06 | 7.417 | 3.05 | 10.50 | 10.50 | 10.2 | 4.417 | 4.06 | 7.590 | 3.05 | 10.58 | 1.02 | 4.583 | 4.06 | 7.593 | 3.05 | 10.58 | 1.02 | 4.583 | 4.06 | 7.583 | 3.05 | 10.67 | 1.02 | 4.583 | 4.06 | 7.583 | 3.05 | 10.67 | 1.02 | 4.583 | 4.06 | 7.750 | 3.05 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 10.87 | 1
                                                                                                                         1.083
1.167
1.250
1.333
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               1.02
1.02
1.02
                                                                                                                      1.417
1.500
1.583
1.667
1.750
1.833
1.917
2.000
2.083
2.167
2.250
2.333
2.417
2.500
2.583
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               1.02
1.02
2.03
2.03
2.03
1.02
1.02
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               1.02
1.02
1.02
1.02
1.02
1.02
1.02
                                                                                                                            2.667
                                                                                                                      2.667
2.750
2.833
2.917
3.000
3.083
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               1.02
1.02
1.02
1.02
      Max.Eff.Inten.(mm/hr)=
                                                                                                                                                                                                                                                                                                               49.78
                                                                                                                                                                                                                                                                                                                                                                                                                                                              28.42
   over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                                                                                                                                                                                                                                                                                         5.00
7.04 (ii)
5.00
0.17
                                                                                                                                                                                                                                                                                                                                                                                                                                                        25.00
20.38 (ii)
25.00
0.05
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                *TOTALS*
0.068 (iii)
PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                                                                                                                                                                                                                                                                                            0.05
                                                                                                                                                                                                                                                                                                               6.25
53.37
55.37
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               6.25
36.78
55.37
                                                                                                                                                                                                                                                                                                                                                                                                                                                                          6.50
                                                                                                                                                                                                                                                                                                                                                                                                                                                              24.78
```

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 83.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB        | Area<br>Total | (ha)=<br>Imp(%)= | 0.79<br>42.00 | Dir. Conn.(          | (%)= 42 | .00 |
|--------------|---------------|------------------|---------------|----------------------|---------|-----|
| Surface Area | (ha)=         | IMPERVI<br>0.3   |               | PERVIOUS (i)<br>0.46 |         |     |

LangstaffRd\_EA\_Existing\_WestDonWatershd
Dep. Storage (mm)= 2.00 5 00

| (11111) - | 2.00         | 3.00                     |
|-----------|--------------|--------------------------|
| (%)=      | 1.00         | 2.00                     |
| (m)=      | 340.00       | 20.00                    |
| =         | 0.013        | 0.250                    |
|           | (%)=<br>(m)= | (%)= 1.00<br>(m)= 340.00 |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR/   | ANSFORME       | HYETOGR | APH   |       |       |
|-------|-------|-------|----------------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN           | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr          | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03           | 6.250   | 49.78 | 9.33  | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03           | 6.333   | 9.14  | 9.42  | 1.02  |
| 0.250 | 0.00  | 3.333 | 3.05           | 6.417   | 9.14  | 9.50  | 1.02  |
| 0.333 | 1.02  | 3.417 | 3.05           | 6.500   | 9.14  | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05           | 6.583   | 10.16 | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03           | 6.667   | 10.16 | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03           | 6.750   | 10.16 | 9.83  | 2.03  |
| 0.667 | 1.02  | 3.750 | 2.03           | 6.833   | 5.08  | 9.92  | 2.03  |
| 0.750 | 1.02  | 3.833 | 2.03           | 6.917   | 5.08  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 2.03           | 7.000   | 5.08  | 10.08 | 1.02  |
| 0.917 | 1.02  | 4.000 | 2.03           | 7.083   | 4.06  | 10.17 | 1.02  |
| 1.000 | 1.02  | 4.083 | 2.03           | 7.167   | 4.06  | 10.25 | 1.02  |
| 1.083 | 1.02  | 4.167 | 2.03           | 7.250   | 4.06  | 10.33 | 1.02  |
| 1.167 | 1.02  | 4.250 | 2.03           | 7.333   | 3.05  | 10.42 | 1.02  |
| 1.250 | 1.02  | 4.333 | 4.06           | 7.417   | 3.05  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 4.06           | 7.500   | 3.05  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 4.06           | 7.583   | 3.05  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 4.06           | 7.667   | 3.05  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 4.06           | 7.750   | 3.05  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 4.06           | 7.833   | 4.06  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 4.06           | 7.917   | 4.06  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 4.06           | 8.000   | 4.06  | 11.08 | 1.02  |
| 1.917 | 1.02  | 5.000 | 4.06           | 8.083   | 3.05  | 11.17 | 1.02  |
| 2.000 | 1.02  | 5.083 | 3.05           | 8.167   | 3.05  | 11.25 | 1.02  |
| 2.083 | 1.02  | 5.167 | 3.05           | 8.250   | 3.05  | 11.33 | 1.02  |
| 2.167 | 1.02  | 5.250 | 3.05           | 8.333   | 2.03  | 11.42 | 1.02  |
| 2.250 | 1.02  | 5.333 | 7.11           | 8.417   | 2.03  | 11.50 | 1.02  |
| 2.333 | 2.03  | 5.417 | 7.11           | 8.500   | 2.03  | 11.58 | 1.02  |
| 2.417 | 2.03  | 5.500 | 7.11           | 8.583   | 2.03  | 11.67 | 1.02  |
| 2.500 | 2.03  | 5.583 | 7.11           | 8.667   | 2.03  | 11.75 | 1.02  |
| 2.583 | 2.03  | 5.667 | 7.11           | 8.750   | 2.03  | 11.83 | 1.02  |
| 2.667 | 2.03  | 5.750 | 7.11           | 8.833   | 3.05  | 11.92 | 1.02  |
| 2.750 | 2.03  | 5.833 | 49.78          | 8.917   | 3.05  | 12.00 | 1.02  |
| 2.833 | 2.03  | 5.917 | 49.78          | 9.000   | 3.05  | 12.08 | 1.02  |
| 2.917 | 2.03  | 6.000 | 49.78<br>49.78 | 9.083   | 2.03  | 12.17 | 1.02  |
| 3.000 |       | 6.083 |                | 9.167   | 2.03  | 12.25 | 1.02  |
| 3.083 | 2.03  | 6.167 | 49.78          | 9.250   | 2.03  |       |       |

Max.Eff.Inten.(mm/hr)= over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)= 49.78 29.56 5.00 15.00 7.04 (ii) 14.62 (ii) 5.00 15.00

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## ${\tt LangstaffRd\_EA\_Existing\_WestDonWatershd}$

|           |       | TRA   | NSFORMFI | D HYETOGR | APH   |       |       |
|-----------|-------|-------|----------|-----------|-------|-------|-------|
| TIME      | RAIN  | TIME  | RAIN     | l' TIME   | RAIN  | TIME  | RAIN  |
| hrs       | mm/hr | hrs   | mm/hr    | i' hrs    | mm/hr | i hrs | mm/hr |
| 0.083     | 0.00  | 3.167 | 2.03     | 6.250     | 49.78 | 9.33  | 1.02  |
| 0.167     | 0.00  | 3.250 | 2.03     | 6.333     | 9.14  | 9.42  | 1.02  |
| 0.250     | 0.00  | 3.333 | 3.05     | 6.417     | 9.14  | 9.50  | 1.02  |
| 0.333     | 1.02  | 3.417 | 3.05     | 6.500     | 9.14  | 9.58  | 2.03  |
| 0.417     | 1.02  | 3.500 | 3.05     | 6.583     | 10.16 | 9.67  | 2.03  |
| 0.500     | 1.02  | 3.583 | 2.03     | 6.667     | 10.16 | 9.75  | 2.03  |
| 0.583     | 1.02  | 3.667 | 2.03     | 6.750     | 10.16 | 9.83  | 2.03  |
| 0.667     | 1.02  | 3.750 | 2.03     |           | 5.08  | 9.92  | 2.03  |
| 0.750     | 1.02  | 3.833 | 2.03     | 6.917     | 5.08  | 10.00 | 2.03  |
| 0.833     | 1.02  | 3.917 | 2.03     | 7.000     | 5.08  | 10.08 | 1.02  |
| 0.917     | 1.02  | 4.000 | 2.03     | 7.083     | 4.06  | 10.17 | 1.02  |
| 1.000     | 1.02  | 4.083 | 2.03     | 7.167     | 4.06  | 10.25 | 1.02  |
| 1.083     | 1.02  | 4.167 | 2.03     | 7.250     | 4.06  | 10.33 | 1.02  |
| 1.167     | 1.02  | 4.250 | 2.03     | 7.333     | 3.05  | 10.42 | 1.02  |
| 1.250     | 1.02  | 4.333 | 4.06     | 7.417     | 3.05  | 10.50 | 1.02  |
| 1.333     | 1.02  | 4.417 | 4.06     | 7.500     | 3.05  | 10.58 | 1.02  |
| 1.417     | 1.02  | 4.500 | 4.06     | 7.583     | 3.05  | 10.67 | 1.02  |
| 1.500     | 1.02  | 4.583 | 4.06     | 7.667     | 3.05  | 10.75 | 1.02  |
| 1.583     | 2.03  | 4.667 | 4.06     | 7.750     | 3.05  | 10.83 | 2.03  |
| 1.667     | 2.03  | 4.750 | 4.06     | 7.833     | 4.06  | 10.92 | 2.03  |
| 1.750     | 2.03  | 4.833 | 4.06     | 7.917     | 4.06  | 11.00 | 2.03  |
| 1.833     | 1.02  | 4.917 | 4.06     | 8.000     | 4.06  | 11.08 | 1.02  |
| 1.917     | 1.02  | 5.000 | 4.06     | 8.083     | 3.05  | 11.17 | 1.02  |
| 2.000     | 1.02  | 5.083 | 3.05     | 8.167     | 3.05  | 11.25 | 1.02  |
| 2.083     | 1.02  | 5.167 | 3.05     | 8.250     | 3.05  | 11.33 | 1.02  |
| 2.167     | 1.02  | 5.250 | 3.05     | 8.333     | 2.03  | 11.42 | 1.02  |
| 2.250     | 1.02  | 5.333 | 7.11     | 8.417     | 2.03  | 11.50 | 1.02  |
| 2.333     | 2.03  | 5.417 | 7.11     | 8.500     | 2.03  | 11.58 | 1.02  |
| 2.417     | 2.03  | 5.500 | 7.11     | 8.583     | 2.03  | 11.67 | 1.02  |
| 2.500     | 2.03  | 5.583 | 7.11     | 8.667     | 2.03  | 11.75 | 1.02  |
| 2.583     | 2.03  | 5.667 | 7.11     | 8.750     | 2.03  | 11.83 | 1.02  |
| 2.667     | 2.03  | 5.750 | 7.11     | 8.833     | 3.05  | 11.92 | 1.02  |
| 2.750     | 2.03  | 5.833 | 49.78    |           | 3.05  | 12.00 | 1.02  |
| 2.833     | 2.03  | 5.917 | 49.78    | 9.000     | 3.05  | 12.08 | 1.02  |
| 2.917     | 2.03  | 6.000 | 49.78    |           | 2.03  |       | 1.02  |
| 3.000     | 2.03  | 6.083 | 49.78    |           | 2.03  | 12.25 | 1.02  |
| 3.083     | 2.03  | 6.167 | 49.78    | 9.250     | 2.03  |       |       |
| nten.(mm/ | /hr)= | 49.78 | :        | 24.61     |       |       |       |
| over (r   | nin)  | 5 00  |          | 20 00     |       |       |       |

Max.Eff.Inten.(mm/hr)= over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)= 5.00 20.00 5.97 (ii) 18.33 (ii) 5.00 20.00 0.19 0.06 \*TOTALS\* 1.176 (iii) 6.25 47.80 55.37 1.10 6.25 54.37 55.37 0.09 6.42 21.52 55.37 PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=

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#### LangstaffRd\_EA\_Existing\_WestDonWatershd

| Unit Hyd. peak  | (cms)= | 0.17  | 0.08  |             |
|-----------------|--------|-------|-------|-------------|
| , ,             |        |       |       | *TOTALS*    |
| PEAK FLOW       | (cms)= | 0.05  | 0.03  | 0.071 (iii) |
| TIME TO PEAK    | (hrs)= | 6.25  | 6.33  | 6.25        |
| RUNOFF VOLUME   | (mm)=  | 53.37 | 24.78 | 36.78       |
| TOTAL RAINFALL  | (mm)=  | 55.37 | 55.37 | 55.37       |
| RUNOFF COEFFICI | ENT =  | 0.96  | 0.45  | 0.66        |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
   CN\* = 83.0 Ia = Dep. Storage (Above)
  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
   THAN THE STORAGE COFFFICIENT.
  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0455)   |              |                |                |              |
|-------------------|--------------|----------------|----------------|--------------|
| 1 + 2 = 3         | AREA<br>(ha) | QPEAK<br>(cms) | TPEAK<br>(hrs) | R.V.<br>(mm) |
| ID1= 1 ( 0190):   | 0.86         | 0.068          | 6.25           | 36.78        |
| + ID2= 2 ( 0195): | 0.79         | 0.071          | 6.25           | 36.78        |
| ID = 3 ( 0455):   | 1.65         | 0.139          | 6.25           | 36.78        |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD ( 0458)   |      |       |       |       |
|-------------------|------|-------|-------|-------|
| 1 + 2 = 3         | AREA | QPEAK | TPEAK | R.V.  |
|                   | (ha) | (cms) | (hrs) | (mm)  |
| ID1= 1 ( 0450):   | 2.15 | 0.197 | 6.25  | 37.24 |
| + ID2= 2 ( 0455): | 1.65 | 0.139 | 6.25  | 36.78 |
|                   |      |       |       |       |
| ID = 3 ( 0458):   | 3.80 | 0.335 | 6.25  | 37.04 |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB<br>  STANDHYD ( 0300) <br> ID= 1 DT= 5.0 min | Area<br>Total | (ha)= 10.00<br>Imp(%)= 80.00 |              | 80.00 |
|--|---------------|------------------------------|--------------|-------|
|  |               |                              |              |       |
|  |               | IMPERVIOUS                   | PERVIOUS (i) |       |
| Surface Area                                       | (ha)=         | 8.00                         | 2.00         |       |
| Dep. Storage                                       | ( mm ) =      | 1.00                         | 5.00         |       |
| Average Slope                                      | (%)=          | 1.00                         | 2.00         |       |
| Length   | (m)=          | 258.20                       | 40.00        |       |
| Mannings n   | ` ′=          | 0.013                        | 0.250        |       |
|  |               |                              |              |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

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- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
- (1) CN\* = 79.0 Ia = Dep. Storage (Above)
  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
  THAN THE STORAGE COEFFICIENT.
  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |            |          |                |       |
|-------------------|------------|----------|----------------|-------|
| STANDHYD ( 0350)  | Area (ha)= | 0 00     |                |       |
| ID= 1 DT= 5.0 min |            |          | Dir. Conn.(%)= | 70.00 |
|                   |            |          |                |       |
|                   | TMDED\/1   | TOLIC DE | PVTOUS (4)     |       |

|               |       | IMPERVIOUS | PERVIOUS (i) |
|---------------|-------|------------|--------------|
| Surface Area  | (ha)= | 0.63       | 0.27         |
| Dep. Storage  | (mm)= | 1.00       | 5.00         |
| Average Slope | (%)=  | 1.00       | 2.00         |
| Length        | (m)=  | 77.46      | 40.00        |
| Mannings n    | =     | 0.013      | 0.250        |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250   | 49.78 | 9.33  | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333   | 9.14  | 9.42  | 1.02  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417   | 9.14  | 9.50  | 1.02  |
| 0.333 | 1.02  | 3.417 | 3.05     | 6.500   | 9.14  | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05     | 6.583   | 10.16 | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03     | 6.667   | 10.16 | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03     | 6.750   | 10.16 | 9.83  | 2.03  |
| 0.667 | 1.02  | 3.750 | 2.03     | 6.833   | 5.08  | 9.92  | 2.03  |
| 0.750 | 1.02  | 3.833 | 2.03     | 6.917   | 5.08  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 2.03     | 7.000   | 5.08  | 10.08 | 1.02  |
| 0.917 | 1.02  | 4.000 | 2.03     | 7.083   | 4.06  | 10.17 | 1.02  |
| 1.000 | 1.02  | 4.083 | 2.03     | 7.167   | 4.06  | 10.25 | 1.02  |
| 1.083 | 1.02  | 4.167 | 2.03     | 7.250   | 4.06  | 10.33 | 1.02  |
| 1.167 | 1.02  | 4.250 | 2.03     | 7.333   | 3.05  | 10.42 | 1.02  |
| 1.250 | 1.02  | 4.333 | 4.06     | 7.417   | 3.05  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 4.06     | 7.500   | 3.05  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 4.06     | 7.583   | 3.05  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 4.06     | 7.667   | 3.05  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 4.06     | 7.750   | 3.05  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 4.06     | 7.833   | 4.06  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 4.06     | 7.917   | 4.06  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 4.06     | 8.000   | 4.06  | 11.08 | 1.02  |
| 1.917 | 1.02  | 5.000 | 4.06     | 8.083   | 3.05  | 11.17 | 1.02  |
| 2.000 | 1.02  | 5.083 | 3.05     | 8.167   | 3.05  | 11.25 | 1.02  |
| 2.083 | 1.02  | 5.167 | 3.05     | 8.250   | 3.05  | 11.33 | 1.02  |

| La  | angstaffRd E | A_Existing_We  | stDonWaters | hd         |      |
|---|--------------|--|-------------|------------|------|
|   |              |  |             | 1          | 1.02 |
| 2.250 1.  | 02   5.333   | 7.11   8.4:<br>7.11   8.5:<br>7.11   8.5:<br>7.11   8.6:<br>7.11   8.7:<br>7.11   8.8:<br>49.78   8.9: | 17 2.03     | 11.50      | 1.02 |
| 2.333 2.  | 03   5.417   | 7.11   8.50  | 2.03        | 11.58      | 1.02 |
| 2.417 2.  | 03   5.500   | 7.11 8.5   | 83 2.03     | 11.67      | 1.02 |
| 2.500 2.  | 03   5.583   | 7.11   8.6   | 57 2.03     | 11.75      | 1.02 |
| 2.583 2.  | 03   5.667   | 7.11   8.7   | 50 2.03     | 11.83      | 1.02 |
| 2.66/ 2.  | 03   5./50   | 7.11   8.8   | 33 3.05     | 11.92      | 1.02 |
| 2.750 2.  | 03   5.833   | 49.78   8.9  | 1/ 3.05     | 12.00      | 1.02 |
| 2.033 2.  | 03   5.917   | 49.78   9.00   | 20 202      | 12.00      | 1.02 |
| 3 000 2   | 03   6.000   | 49.78   9.00   | 57 2.03     | 12.17      | 1 02 |
| 3.083 2.  | 03   6.167   | 49.78   9.00<br>49.78   9.00<br>49.78   9.10<br>49.78   9.20   | 50 2.03     | 12.25      | 1.02 |
| May Eff Takon (mm/hm)   | 40.70        | 24 61  |             |            |      |
| over (min) Storage Coeff. (min) Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)=  | 5 00         | 24.01  |             |            |      |
| Storage Coeff (min)=  | 2 90         | (ii) 15 26   | (ii)        |            |      |
| Unit Hvd. Tneak (min)=  | 5.00         | 20.00  | (11)        |            |      |
| Unit Hvd. peak (cms)=   | 0.28         | 0.07   |             |            |      |
|   |              |  |             | TALS*      |      |
| PEAK FLOW (cms)=  | 0.09         | 0.01   | 0           | .098 (iii) |      |
| TIME TO PEAK (hrs)=   | 6.25         | 6.42   |             | 6.25       |      |
| RUNOFF VOLUME (mm)=   | 54.37        | 21.52  | 4           | 4.51       |      |
| PEAK FLOW (cms)= TIME TO PEAK (hrs)= RUNOFF VOLUME (mm)= TOTAL RAINFALL (mm)= | 55.37        | 55.37  | 5           | 5.37       |      |
| RUNOFF COEFFICIENT =  | 0.98         | 0.39   |             | 0.80       |      |
| **** WARNING: STORAGE COEF  | F. IS SMALLE | R THAN TIME  | STEP!       |            |      |
| (i) CN PROCEDURE SEL  | ECTED FOR PE | RVIOUS LOSSES  | S:          |            |      |
| CN* = 79.0  |              |  |             |            |      |
| (ii) TIME STEP (DT) S   | HOULD BE SMA | LLER OR EQUA   | L ´         |            |      |
| THAN THE STORAGE  | COEFFICIENT  |  |             |            |      |
| (iii) PEAK FLOW DOES N  | OT INCLUDE B | BASEFLOW IF A  | NY.         |            |      |
|   |              |  |             |            |      |
|   |              |  |             |            |      |
| 1 ()  |              |  |             |            |      |
| ADD HYD ( 0375)   |              |  |             |            |      |
| ID1= 1 ( 0300):<br>+ ID2= 2 ( 0350):  | AREA QF      | EAK IPEAK  | R.V.        |            |      |
| TD4 4 ( 0200)   | (ha) (c      | ms) (hrs)  | (mm)        |            |      |
| IDI= 1 ( 0300):   | 10.00 1.1    | 1/6 6.25   | 47.80       |            |      |
| + 102= 2 ( 0350):   | 0.90 0.6     | 198 6.25   | 44.51       |            |      |
| ID = 3 ( 0375):   |              |  |             |            |      |
| NOTE: PEAK FLOWS DO N   | OT INCLUDE B | BASEFLOWS IF   | ANY.        |            |      |
| ********  | *****        |  |             |            |      |
| ** STMULATTON: Run 04   |              |  |             |            |      |
| *****************   |              |  |             |            |      |
|   |              |  |             |            |      |

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ata\Local\Temp\

|                    | Langs | taffRd_E | A_Existi | ng_WestDon | Waters | hd         |      |
|--------------------|-------|----------|----------|------------|--------|------------|------|
| 1.250              | 1.02  | 4.333    | 5.08     | 7.417      | 4.06   | 10.50      | 1.02 |
| 1.333              | 1.02  | 4.417    | 5.08     | 7.500      | 4.06   | 10.58      | 1.02 |
| 1.417              | 1.02  | 4.500    | 5.08     | 7.583      | 4.06   | 10.67      | 1.02 |
| 1.500              | 1.02  | 4.583    | 4.06     | 7.667      | 4.06   | 10.75      | 1.02 |
| 1.583              | 2.03  | 4.667    | 4.06     | 7.750      | 4.06   | 10.83      | 2.03 |
| 1.667              | 2.03  | 4.750    | 4.06     | 7.833      | 4.06   | 10.92      | 2.03 |
| 1.750              | 2.03  | 4.833    | 4.06     | 7.917      | 4.06   | 11.00      | 2.03 |
| 1.833              | 1.02  | 4.917    | 4.06     | 8.000      | 4.06   | 11.08      | 1.02 |
| 1.917              | 1.02  | 5.000    | 4.06     | 8.083      | 3.05   | 11.17      | 1.02 |
| 2.000              | 1.02  | 5.083    | 5.08     | 8.167      | 3.05   | 11.25      | 1.02 |
| 2.083              | 1.02  | 5.167    | 5.08     | 8.250      | 3.05   | 11.33      | 1.02 |
| 2.167              | 1.02  | 5.250    | 5.08     | 8.333      | 3.05   | 11.42      | 1.02 |
| 2.250              | 1.02  | 5.333    | 7.11     | 8.417      | 3.05   | 11.50      | 1.02 |
| 2.333              | 3.05  | 5.417    | 7.11     | 8.500      | 3.05   | 11.58      | 1.02 |
| 2.417              | 3.05  | 5.500    | 7.11     | 8.583      | 2.03   | 11.67      | 1.02 |
| 2.500              | 3.05  |          |          | 8.667      | 2.03   | 11.75      | 1.02 |
| 2.583              | 2.03  | 5.667    | 8.13     | 8.750      | 2.03   | 11.83      | 2.03 |
| 2.667              | 2.03  | 5.750    | 8.13     | 8.833      | 3.05   | 11.92      | 2.03 |
| 2.750              | 2.03  | 5.833    | 56.90    | 8.917      | 3.05   | 12.00      | 2.03 |
| 2.833              | 3.05  |          |          | 9.000      | 3.05   |            | 1.02 |
| 2.917              |       | 6.000    | 56.90    | 9.083      | 2.03   |            | 1.02 |
| 3.000              | 3.05  | 6.083    | 57.91    | 9.167      | 2.03   |            | 1.02 |
| 3.083              | 2.03  | 6.167    | 57.91    | 9.250      | 2.03   | l          |      |
| Max.Eff.Inten.(mm, |       | 57.91    |          | 39.56      |        |            |      |
| over (r            |       | 10.00    |          | 20.00      |        |            |      |
|                    | min)= |          |          | 18.88 (ii) |        |            |      |
|                    | min)= | 10.00    |          | 20.00      |        |            |      |
| Unit Hyd. peak (   | cms)= | 0.12     |          | 0.06       |        |            |      |
|                    |       |          |          |            |        | TALS*      |      |
|                    | cms)= | 0.29     |          | 0.08       |        | .365 (iii) |      |
|                    | nrs)= | 6.25     |          | 6.42       |        | 5.25       |      |
|                    | (mm)= | 61.75    |          | 34.48      |        | 1.39       |      |
|                    | (mm)= | 63.75    |          | 63.75      |        | 3.75       |      |
| RUNOFF COEFFICIEN  | Γ =   | 0.97     |          | 0.54       | (      | 0.81       |      |
|                    |       |          |          |            |        |            |      |

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 86.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COFFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB | STANDHYD ( 0140)| |ID= 1 DT= 5.0 min | Area (ha)= 1.27 Total Imp(%)= 52.00 Dir. Conn.(%)= 52.00 IMPERVIOUS PERVIOUS (i) 0.61 5.00 2.00 Surface Area (ha)= 0.66 2.00 Dep. Storage Average Slope (mm)= (%)= 1.00

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Comments: 10yr-12hrSCS Ptotal= 63.75 mm RAIN | TIME mm/hr | hrs 11.18 | 10.00 5.08 | 10.25 5.08 | 10.50 RAIN mm/hr 2.03 2.03 TIME hrs 6.75 7.00 7.25 7.50 7.75 8.00 8.25 8.50 8.75 9.00 9.25 TIME RAIN | TIME hrs 3.50 3.75 4.00 4.25 4.50 4.75 5.00 5.25 5.50 5.75 6.00 mm/hr 3.05 2.03 3 ar 71ME hrs 0.25 0.50 0.75 1.00 1.25 mm/hr 0.00 1.02 2.03 3.05 1.02 1.02 2.03 4.06 10.75 1.02 2.03 | 5.08 | 4.06 | 5.08 | 7.11 | 8.13 | 56.90 | 57.91 | 11.18 | 1.02 4.06 11.00 2.03 1.02 1.02 2.03 1.02 1.02 3.05 2.03 1.25 1.50 1.75 2.00 2.25 2.50 2.75 4.06 3.05 3.05 2.03 3.05 2.03 11.25 11.50 11.75 12.00 12.25 1.02 1.02 1.02 2.03 1.02 3.05 | 2.03 | 6.25 9.50 9.75 2.03 3.25 2.03 | CALIB | | STANDHYD ( 0145) | |ID= 1 DT= 5.0 min | Area (ha)= 3.05 Total Imp(%)= 62.00 Dir. Conn.(%)= 62.00 PERVIOUS (i) TMPERVTOUS Surface Area Dep. Storage Average Slope Length (ha)= (mm)= (%)= (m)= 1.89 2.00 1.00 531.00 1.16 5.00 2.00 40.00 Mannings n 0.013 0.250 NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP. TIME 9.33 9.42 9.50 9.58 9.67 9.75 9.83 9.92 mm/hr 0.00 0.00 hrs 0.083 mm/hr 2.03 0.167 2.03 0.167 0.250 0.333 0.417 0.500 0.583 0.667 0.00 1.02 1.02 1.02 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03 2.03 0.750 0.833 2.03 5.08 5.08 10.00 10.08 2.03 3.917 4.000 4.083 4.167 4.250 1.02 2.03

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5.08 | 5.08 | 5.08 | 4.06 | 10.17 10.25 10.33 10.42 2.03 2.03 1.02 1.02

LangstaffRd\_EA\_Existing\_WestDonWatershd n) = 503.00 25.00 = 0.013 0.250 (m)= = Length Mannings n NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

0.917 1.000 1.083 1.167

1.02 1.02 1.02 1.02

|                |              | TR     | ANS EORMEI   | ) HYETOGR      | ADH   | _              |       |
|----------------|--------------|--------|--------------|----------------|-------|----------------|-------|
| TIME           | RAIN         | I TIME | RAIN         | l' TTMF        | RAIN  | TIME           | RAIN  |
| hrs            | mm/hr        | hrs    | mm/hr        | l' hrs         |       | hrs            | mm/hr |
| 0.083          | 0.00         | 3.167  | 2.03         | 6.250          | 57.91 | 9.33           | 2.03  |
| 0.167          | 0.00         | 3.250  | 2.03         | 6.333          | 11.18 | 9.42           | 2.03  |
| 0.250          | 0.00         | 3.333  | 3.05         | 6.417          | 11.18 | 9.50           | 2.03  |
| 0.333          | 1.02         | 3.417  | 3.05         | 6.500          | 11.18 | 9.58           | 2.03  |
| 0.417          | 1.02         | 3.500  | 3.05         | 6.583          | 11.18 | 9.67           | 2.03  |
| 0.500          | 1.02         | 3.583  | 2.03         | 6.667          | 11.18 | 9.75           | 2.03  |
| 0.583          | 2.03         | 3.667  | 2.03         | 6.750          | 11.18 | 9.83           | 2.03  |
| 0.667          | 2.03         | 3.750  | 2.03         | 6.833          | 5.08  | 9.92           | 2.03  |
| 0.750          | 2.03         | 3.833  | 3.05         | 6.917          | 5.08  | 10.00          | 2.03  |
| 0.833          | 1.02         | 3.917  | 3.05         | 7.000          | 5.08  | 10.08          | 2.03  |
| 0.917          | 1.02         | 4.000  | 3.05         | 7.083          | 5.08  | 10.17          | 2.03  |
| 1.000          | 1.02         | 4.083  | 2.03         | 7.167          | 5.08  | 10.25          | 2.03  |
| 1.083          | 1.02         | 4.167  | 2.03         | 7.250          | 5.08  | 10.33          | 1.02  |
| 1.167          | 1.02         | 4.250  | 2.03         | 7.333          | 4.06  | 10.42          | 1.02  |
| 1.250          | 1.02         |        | 5.08         | 7.417          | 4.06  | 10.50          | 1.02  |
| 1.333          | 1.02         | 4.417  | 5.08         | 7.500          | 4.06  | 10.58          | 1.02  |
| 1.417          | 1.02         | 4.500  | 5.08         | 7.583          | 4.06  | 10.67          | 1.02  |
| 1.500          | 1.02         | 4.583  | 4.06         | 7.667          | 4.06  | 10.75          | 1.02  |
| 1.583          | 2.03         | 4.667  | 4.06         | 7.750          | 4.06  | 10.83          | 2.03  |
| 1.667          | 2.03         | 4.750  | 4.06         | 7.833          | 4.06  | 10.92          | 2.03  |
| 1.750          | 2.03         | 4.833  | 4.06         | 7.917          | 4.06  | 11.00          | 2.03  |
| 1.833          | 1.02         | 4.917  | 4.06         | 8.000          | 4.06  | 11.08          | 1.02  |
| 1.917          | 1.02         | 5.000  | 4.06         | 8.083          | 3.05  | 11.17          | 1.02  |
| 2.000          | 1.02         | 5.083  | 5.08         | 8.167          | 3.05  | 11.25          | 1.02  |
| 2.083          | 1.02         | 5.167  | 5.08         | 8.250          | 3.05  | 11.33          | 1.02  |
| 2.167          | 1.02         | 5.250  | 5.08         | 8.333          | 3.05  | 11.42          | 1.02  |
| 2.250          | 1.02         | 5.333  | 7.11         | 8.417          | 3.05  | 11.50          | 1.02  |
| 2.333          | 3.05         | 5.417  | 7.11         | 8.500          | 3.05  | 11.58          | 1.02  |
| 2.417          | 3.05         | 5.500  | 7.11         | 8.583          | 2.03  | 11.67          | 1.02  |
| 2.500<br>2.583 | 3.05<br>2.03 | 5.583  | 8.13<br>8.13 | 8.667          | 2.03  | 11.75<br>11.83 | 1.02  |
| 2.583          | 2.03         | 5.750  | 8.13         | 8.750<br>8.833 | 3.05  | 11.83          | 2.03  |
| 2.750          | 2.03         | 5.833  | 56.90        | 8.917          | 3.05  | 12.00          | 2.03  |
| 2.750          | 3.05         | 5.917  | 56.90        | 9.000          | 3.05  | 12.00          | 1.02  |
| 2.833          | 3.05         | 6.000  | 56.90        | 9.083          | 2.03  | 12.00          | 1.02  |
| 3.000          | 3.05         | 6.083  | 57.91        | 9.065          | 2.03  | 12.17          | 1.02  |
| 3.083          | 2.03         | 6.167  | 57.91        | 9.167          | 2.03  |                | 1.02  |
| 5.005          | 2.03         | 0.107  | 57.51        | 1 3.230        | 2.03  |                |       |

57.91 10.00 8.38 (ii) 10.00 0.12 37.09 20.00 16.29 (ii) Max.Eff.Inten.(mm/hr)= over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)= 20.00

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\*TOTALS\*

|                 | LangstaffRd_EA_Existing_WestDonWatershd |       |       |             |  |  |  |  |  |
|-----------------|---|-------|-------|-------------|--|--|--|--|--|
| PEAK FLOW       | (cms)=                                  | 0.10  | 0.04  | 0.139 (iii) |  |  |  |  |  |
| TIME TO PEAK    | (hrs)=                                  | 6.25  | 6.42  | 6.25        |  |  |  |  |  |
| RUNOFF VOLUME   | (mm)=                                   | 61.75 | 31.16 | 47.06       |  |  |  |  |  |
| TOTAL RAINFALL  | (mm)=                                   | 63.75 | 63.75 | 63.75       |  |  |  |  |  |
| RUNOFF COEFFICI | ENT =                                   | 0.97  | 0.49  | 0.74        |  |  |  |  |  |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
  CN\* = 83.0 Ia = Dep. Storage (Above)
  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
  THAN THE STORAGE COEFFICIENT.
  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB<br>  STANDHYD ( 0135) <br> ID= 1 DT= 5.0 min | Area<br>Total | (ha)=<br>Imp(%)= | 1.43 | Dir.   | Conn.(%)= | 40.00 |  |
|--|---------------|------------------|------|--------|-----------|-------|--|
| ·  |               | IMPERVI          | ous  | PERVIO | JS (i)    |       |  |
| Surface Area                                       | (ha)=         | 0.5              | 7    | 0.8    |           |       |  |
| Dep. Storage                                       | (mm)=         | 2.0              | 0    | 5.00   | 9         |       |  |
| Average Slope                                      | (%)=          | 1.0              | 0    | 2.00   | 9         |       |  |
| Length   | (m)=          | 503.0            | 0    | 30.00  | 3         |       |  |
| Mannings n   | =             | 0.01             | 3    | 0.25   | 9         |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR/   | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250   | 57.91 | 9.33  | 2.03  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333   | 11.18 | 9.42  | 2.03  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417   | 11.18 | 9.50  | 2.03  |
| 0.333 | 1.02  | 3.417 | 3.05     | 6.500   | 11.18 | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05     | 6.583   | 11.18 | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03     | 6.667   | 11.18 | 9.75  | 2.03  |
| 0.583 | 2.03  | 3.667 | 2.03     | 6.750   | 11.18 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 2.03     | 6.833   | 5.08  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 3.05     | 6.917   | 5.08  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 3.05     | 7.000   | 5.08  | 10.08 | 2.03  |
| 0.917 | 1.02  | 4.000 | 3.05     | 7.083   | 5.08  | 10.17 | 2.03  |
| 1.000 | 1.02  | 4.083 | 2.03     | 7.167   | 5.08  | 10.25 | 2.03  |
| 1.083 | 1.02  | 4.167 | 2.03     | 7.250   | 5.08  | 10.33 | 1.02  |
| 1.167 | 1.02  | 4.250 | 2.03     | 7.333   | 4.06  | 10.42 | 1.02  |
| 1.250 | 1.02  | 4.333 | 5.08     | 7.417   | 4.06  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 5.08     | 7.500   | 4.06  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 5.08     | 7.583   | 4.06  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 4.06     | 7.667   | 4.06  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 4.06     | 7.750   | 4.06  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 4.06     | 7.833   | 4.06  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 4.06     | 7.917   | 4.06  | 11.00 | 2.03  |
|       |       |       |          |         |       |       |       |

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|                   | Langstaff | Rd_EA_Exi | sting_Wes | tDonWaters | shd |
|-------------------|-----------|-----------|-----------|------------|-----|
|                   | (ha)      | (cms)     | (hrs)     | (mm)       |     |
| ID1= 1 ( 0145):   | 3.05      | 0.365     | 6.25      | 51.39      |     |
| + ID2= 2 ( 0420): | 2.70      | 0.280     | 6.25      | 45.45      |     |
| ===========       |           |           |           |            |     |
| ID = 3 (0425):    | 5.75      | 0.645     | 6.25      | 48.60      |     |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB<br>  STANDHYD ( 0210) <br> ID= 1 DT= 5.0 min                    | Area<br>Total                  | (ha)=<br>Imp(%)=                              | 0.96<br>44.00 | Dir. Conn.(  | %)= 44.00 |
|---|--------------------------------|---|---------------|--|-----------|
| Surface Area<br>Dep. Storage<br>Average Slope<br>Length<br>Mannings n | (ha)=<br>(mm)=<br>(%)=<br>(m)= | IMPERVI<br>0.4<br>2.0<br>1.0<br>470.0<br>0.01 | 2<br>0<br>0   | PERVIOUS (i)<br>0.54<br>5.00<br>2.00<br>20.00<br>0.250 |           |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       | TRANSFORMED HYETOGRAPH |       |       |        |       |       |       |  |  |  |
|-------|------------------------|-------|-------|--------|-------|-------|-------|--|--|--|
| TIME  | RAIN                   | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |  |  |
| hrs   | mm/hr                  | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |  |  |
| 0.083 | 0.00                   | 3.167 | 2.03  | 6.250  | 57.91 | 9.33  | 2.03  |  |  |  |
| 0.167 | 0.00                   | 3.250 | 2.03  | 6.333  | 11.18 | 9.42  | 2.03  |  |  |  |
| 0.250 | 0.00                   | 3.333 | 3.05  | 6.417  | 11.18 | 9.50  | 2.03  |  |  |  |
| 0.333 | 1.02                   | 3.417 | 3.05  | 6.500  | 11.18 | 9.58  | 2.03  |  |  |  |
| 0.417 | 1.02                   | 3.500 | 3.05  | 6.583  | 11.18 | 9.67  | 2.03  |  |  |  |
| 0.500 | 1.02                   | 3.583 | 2.03  | 6.667  | 11.18 | 9.75  | 2.03  |  |  |  |
| 0.583 | 2.03                   | 3.667 | 2.03  | 6.750  | 11.18 | 9.83  | 2.03  |  |  |  |
| 0.667 | 2.03                   | 3.750 | 2.03  | 6.833  | 5.08  | 9.92  | 2.03  |  |  |  |
| 0.750 | 2.03                   | 3.833 | 3.05  | 6.917  | 5.08  | 10.00 | 2.03  |  |  |  |
| 0.833 | 1.02                   |       | 3.05  | 7.000  | 5.08  | 10.08 | 2.03  |  |  |  |
| 0.917 | 1.02                   | 4.000 | 3.05  | 7.083  | 5.08  | 10.17 | 2.03  |  |  |  |
| 1.000 | 1.02                   | 4.083 | 2.03  | 7.167  | 5.08  | 10.25 | 2.03  |  |  |  |
| 1.083 | 1.02                   | 4.167 | 2.03  | 7.250  | 5.08  | 10.33 | 1.02  |  |  |  |
| 1.167 | 1.02                   | 4.250 | 2.03  | 7.333  | 4.06  | 10.42 | 1.02  |  |  |  |
| 1.250 | 1.02                   | 4.333 | 5.08  | 7.417  | 4.06  | 10.50 | 1.02  |  |  |  |
| 1.333 | 1.02                   | 4.417 | 5.08  | 7.500  | 4.06  | 10.58 | 1.02  |  |  |  |
| 1.417 | 1.02                   | 4.500 | 5.08  | 7.583  | 4.06  |       | 1.02  |  |  |  |
| 1.500 | 1.02                   |       | 4.06  | 7.667  | 4.06  | 10.75 | 1.02  |  |  |  |
| 1.583 | 2.03                   | 4.667 | 4.06  | 7.750  | 4.06  | 10.83 | 2.03  |  |  |  |
| 1.667 | 2.03                   | 4.750 | 4.06  | 7.833  | 4.06  | 10.92 | 2.03  |  |  |  |
| 1.750 | 2.03                   | 4.833 | 4.06  | 7.917  | 4.06  | 11.00 | 2.03  |  |  |  |
| 1.833 | 1.02                   | 4.917 | 4.06  | 8.000  | 4.06  | 11.08 | 1.02  |  |  |  |
| 1.917 | 1.02                   | 5.000 | 4.06  | 8.083  | 3.05  | 11.17 | 1.02  |  |  |  |
| 2.000 | 1.02                   | 5.083 | 5.08  | 8.167  | 3.05  | 11.25 | 1.02  |  |  |  |
| 2.083 | 1.02                   | 5.167 | 5.08  | 8.250  | 3.05  | 11.33 | 1.02  |  |  |  |
| 2.167 | 1.02                   | 5.250 | 5.08  | 8.333  | 3.05  | 11.42 | 1.02  |  |  |  |
| 2.250 | 1.02                   | 5.333 | 7.11  | 8.417  | 3.05  | 11.50 | 1.02  |  |  |  |
|       |                        |       | Page  | 71     |       |       |       |  |  |  |

|   | Langsta  | ffRd_E  | A_Exist  | ing_West | DonWaters | hd        |      |
|---|--|---------|----------|----------|-----------|-----------|------|
| 1.833   | 1.02   4   | 4.917   | 4.06     | 8.000    | 4.06      | 11.08     | 1.02 |
| 1.91/   | 1.02   3   | .000    | 4.06     | 0 167    | 3.05      | 11.1/     | 1.02 |
| 2.000   | 1 02   | 5 167   | 5.00     | 8 250    | 3.05      | 11.23     | 1 02 |
| 2.167   | 1.02   | 5.250   | 5.08     | 8.333    | 3.05      | 11.42     | 1.02 |
| 2.250   | 1.02   | 5.333   | 7.11     | 8.417    | 3.05      | 11.50     | 1.02 |
| 2.333   | 3.05   | 5.417   | 7.11     | 8.500    | 3.05      | 11.58     | 1.02 |
| 2.417   | 3.05   5   | 5.500   | 7.11     | 8.583    | 2.03      | 11.67     | 1.02 |
| 2.500   | 3.05   5   | 5.583   | 8.13     | 8.667    | 2.03      | 11.75     | 1.02 |
| 2.583   | 2.03   !   | 5.667   | 8.13     | 8.750    | 2.03      | 11.83     | 2.03 |
| 2.66/   | 2.03   3   | ./50    | 8.13     | 8.833    | 3.05      | 11.92     | 2.03 |
| 2./50   | 2.03   3   | 0.000   | 56.90    | 0.917    | 3.05      | 12.00     | 1 02 |
| 2 917   | 3.05   | 5 000   | 56 90    | 9 983    | 2 03      | 12.00     | 1 02 |
| 3.000   | 3.05   | 5.083   | 57.91    | 9.167    | 2.03      | 12.25     | 1.02 |
| 3.083   | Langsta 1.02   1 1.02 | 5.167   | 57.91    | 9.250    | 2.03      | i         |      |
| Max.Eff.Inten.(mm,<br>over (r<br>Storage Coeff. (r<br>Unit Hyd. Tpeak (r<br>Unit Hyd. peak (r | /hr)=  | 57.91   |          | 38.29    |           |           |      |
| over (r   | nin)   | 10.00   |          | 20.00    |           |           |      |
| Storage Coeff. (r   | nin)=  | 8.38    | (11)     | 17.10 (: | ii)       |           |      |
| Unit Hyd. Ipeak (r  | nin)=  | 10.00   |          | 20.00    |           |           |      |
| опіт нуш. реак (  | cms)=  | 0.12    |          | 0.06     | ****      | TALS*     |      |
|   |  |         |          |          |           | .141 (iii | ١    |
| TIME TO PEAK (  | nrs)=  | 6.25    |          | 6.42     |           | 6.25      | ,    |
| RUNOFF VOLUME   | (mm)=  | 61.75   |          | 32.22    | 4         | 4.03      |      |
| TOTAL RAINFALL  | (mm)=  | 63.75   |          | 63.75    | 6         | 3.75      |      |
| PEAK FLOW ( TIME TO PEAK (I RUNOFF VOLUME TOTAL RAINFALL RUNOFF COEFFICIEN                    | Γ =  | 0.97    |          | 0.51     |           | 0.69      |      |
| (i) CN PROCEDURI<br>CN* = 84  |  |         |          |          | ١         |           |      |
| (ii) TIME STEP (I   | OT) SHOULD   | BE SMA  | ALLER OF |          | ,         |           |      |
| (iii) PEAK FLOW DO  |  |         |          | IF ANY   |           |           |      |
|   |  |         |          |          |           |           |      |
|   |  |         |          |          |           |           |      |
| ADD 11VD / 0430\]   |  |         |          |          |           |           |      |
| 1 + 2 = 3  <br>ID1= 1 ( 0135)   | ARE  | A QI    | PEAK     | TPEAK    | R.V.      |           |      |
| TD4 4 ( 043F  | (ha  | ) (     | cms)     | (hrs)    | (mm)      |           |      |
| + ID2= 2 ( 0140)  | ): 1.2   | 7 0.1   | 139      | 6.25     | 47.06     |           |      |
| ID = 3 ( 0420)  |  |         |          |          |           |           |      |
| NOTE: PEAK FLOWS  | DO NOT TNO   | 'LUDE E | RASEFION | IS TE AN | ,         |           |      |
| NOTE: TEAR TEORS  |  |         |          |          |           |           |      |
| ADD 11VD / 0435)  |  |         |          |          |           |           |      |
| ADD HYD ( 0425)  <br>1 + 2 = 3  | AREA   | A QI    | PEAK     | TPEAK    | R.V.      |           |      |
|   |  |         | Page     |          |           |           |      |
|   |  |         |          |          |           |           |      |

|                  | Langs  | taffRd E | A Exist | ing WestDon | Watersh | ıd        |      |
|------------------|--------|----------|---------|-------------|---------|-----------|------|
| 2.333            | 3.05   | 5.417    | 7.11    | 8.500       | 3.05    | 11.58     | 1.02 |
| 2.417            | 7 3.05 | 5.500    | 7.11    | 8.583       | 2.03    | 11.67     | 1.02 |
| 2.506            | 3.05   | 5.583    | 8.13    | 8.667       | 2.03    | 11.75     | 1.02 |
| 2.583            | 2.03   | 5.667    | 8.13    | 8.750       | 2.03    | 11.83     | 2.03 |
| 2.667            | 7 2.03 | 5.750    | 8.13    | 8.833       | 3.05    | 11.92     | 2.03 |
| 2.756            | 2.03   | 5.833    | 56.90   | 8.917       | 3.05    | 12.00     | 2.03 |
| 2.833            | 3.05   | 5.917    | 56.90   | 9.000       | 3.05    | 12.08     | 1.02 |
| 2.917            | 7 3.05 | 6.000    | 56.90   | 9.083       | 2.03    | 12.17     | 1.02 |
| 3.000            | 3.05   | 6.083    | 57.91   | 9.167       | 2.03    | 12.25     | 1.02 |
| 3.083            | 2.03   | 6.167    | 57.91   | 9.250       | 2.03    |           |      |
| H FCC T-+ /-     | (1 )   | F7 04    |         | 27.00       |         |           |      |
| Max.Eff.Inten.(  |        | 57.91    |         | 37.09       |         |           |      |
|                  | (min)  | 10.00    |         | 15.00       |         |           |      |
| Storage Coeff.   | (min)= |          |         | 14.97 (ii)  |         |           |      |
| Unit Hyd. Tpeak  |        | 10.00    |         | 15.00       |         |           |      |
| Unit Hyd. peak   | (cms)= | 0.13     |         | 0.08        |         |           |      |
|                  |        |          |         |             | *TOT    |           |      |
| PEAK FLOW        | (cms)= | 0.07     |         | 0.04        |         | 103 (iii) |      |
| TIME TO PEAK     | (hrs)= | 6.25     |         | 6.33        | 6       | . 25      |      |
| RUNOFF VOLUME    | (mm)=  | 61.75    |         | 31.16       | 44      | .61       |      |
| TOTAL RAINFALL   | (mm)=  | 63.75    |         | 63.75       | 63      | .75       |      |
| RUNOFF COEFFICIE | NT =   | 0.97     |         | 0.49        | 0       | .70       |      |
|                  |        |          |         |             |         |           |      |
|                  |        |          |         |             |         |           |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB         | Area<br>Total | (ha)= 1.11<br>Imp(%)= 38.00 |                     |
|---------------|---------------|-----------------------------|---------------------|
|               |               | THREENITOUS                 | DEBUTOUS (4)        |
|               |               | IMPERVIOUS                  | PERVIOUS (i)        |
| Surface Area  | (ha)=         | 0.42                        | 0.69                |
| Dep. Storage  | (mm)=         | 2.00                        | 5.00                |
| Average Slope | (%)=          | 1.00                        | 2.00                |
| Length        | (m)=          | 470.00                      | 20.00               |
| Mannings n    | =             | 0.013                       | 0.250               |
| NOTE: RATNE   | AII WAS       | TRANSFORMED TO              | 5.0 MTN. TIME STEP. |

| TRANSFORMED HYETOGRAPH |       |    |            |       |    |                |                |   |              |       |
|------------------------|-------|----|------------|-------|----|----------------|----------------|---|--------------|-------|
| TIME                   | RAIN  | 1  | IME        | RAIN  | 1. | TIME           | RAI            | N | TIME         | RAIN  |
| hrs                    | mm/hr |    | hrs        | mm/hr | 1. | hrs            | mm/h           | r | hrs          | mm/hr |
| 0.083                  | 0.00  | 3. | 167        | 2.03  | 1  | 5.250          | 57.91          |   | 9.33         | 2.03  |
| 0.167                  | 0.00  | 3. | 250        | 2.03  | 1  | 5.333          | 11.18          |   | 9.42         | 2.03  |
| 0.250                  | 0.00  |    |            | 3.05  |    |                | 11.18          |   |              |       |
| 0.333                  | 1.02  | 3. | 417        | 3.05  | 1  | 5.500          | 11.18          | - | 9.58         | 2.03  |
| 0.167                  | 0.00  | 3. | 250<br>333 | 2.03  | Ė  | 6.333<br>6.417 | 11.18<br>11.18 | İ | 9.42<br>9.50 | 2.03  |

|            |      |       |       | ing_WestD |       |       |      |
|------------|------|-------|-------|-----------|-------|-------|------|
| 0.417      |      | 3.500 |       | 6.583     |       |       | 2.03 |
| 0.500      | 1.02 | 3.583 | 2.03  |           |       | 9.75  | 2.03 |
| 0.583      | 2.03 | 3.667 |       | 6.750     | 11.18 |       | 2.03 |
| 0.667      |      | 3.750 |       | 6.833     | 5.08  |       | 2.03 |
| 0.750      |      | 3.833 |       | 6.917     | 5.08  |       | 2.03 |
| 0.833      |      | 3.917 |       | 7.000     | 5.08  |       | 2.03 |
| 0.917      |      | 4.000 |       | 7.083     | 5.08  |       | 2.03 |
| 1.000      |      | 4.083 |       | 7.167     |       |       | 2.03 |
| 1.083      |      | 4.167 |       | 7.250     | 5.08  |       | 1.02 |
| 1.167      |      | 4.250 |       | 7.333     |       |       | 1.02 |
| 1.250      |      | 4.333 |       |           |       |       | 1.02 |
| 1.333      | 1.02 | 4.417 | 5.08  | 7.500     | 4.06  |       | 1.02 |
| 1.417      | 1.02 | 4.500 | 5.08  | 7.583     | 4.06  | 10.67 | 1.02 |
| 1.500      | 1.02 | 4.583 | 4.06  | 7.667     | 4.06  | 10.75 | 1.02 |
| 1.583      | 2.03 | 4.667 |       | 7.750     |       |       | 2.03 |
| 1.667      | 2.03 | 4.750 | 4.06  | 7.833     |       |       | 2.03 |
| 1.750      | 2.03 | 4.833 | 4.06  | 7.917     | 4.06  | 11.00 | 2.03 |
| 1.833      | 1.02 | 4.917 | 4.06  | 8.000     | 4.06  | 11.08 | 1.02 |
| 1.917      | 1.02 | 5.000 | 4.06  | 8.083     | 3.05  | 11.17 | 1.02 |
| 2.000      | 1.02 | 5.083 | 5.08  | 8.167     | 3.05  | 11.25 | 1.02 |
| 2.083      | 1.02 | 5.167 | 5.08  | 8.250     | 3.05  | 11.33 | 1.02 |
| 2.167      | 1.02 | 5.250 | 5.08  | 8.333     | 3.05  | 11.42 | 1.02 |
| 2.250      | 1.02 | 5.333 | 7.11  | 8.417     | 3.05  | 11.50 | 1.02 |
| 2.333      | 3.05 | 5.417 | 7.11  | 8.500     | 3.05  | 11.58 | 1.02 |
| 2.417      | 3.05 | 5.500 | 7.11  | 8.583     | 2.03  | 11.67 | 1.02 |
| 2.500      | 3.05 | 5.583 | 8.13  | 8.667     | 2.03  | 11.75 | 1.02 |
| 2.583      | 2.03 | 5.667 | 8.13  | 8.750     | 2.03  | 11.83 | 2.03 |
| 2.667      | 2.03 | 5.750 | 8.13  | 8.833     | 3.05  | 11.92 | 2.03 |
| 2.750      | 2.03 | 5.833 | 56.90 | 8.917     | 3.05  | 12.00 | 2.03 |
| 2.833      | 3.05 | 5.917 | 56.90 | 9.000     | 3.05  | 12.08 | 1.02 |
| 2.917      | 3.05 | 6.000 | 56.90 | 9.083     | 2.03  | 12.17 | 1.02 |
| 3.000      | 3.05 | 6.083 | 57.91 | 9.167     | 2.03  | 12.25 | 1.02 |
| 3.083      | 2.03 | 6.167 | 57.91 | 9.250     | 2.03  | İ     |      |
| Inten.(mm/ | hr)= | 57.91 |       | 37.09     |       |       |      |
| over (m    | in)  | 10.00 |       | 15.00     |       |       |      |
|            |      |       |       |           |       |       |      |

| Max.Eff.Inten.(mm/hr)= | 57.91     | 37.09      |             |
|------------------------|-----------|------------|-------------|
| over (min)             | 10.00     | 15.00      |             |
| Storage Coeff. (min)=  | 8.04 (ii) | 14.97 (ii) |             |
| Unit Hyd. Tpeak (min)= | 10.00     | 15.00      |             |
| Unit Hyd. peak (cms)=  | 0.13      | 0.08       |             |
|                        |           |            | *TOTALS*    |
| PEAK FLOW (cms)=       | 0.07      | 0.05       | 0.114 (iii) |
| TIME TO PEAK (hrs)=    | 6.25      | 6.33       | 6.25        |
| RUNOFF VOLUME (mm)=    | 61.75     | 31.16      | 42.78       |
| TOTAL RAINFALL (mm)=   | 63.75     | 63.75      | 63.75       |
| RUNOFF COEFFICIENT =   | 0.97      | 0.49       | 0.67        |
|                        |           |            |             |

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|            | Langs | taffRd_E/ | A_Existi | ng_WestDo | onWaters | hd    |      |
|------------|-------|-----------|----------|-----------|----------|-------|------|
| 1.917      | 1.02  | 5.000     | 4.06     | 8.083     | 3.05     | 11.17 | 1.02 |
| 2.000      | 1.02  | 5.083     | 5.08     | 8.167     | 3.05     | 11.25 | 1.02 |
| 2.083      | 1.02  | 5.167     | 5.08     | 8.250     | 3.05     | 11.33 | 1.02 |
| 2.167      | 1.02  | 5.250     | 5.08     | 8.333     | 3.05     | 11.42 | 1.02 |
| 2.250      | 1.02  | 5.333     | 7.11     | 8.417     | 3.05     | 11.50 | 1.02 |
| 2.333      | 3.05  | 5.417     | 7.11     | 8.500     | 3.05     | 11.58 | 1.02 |
| 2.417      | 3.05  | 5.500     | 7.11     | 8.583     | 2.03     | 11.67 | 1.02 |
| 2.500      | 3.05  | 5.583     | 8.13     | 8.667     | 2.03     | 11.75 | 1.02 |
| 2.583      | 2.03  | 5.667     | 8.13     | 8.750     | 2.03     | 11.83 | 2.03 |
| 2.667      | 2.03  | 5.750     | 8.13     | 8.833     | 3.05     | 11.92 | 2.03 |
| 2.750      | 2.03  | 5.833     | 56.90    | 8.917     | 3.05     | 12.00 | 2.03 |
| 2.833      | 3.05  | 5.917     | 56.90    | 9.000     | 3.05     | 12.08 | 1.02 |
| 2.917      | 3.05  | 6.000     | 56.90    | 9.083     | 2.03     | 12.17 | 1.02 |
| 3.000      | 3.05  | 6.083     | 57.91    | 9.167     | 2.03     | 12.25 | 1.02 |
| 3.083      | 2.03  | 6.167     | 57.91    | 9.250     | 2.03     | l     |      |
| Inten.(mm/ | hr)=  | 57.91     |          | 34.81     |          |       |      |

| Max.Eff.Inten.(m | m/hr)= | 57.91     | 34.81      |             |
|------------------|--------|-----------|------------|-------------|
| over             | (min)  | 5.00      | 20.00      |             |
| Storage Coeff.   | (min)= | 6.39 (ii) | 15.26 (ii) |             |
| Unit Hyd. Tpeak  | (min)= | 5.00      | 20.00      |             |
| Unit Hyd. peak   | (cms)= | 0.18      | 0.07       |             |
|                  |        |           |            | *TOTALS*    |
| PEAK FLOW        | (cms)= | 0.06      | 0.02       | 0.081 (iii) |
| TIME TO PEAK     | (hrs)= | 6.25      | 6.42       | 6.25        |
| RUNOFF VOLUME    | (mm)=  | 61.75     | 29.17      | 47.73       |
| TOTAL RAINFALL   | (mm)=  | 63.75     | 63.75      | 63.75       |
| RUNOFF COEFFICIE | NT =   | 0.97      | 0.46       | 0.75        |
|                  |        |           |            |             |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 81.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

|             | 0.90                                       |                                    |   |  |  |
|-------------|--|------------------------------------|---|--|--|
|             |  |                                    |   |  |  |
| 1 Tmm/9/\   |  |                                    |   |  |  |
| T TIIIb(%)= | 53.00                                      | Dir. 0                             | Conn.(%)=   | 53.00  |  |
|             |  |                                    |   |  |  |
| IMPERVI(    | OUS  | PERVIOUS                           | S (i)   |  |  |
| 0.4         | 3  | 0.42                               |   |  |  |
| 2.0         | 3  | 5.00                               |   |  |  |
| 1.0         | 3  | 2.00                               |   |  |  |
| 320.0       | 9  | 25.00                              |   |  |  |
| 0.01        | 3  | 0.250                              |   |  |  |
|             | IMPERVIO<br>0.48<br>2.00<br>1.00<br>320.00 | IMPERVIOUS<br>0.48<br>2.00<br>1.00 | IMPERVIOUS PERVIOU<br>0.48 0.42<br>2.00 5.00<br>1.00 2.00<br>320.00 25.00 | IMPERVIOUS PERVIOUS (i) 0.48 0.42 2.00 5.00 1.00 2.00 320.00 25.00 | IMPERVIOUS PERVIOUS (i) 0.48 0.42 2.00 5.00 1.00 2.00 320.00 25.00 |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ---TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN

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#### ${\tt LangstaffRd\_EA\_Existing\_WestDonWatershd}$

| ADD HYD ( 0460) <br>  1 + 2 = 3  <br>  ID1= 1 ( 0205): | AREA<br>(ha)<br>1.11 | QPEAK<br>(cms)<br>0.114 | TPEAK<br>(hrs)<br>6.25 | R.V.<br>(mm)<br>42.78 |
|--|----------------------|-------------------------|------------------------|-----------------------|
| + ID2= 2 ( 0210):                                      | 0.96                 | 0.103                   | 6.25                   | 44.61                 |
| ID = 3 ( 0460):  | 2.07                 | 0.217                   | 6.25                   | 43.63                 |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB  <br>  STANDHYD ( 0230) | Area  | (ha)=   | 0.70  |                |       |
|-------------------------------|-------|---------|-------|----------------|-------|
| ID= 1 DT= 5.0 min             | Total | Imp(%)= | 57.00 | Dir. Conn.(%)= | 57.00 |
|                               |       |         |       |                |       |
|                               |       | IMPERVI | OUS   | PERVIOUS (i)   |       |
| Surface Area                  | (ha)= | 0.4     | 0     | 0.30           |       |
| Dep. Storage                  | (mm)= | 2.0     | 0     | 5.00           |       |
| Average Slope                 | (%)=  | 1.0     | 0     | 2.00           |       |
| Length                        | (m)=  | 320.0   | 0     | 25.00          |       |
| Mannings n                    | _     | a a1    | 3     | a 29a          |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TRANSFORMED HYETOGRAPH |       |       |       |        |       |       |       |  |  |
|------------------------|-------|-------|-------|--------|-------|-------|-------|--|--|
| TIME                   | RAIN  | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |  |
| hrs                    | mm/hr | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |  |
| 0.083                  | 0.00  | 3.167 | 2.03  | 6.250  | 57.91 | 9.33  | 2.03  |  |  |
| 0.167                  | 0.00  | 3.250 | 2.03  | 6.333  | 11.18 | 9.42  | 2.03  |  |  |
| 0.250                  | 0.00  | 3.333 | 3.05  | 6.417  | 11.18 | 9.50  | 2.03  |  |  |
| 0.333                  | 1.02  | 3.417 | 3.05  | 6.500  | 11.18 | 9.58  | 2.03  |  |  |
| 0.417                  | 1.02  | 3.500 | 3.05  | 6.583  | 11.18 | 9.67  | 2.03  |  |  |
| 0.500                  | 1.02  | 3.583 | 2.03  | 6.667  | 11.18 | 9.75  | 2.03  |  |  |
| 0.583                  | 2.03  | 3.667 | 2.03  | 6.750  | 11.18 | 9.83  | 2.03  |  |  |
| 0.667                  | 2.03  | 3.750 | 2.03  | 6.833  | 5.08  | 9.92  | 2.03  |  |  |
| 0.750                  | 2.03  | 3.833 | 3.05  | 6.917  | 5.08  | 10.00 | 2.03  |  |  |
| 0.833                  | 1.02  | 3.917 | 3.05  | 7.000  | 5.08  | 10.08 | 2.03  |  |  |
| 0.917                  | 1.02  | 4.000 | 3.05  | 7.083  | 5.08  | 10.17 | 2.03  |  |  |
| 1.000                  | 1.02  | 4.083 | 2.03  | 7.167  | 5.08  | 10.25 | 2.03  |  |  |
| 1.083                  | 1.02  | 4.167 | 2.03  | 7.250  | 5.08  | 10.33 | 1.02  |  |  |
| 1.167                  | 1.02  | 4.250 | 2.03  | 7.333  | 4.06  | 10.42 | 1.02  |  |  |
| 1.250                  | 1.02  | 4.333 | 5.08  | 7.417  | 4.06  | 10.50 | 1.02  |  |  |
| 1.333                  | 1.02  | 4.417 | 5.08  | 7.500  | 4.06  | 10.58 | 1.02  |  |  |
| 1.417                  | 1.02  | 4.500 | 5.08  | 7.583  | 4.06  | 10.67 | 1.02  |  |  |
| 1.500                  | 1.02  | 4.583 | 4.06  | 7.667  | 4.06  | 10.75 | 1.02  |  |  |
| 1.583                  | 2.03  | 4.667 | 4.06  | 7.750  | 4.06  | 10.83 | 2.03  |  |  |
| 1.667                  | 2.03  | 4.750 | 4.06  | 7.833  | 4.06  | 10.92 | 2.03  |  |  |
| 1.750                  | 2.03  | 4.833 | 4.06  | 7.917  | 4.06  | 11.00 | 2.03  |  |  |
| 1.833                  | 1.02  | 4.917 | 4.06  | 8.000  | 4.06  | 11.08 | 1.02  |  |  |

| Langs                  | taffRd F | Δ Fyist | ing WestDo | nWaters | hd         |       |
|------------------------|----------|---------|------------|---------|------------|-------|
| hrs mm/hr              |          |         | l' hrs     | mm/hr   |            | mm/hr |
| 0.083 0.00             |          | 2.03    |            | 57.91   |            | 2.03  |
|                        | 3.250    |         | 6.333      | 11.18   |            | 2.03  |
|                        | 3.333    |         | 6.417      | 11.18   |            | 2.03  |
|                        | 3.417    | 3.05    |            | 11.18   |            | 2.03  |
|                        | 3.500    |         | 6.583      | 11.18   |            | 2.03  |
|                        | 3.583    |         | 6.667      | 11.18   |            | 2.03  |
|                        | 3.667    |         | 6.750      | 11.18   |            | 2.03  |
|                        | 3.750    |         | 6.833      | 5.08    |            | 2.03  |
|                        | 3.833    | 3.05    |            | 5.08    |            | 2.03  |
|                        | 3.917    |         | 7.000      | 5.08    |            | 2.03  |
|                        | 4.000    | 3.05    |            | 5.08    |            | 2.03  |
|                        | 4.083    |         | 7.167      | 5.08    |            | 2.03  |
|                        | 4.167    | 2.03    |            | 5.08    |            | 1.02  |
|                        | 4.250    | 2.03    |            | 4.06    |            | 1.02  |
|                        | 4.230    | 5.08    |            | 4.06    |            | 1.02  |
|                        | 4.333    |         |            | 4.06    |            | 1.02  |
|                        | 4.500    |         | 7.583      | 4.06    |            | 1.02  |
|                        | 4.583    | 4.06    |            | 4.06    |            | 1.02  |
|                        | 4.667    | 4.06    |            | 4.06    |            | 2.03  |
|                        | 4.750    | 4.06    |            | 4.06    |            | 2.03  |
|                        | 4.833    | 4.06    |            | 4.06    |            | 2.03  |
|                        | 4.917    | 4.06    |            | 4.06    |            | 1.02  |
|                        | 5.000    |         | 8.083      | 3.05    |            | 1.02  |
|                        | 5.083    | 5.08    |            | 3.05    |            | 1.02  |
|                        | 5.167    |         | 8.250      | 3.05    |            | 1.02  |
|                        | 5.250    | 5.08    |            | 3.05    |            | 1.02  |
| 2.250 1.02             |          |         | 8.417      | 3.05    |            | 1.02  |
|                        | 5.417    |         | 8.500      | 3.05    |            | 1.02  |
|                        | 5.500    |         | 8.583      | 2.03    |            | 1.02  |
|                        | 5.583    |         | 8.667      | 2.03    |            | 1.02  |
| 2.583 2.03             |          |         | 8.750      | 2.03    |            | 2.03  |
|                        | 5.750    |         | 8.833      | 3.05    |            | 2.03  |
| 2.750 2.03             |          |         | 8.917      | 3.05    |            | 2.03  |
|                        | 5.917    |         |            | 3.05    |            | 1.02  |
|                        | 6.000    |         | 9.000      | 2.03    |            | 1.02  |
| 3.000 3.05             |          |         |            | 2.03    |            | 1.02  |
|                        | 6.167    | 57.91   |            | 2.03    |            | 1.02  |
| 3.083 2.03             | 0.10/    | 57.91   | 9.250      | 2.03    |            |       |
| Max.Eff.Inten.(mm/hr)= | 57.91    |         | 37.09      |         |            |       |
| over (min)             | 5.00     |         | 15.00      |         |            |       |
| Storage Coeff. (min)=  | 6.39     | (11)    | 14.30 (ii  | )       |            |       |
| Unit Hyd. Tpeak (min)= | 5.00     |         | 15.00      |         |            |       |
| Unit Hyd. peak (cms)=  | 0.18     |         | 0.08       | *****   | TALS*      |       |
| PEAK FLOW (cms)=       | 0.08     |         | 0.03       |         | .106 (iii) |       |
| TIME TO PEAK (hrs)=    | 6.25     |         | 6.33       |         | 5.25       | ,     |
| RUNOFF VOLUME (mm)=    | 61.75    |         | 31.16      |         | 7.37       |       |
| TOTAL RAINFALL (mm)=   | 63.75    |         | 63.75      |         | 3.75       |       |
| RUNOFF COEFFICIENT =   | 0.97     |         | 0.49       |         | 9.74       |       |
| MONOT. COLT. TETENT -  | 3.57     |         | 05         | ,       |            |       |

LangstaffRd\_EA\_Existing\_WestDonWatershd
CN\* = 83.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0475)| | 1 + 2 = 3 | AREA QPEAK TPEAK R.V. ID1= 1 ( 0225): 0.90 + ID2= 2 ( 0230): 0.70 (cms) 0.106 0.081 (hrs) (mm) 6.25 47.37 6.25 47.73 ID = 3 ( 0475): 1.60 0.187 6.25

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS TE ANY.

| STANDHYD ( 0220) | Area (ha)= 0.65 |ID= 1 DT= 5.0 min | Total Imp(%)= 46.00 Dir. Conn.(%)= 46.00 IMPERVIOUS PERVIOUS (i)

1MPERVIOU 0.30 2.00 1.00 260.00 0.013 Surface Area (ha)= 0.35 5.00 Dep. Storage (mm)=
Average Slope (%)=
Length (m)=
Mannings n = 2.00 20.00 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TRANSFORMED HYETOGRAPH RAIN | mm/hr | 0.00 | 0.00 | TIME hrs 3.167 TIME hrs 0.083 0.167 3.333 0.250 0.333 1.02 3.417 2.03 0.417 1.02 3.500 2.03 1.02 2.03 2.03 2.03 1.02 3.583 3.667 3.750 3.833 3.917 4.000 0.500 0.583 2.03 0.583 0.667 0.750 0.833 2.03 0.917 2.03 4.083 1.000 1.02 2.03 1.02 | 4.083 1.02 | 4.167 1.02 | 4.250 1.02 | 4.333 1.02 | 4.417 1.02 | 4.500 1.083 1.02 1.167 1.02

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LangstaffRd\_EA\_Existing\_WestDonWatershd NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TRANSFORMED HYETOGRAPH RAIN | TIME TTMF RATN 0.083 0.167 0.250 0.333 mm/hr | hrs 0.00 | 3.167 0.00 | 3.250 0.00 | 3.333 1.02 | 3.417 6.250 6.333 6.417 6.500 6.583 6.667 6.750 6.833 6.917 7.000 7.083 3.05 0.417 1.02 3.500 2.03 1.02 2.03 2.03 | 2.03 | 2.03 | 3.05 | 3.05 | 3.05 | 2.03 | 2.03 2.03 2.03 1.02 0.583 3.667 3.750 11.18 9.83 2.03 0.583 0.667 0.750 0.833 0.917 1.000 11.18 5.08 5.08 5.08 5.08 5.08 5.08 3.750 3.833 3.917 4.000 4.083 4.167 4.250 4.333 7.167 7.250 1.083 1.02 2.03 7.236 7.333 7.417 7.500 7.583 7.667 7.750 7.833 1.167 1.02 2.03 4.06 1.02 5.08 5.08 5.08 4.06 4.06 4.06 4.06 4.06 4.06 4.06 4.06 4.06 4.06 4.06 1.250 1.02 1.02 4.333 4.417 4.500 4.583 4.667 4.750 1 333 1.417 1.500 1.583 1.02 1.02 1.02 2.03 1.667 4.833 1.750 2.03 7.917 11.00 2.03 8.000 8.083 8.167 8.250 8.333 8.417 8.500 1.833 1.02 4.917 4.06 4.06 3.05 3.05 3.05 3.05 3.05 3.05 3.05 1.02 1.02 1.02 1.02 4.06 5.08 5.08 5.08 7.11 1.02 1.02 1.02 1.02 1.917 5.000 11.17 5.083 5.167 5.250 5.333 2.250 1.02 11.50 2.333 5.417 7.11 | 8.500 7.11 | 8.583 8.13 | 8.667 8.13 | 8.750 8.13 | 8.833 56.90 | 9.000 56.90 | 9.083 57.91 | 9.167 57.91 | 9.250 7.11 | 2.417 3.05 5.500 2.03 11.67 1.02 5.583 2.03 11.75 1.02 2.03 2.03 2.03 3.05 5.667 5.750 5.833 5.917 6.000 2.03 | 3.05 | 3.05 | 3.05 | 2.03 | 2.03 2.03 2.03 1.02 2.583 11.83 11.92 12.00 12.08 12.17 2.917 3.05 1.02 6.083 2.03 12.25 1.02 3.083 2.03 | 6.167 2.03

> 31.16 Page 79

5.00 15.00 5.64 (ii) 14.47 (ii) 5.00 15.00 0.20 0.08

0.02

0.05

6.25 61.75

\*TOTALS\*

0.071 (iii)

Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=

PEAK FLOW (cms)= TIME TO PEAK (hrs)= RUNOFF VOLUME (mm)=

|                                | Langs   | staffRd_E/       | A_Existi | .ng_WestDoi                            | waters | hd       |      |
|--------------------------------|---------|------------------|----------|--|--------|----------|------|
| 1.500                          |         |                  |          | 7.667                                  |        | 10.75    | 1.02 |
| 1.583                          |         | 4.667            |          | 7.750                                  |        | 10.83    | 2.03 |
| 1.667                          | 2.03    | 4.750            | 4.06     | 7.833                                  | 4.06   | 10.92    | 2.03 |
| 1.750                          | 2.03    | 4.833            | 4.06     | 7.917                                  | 4.06   | 11.00    | 2.03 |
| 1.833                          | 1.02    | 4.917            | 4.06     | 8.000                                  | 4.06   | 11.08    | 1.02 |
| 1.917                          | 1.02    | 5.000            | 4.06     | 8.083                                  | 3.05   | 11.17    | 1.02 |
| 2.000                          | 1.02    | 5.083            | 5.08     | 8.167                                  | 3.05   | 11.25    | 1.02 |
|                                | 1.02    | 5.167            | 5.08     | 8.250                                  | 3.05   | 11.33    | 1.02 |
| 2.167                          | 1.02    | 5.250            | 5.08     | 8.333<br>8.417                         | 3.05   | 11.42    | 1.02 |
| 2.250                          | 1.02    | 5.333            | 7.11     | 8.417                                  | 3.05   | 11.50    | 1.02 |
| 2.333<br>2.417                 | 3.05    | 5.41/            | 7.11     | 8.500<br>8.583<br>8.667                | 3.05   | 11.58    | 1.02 |
| 2 500                          | 2.05    | 1 5.500          | 0.11     | 0.505                                  | 2.03   | 11.07    | 1.02 |
| 2.500                          | 2 02    | 5.565<br>  E 667 | 0.13     | 0.007                                  | 2.03   | 11./5    | 2.03 |
| 2.565                          | 2.03    | 5.00/<br>  E 7EA | 0.13     | 0./50                                  | 2.05   | 11.03    | 2.03 |
| 2.007                          | 2.03    | 1 5 000          | 6.13     | 8.667<br>  8.750<br>  8.833<br>  8.917 | 2 05   | 12.92    | 2.03 |
| 2.833                          | 3 05    | 5 017            | 56 90    | 9.000                                  | 3 05 1 | 12.00    | 1.02 |
| 2.033                          | 3.05    | 1 6 000          | 56 90    | 1 9.000                                | 2 03   | 12.17    |      |
| 3 000                          | 3.05    | 6.000            | 57 91    | 9.083                                  | 2.03   | 12.17    | 1.02 |
| 3.000                          | 2 03    | 6 167            | 57 91    | 9.250                                  | 2 03   | 12.23    | 1.02 |
| 3.003                          | 2.05    | 01207            | 37.132   | 7.250                                  | 2.05   |          |      |
| Max.Eff.Inten.(mm/             | /hr)=   | 57.91            |          | 37.09                                  |        |          |      |
|                                |         | 5 00             |          | 15 00                                  |        |          |      |
| over (m<br>Storage Coeff. (m   | nin)=   | 5.64             | (ii)     | 12.56 (ii)                             |        |          |      |
| Unit Hyd. Tpeak (m             |         | 5.00             |          | 15.00 ` ′                              |        |          |      |
| Unit Hyd. peak (d              | ms)=    | 0.20             |          | 0.08                                   |        |          |      |
| , , ,                          |         |                  |          |  | *T0T   | ALS*     |      |
| PEAK FLOW (c                   | ms)=    | 0.05             |          | 0.03                                   | 0.     | 074 (iii | )    |
| TIME TO PEAK (F                | nrs)=   | 6.25             |          | 6.33                                   | E      | .25      |      |
|                                | (mm)=   | 61.75            |          | 31.16                                  | 45     | .22      |      |
|                                | (mm)=   | 63.75            |          | 63.75                                  |        | 3.75     |      |
| RUNOFF COEFFICIENT             | · =     | 0.97             |          | 0.49                                   | 6      | 71       |      |
|                                |         |                  |          |  |        |          |      |
| (1)                            |         |                  |          |  |        |          |      |
| (i) CN PROCEDURE               |         |                  |          |  |        |          |      |
| CN* = 83.<br>(ii) TIME STEP (E |         |                  |          |  |        |          |      |
| THAN THE STOP                  |         |                  |          | EQUAL                                  |        |          |      |
| (iii) PEAK FLOW DO             |         |                  |          | TE ANV                                 |        |          |      |
| (III) PEAK FLOW DO             | JES NUI | INCLUDE D        | ASEFLUW  | IF ANT.                                |        |          |      |
|                                |         |                  |          |  |        |          |      |
|                                |         |                  |          |  |        |          |      |
| CALIB                          |         |                  |          |  |        |          |      |
| STANDHYD ( 0215)               | Area    | (ha)=            | 0.58     |  |        |          |      |
| ID= 1 DT= 5.0 min              |         |                  |          | Dir. Conn.                             | (%)= 5 | 7.00     |      |
|                                |         | , -              |          |  | , -    |          |      |
|                                |         | IMPERVIOU        | S PE     | RVIOUS (i)                             |        |          |      |
| Surface Area (                 | (ha)=   | 0.33             |          | 0.25                                   |        |          |      |
| Dep. Storage (                 | (mm)=   | 2.00             |          | 5.00                                   |        |          |      |
| Average Slope                  | (%)=    | 1.00             |          | 2.00                                   |        |          |      |
| Length                         | (m)=    | 260.00           |          | 30.00                                  |        |          |      |
| Mannings n                     | ` =     | 0.013            |          | 0.250                                  |        |          |      |
| •                              |         |                  |          |  |        |          |      |

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(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: (1) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 83.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY. | ADD HYD ( 0470)| | 1 + 2 = 3 | | ID1= 1 ( 0215): + ID2= 2 ( 0220): AREA (ha) 0.58 QPEAK (cms) 0.071 0.074 TPEAK (hrs) 6.25 6.25 R.V. (mm) 48.58 45.22 0.65 ID = 3 ( 0470): 1.23 0.145 6.25 46.81 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY. | ADD HYD ( 0480)| | 1 + 2 = 3 | QPEAK AREA (ha) (cms) 1.23 0.145 AREA (hrs) 6.25 6.25 ID = 3 ( 0480): 2.83 0.332 6.25 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY. I CALTB IMPERVIOUS PERVIOUS (i) Surface Area 0.24 2.00 0.19 Dep. Storage Average Slope Length Mannings n (mm) = (%) = (m) = 5.00 2.00 260.00 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYFTOGRAPH ----TIME RAIN | TIME RAIN | TIME RAIN | TIME hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs

|                  |                 | +- CCD 4 F |       |                   |       | 6.4       |      |
|------------------|-----------------|------------|-------|-------------------|-------|-----------|------|
| 0.000            |                 |            |       | ing_WestD         |       |           | 2 02 |
| 0.083            |                 | 3.167      |       | 6.250             |       |           | 2.03 |
| 0.167            |                 |            |       | 6.333             |       |           | 2.03 |
| 0.250            |                 | 3.333      |       | 6.417             |       |           | 2.03 |
| 0.333            |                 | 3.417      |       | 6.500             |       |           | 2.03 |
| 0.417            |                 | 3.500      |       | 6.583             |       |           | 2.03 |
| 0.500            |                 | 3.583      |       | 6.667             |       |           | 2.03 |
| 0.583            |                 | 3.667      |       | 6.750             | 11.18 |           | 2.03 |
| 0.667            |                 | 3.750      |       | 6.833             | 5.08  |           | 2.03 |
| 0.750            |                 | 3.833      |       | 6.917             | 5.08  |           | 2.03 |
| 0.833            |                 | 3.917      |       | 7.000             | 5.08  |           | 2.03 |
| 0.917            |                 |            |       | 7.083             | 5.08  |           | 2.03 |
| 1.000            |                 | 4.083      |       | 7.167             | 5.08  |           | 2.03 |
| 1.083            | 1.02            | 4.167      | 2.03  | 7.250             | 5.08  | 10.33     | 1.02 |
| 1.167            | 1.02            | 4.250      | 2.03  | 7.333             | 4.06  | 10.42     | 1.02 |
| 1.250            | 1.02            | 4.333      | 5.08  | 7.417             | 4.06  | 10.50     | 1.02 |
| 1.333            | 1.02            | 4.417      | 5.08  | 7.500             | 4.06  | 10.58     | 1.02 |
| 1.417            | 1.02            | 4.500      | 5.08  | 7.583             | 4.06  | 10.67     | 1.02 |
| 1.500            | 1.02            | 4.583      | 4.06  | 7.667             | 4.06  | 10.75     | 1.02 |
| 1.583            | 2.03            | 4.667      | 4.06  | 7.750             | 4.06  | 10.83     | 2.03 |
| 1.667            | 2.03            | 4.750      | 4.06  | 7.833             | 4.06  | 10.92     | 2.03 |
| 1.750            | 2.03            | 4.833      | 4.06  | 7.917             | 4.06  | 11.00     | 2.03 |
| 1.833            | 1.02            | 4.917      | 4.06  | 8.000             | 4.06  | 11.08     | 1.02 |
| 1.917            |                 | 5.000      | 4.06  | 8.083             | 3.05  | 11.17     | 1.02 |
| 2.000            |                 | 5.083      |       | 8.167             | 3.05  | 11.25     | 1.02 |
| 2.083            | 1.02            | 5.167      | 5.08  | 8.250             | 3.05  | 11.33     | 1.02 |
| 2.167            | 1.02            | 5.250      | 5.08  | 8.333             | 3.05  | 11.42     | 1.02 |
| 2.250            |                 | 5.333      |       | 8.417             | 3.05  |           | 1.02 |
| 2.333            |                 | 5.417      |       | 8.500             | 3.05  |           | 1.02 |
| 2.417            |                 | 5.500      | 7.11  |                   | 2.03  |           | 1.02 |
| 2.500            |                 | 5.583      |       | 8.667             | 2.03  |           | 1.02 |
| 2.583            |                 | 5.667      |       | 8.750             | 2.03  |           | 2.03 |
| 2.667            |                 | 5.750      |       | 8.833             | 3.05  |           | 2.03 |
| 2.750            |                 | 5.833      |       | 8.917             | 3.05  |           | 2.03 |
| 2.833            |                 | 5.917      |       | 9.000             | 3.05  |           | 1.02 |
| 2.917            |                 |            |       | 9.083             | 2.03  |           | 1.02 |
| 3.000            |                 | 6.083      |       |                   | 2.03  |           | 1.02 |
| 3.083            |                 | 6.167      | 57.91 |                   | 2.03  |           | 1.02 |
| Max.Eff.Inten.(m | m/hn\-          | 57.91      |       | 44.85             |       |           |      |
| over             |                 | 5.00       |       | 15.00             |       |           |      |
|                  | (min)<br>(min)= |            | (::)  |                   | 2.1   |           |      |
| Unit Hyd. Tpeak  |                 | 5.00       | (ii)  | 12.06 (i<br>15.00 | 1)    |           |      |
|                  |                 |            |       |                   |       |           |      |
| Unit Hyd. peak   | (cms)=          | 0.20       |       | 0.09              | *T0   | TALS*     |      |
| PEAK FLOW        | (cms)=          | 0.04       |       | 0.02              |       | .057 (iii | )    |
|                  | (hrs)=          | 6.25       |       | 6.33              |       | 5.25      | ′    |
| RUNOFF VOLUME    | (mm)=           | 61.75      |       | 38.29             |       | 1.41      |      |
| TOTAL RAINFALL   | (mm)=           | 63.75      |       | 63.75             |       | 3.75      |      |
| RUNOFF COEFFICIE |                 | 0.97       |       | 0.60              |       | 0.81      |      |
|                  |                 | 0.57       |       | 2.00              |       |           |      |
|                  |                 |            |       |                   |       |           |      |

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  $CN^* = 89.0$  Ia = Dep. Storage (Above)

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| Lar<br>2.583 2.0<br>2.667 2.0<br>2.759 2.0<br>2.833 3.0<br>2.917 3.0<br>3.000 3.0   | ngstaffRd_EA_Exist<br>3   5.667            | sing_WestDonWaters<br>  8.750                 | hd   11.83   2.03   11.92   2.03   12.00   2.03   12.08   1.02   12.17   1.02   12.25   1.02 |  |  |  |  |  |  |
|---|--|---|--|--|--|--|--|--|--|
| Max.Eff.Inten.(mm/hr)=  | 57.91<br>5.00<br>5.64 (ii)<br>5.00<br>0.20 | 42.12<br>15.00<br>13.86 (ii)<br>15.00<br>0.08 | TAI C*   |  |  |  |  |  |  |
| RUNOFF COEFFICIENT = 0.97 0.56 0.74  (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  CN* = 87.0 Ia = Dep. Storage (Above)  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  THAN THE STORAGE COEFFICIENT.  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY. |  |   |  |  |  |  |  |  |  |
| ADD HYD ( 0430) <br>  1 + 2 = 3  <br>  ID1= 1 ( 0155):<br>+ ID2= 2 ( 0160):<br>  ID = 3 ( 0430):  |  |   |  |  |  |  |  |  |  |
| NOTE: PEAK FLOWS DO NO    CALIB   |  |   | 94.00  |  |  |  |  |  |  |
|   | 0.013                                      | 0.23<br>5.00<br>2.00<br>40.00<br>0.250        | EP.  |  |  |  |  |  |  |

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LangstaffRd\_EA\_Existing\_WestDonWatershd
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |          |         |       |        |           |       |
|-------------------|----------|---------|-------|--------|-----------|-------|
| STANDHYD ( 0155)  | Area     | (ha)=   | 0.56  |        |           |       |
| ID= 1 DT= 5.0 min | Total    | Imp(%)= | 45.00 | Dir.   | Conn.(%)= | 45.00 |
|                   |          |         |       |        |           |       |
|                   |          | IMPERVI | OUS   | PERVIO | JS (i)    |       |
| Surface Area      | (ha)=    | 0.2     | 5     | 0.33   | 1         |       |
| Dep. Storage      | ( mm ) = | 2.0     | 0     | 5.00   | 9         |       |
| Average Slope     | (%)=     | 1.0     | 0     | 2.00   | 9         |       |
| Length            | (m)=     | 260.0   | 0     | 25.00  | 9         |       |
| Mannings n        | ` ′=     | 9.91    | 3     | 0.296  | 9         |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       |       |       | HYETOGR |       |       |       |
|-------|-------|-------|-------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN  | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03  | 6.250   | 57.91 | 9.33  | 2.03  |
| 0.167 | 0.00  | 3.250 | 2.03  | 6.333   | 11.18 | 9.42  | 2.03  |
| 0.250 | 0.00  | 3.333 | 3.05  | 6.417   | 11.18 | 9.50  | 2.03  |
| 0.333 | 1.02  | 3.417 | 3.05  | 6.500   | 11.18 | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05  | 6.583   | 11.18 | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03  | 6.667   | 11.18 | 9.75  | 2.03  |
| 0.583 | 2.03  | 3.667 | 2.03  | 6.750   | 11.18 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 2.03  | 6.833   | 5.08  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 3.05  | 6.917   | 5.08  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 3.05  | 7.000   | 5.08  | 10.08 | 2.03  |
| 0.917 | 1.02  | 4.000 | 3.05  | 7.083   | 5.08  | 10.17 | 2.03  |
| 1.000 | 1.02  | 4.083 | 2.03  | 7.167   | 5.08  | 10.25 | 2.03  |
| 1.083 | 1.02  | 4.167 | 2.03  | 7.250   | 5.08  | 10.33 | 1.02  |
| 1.167 | 1.02  | 4.250 | 2.03  | 7.333   | 4.06  | 10.42 | 1.02  |
| 1.250 | 1.02  | 4.333 | 5.08  | 7.417   | 4.06  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 5.08  | 7.500   | 4.06  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 5.08  | 7.583   | 4.06  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 4.06  | 7.667   | 4.06  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 4.06  | 7.750   | 4.06  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 4.06  | 7.833   | 4.06  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 4.06  | 7.917   | 4.06  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 4.06  | 8.000   | 4.06  | 11.08 | 1.02  |
| 1.917 | 1.02  | 5.000 | 4.06  | 8.083   | 3.05  | 11.17 | 1.02  |
| 2.000 | 1.02  | 5.083 | 5.08  | 8.167   | 3.05  | 11.25 | 1.02  |
| 2.083 | 1.02  | 5.167 | 5.08  | 8.250   | 3.05  | 11.33 | 1.02  |
| 2.167 | 1.02  | 5.250 | 5.08  | 8.333   | 3.05  | 11.42 | 1.02  |
| 2.250 | 1.02  | 5.333 | 7.11  | 8.417   | 3.05  | 11.50 | 1.02  |
| 2.333 | 3.05  | 5.417 | 7.11  | 8.500   | 3.05  | 11.58 | 1.02  |
| 2.417 | 3.05  | 5.500 | 7.11  | 8.583   | 2.03  | 11.67 | 1.02  |
| 2.500 | 3.05  | 5.583 | 8.13  | 8.667   | 2.03  | 11.75 | 1.02  |

 ${\tt LangstaffRd\_EA\_Existing\_WestDonWatershd}$ 

|   | TR        | ANSFORMFI | O HYETOGR | ΔPH     |           |       |  |  |  |
|---|-----------|-----------|-----------|---------|-----------|-------|--|--|--|
| TIME RAI                                | N I TIME  | RAIN      |           | RAIN    |           | RAIN  |  |  |  |
| hrs mm/h                                |           | mm/hr     |           | mm/hr   |           | mm/hr |  |  |  |
| 0.083 0.0                               |           |           | 6.250     | 57.91 l |           | 2.03  |  |  |  |
|   | 0   3.250 | 2.03      |           | 11.18   |           | 2.03  |  |  |  |
|   | 0   3.333 | 3.05      |           | 11.18   |           | 2.03  |  |  |  |
|   | 2   3.417 | 3.05      |           | 11.18   |           | 2.03  |  |  |  |
|   | 2   3.500 | 3.05      |           | 11.18   |           | 2.03  |  |  |  |
|   | 2   3.583 | 2.03      |           | 11.18   |           | 2.03  |  |  |  |
| 0.583 2.0                               |           | 2.03      |           | 11.18   |           | 2.03  |  |  |  |
| 0.667 2.0                               |           | 2.03      |           | 5.08    |           | 2.03  |  |  |  |
| 0.750 2.0                               |           | 3.05      |           | 5.08    |           | 2.03  |  |  |  |
|   | 2   3.917 | 3.05      |           | 5.08    |           | 2.03  |  |  |  |
|   | 2   4.000 | 3.05      |           | 5.08    |           | 2.03  |  |  |  |
|   | 2   4.083 | 2.03      |           | 5.08    |           | 2.03  |  |  |  |
|   | 2   4.167 | 2.03      |           | 5.08    |           | 1.02  |  |  |  |
|   | 2   4.250 |           | 7.333     | 4.06    |           | 1.02  |  |  |  |
|   | 2   4.333 | 5.08      |           | 4.06    |           | 1.02  |  |  |  |
|   | 2   4.417 | 5.08      |           | 4.06    |           | 1.02  |  |  |  |
|   | 2 4.500   | 5.08      |           | 4.06    |           | 1.02  |  |  |  |
|   | 2   4.583 | 4.06      |           | 4.06    |           | 1.02  |  |  |  |
|   | 3   4.667 | 4.06      |           | 4.06    |           | 2.03  |  |  |  |
|   | 3   4.750 | 4.06      |           | 4.06    |           | 2.03  |  |  |  |
|   | 3   4.833 | 4.06      |           | 4.06    |           | 2.03  |  |  |  |
|   | 2   4.917 | 4.06      |           | 4.06    |           | 1.02  |  |  |  |
|   | 2   5.000 | 4.06      |           | 3.05    |           | 1.02  |  |  |  |
| 2.000 1.0                               |           | 5.08      |           | 3.05    |           | 1.02  |  |  |  |
|   | 2   5.167 | 5.08      |           | 3.05    |           | 1.02  |  |  |  |
|   | 2   5.250 | 5.08      |           | 3.05    |           | 1.02  |  |  |  |
| 2.250 1.0                               |           | 7.11      |           | 3.05    |           | 1.02  |  |  |  |
| 2.333 3.0                               |           | 7.11      |           | 3.05    |           | 1.02  |  |  |  |
|   | 5   5.500 | 7.11      |           | 2.03    |           | 1.02  |  |  |  |
| 2.500 3.0                               |           | 8.13      |           | 2.03    |           | 1.02  |  |  |  |
| 2.583 2.0                               |           | 8.13      |           | 2.03    |           | 2.03  |  |  |  |
| 2.667 2.0                               |           | 8.13      |           | 3.05    |           | 2.03  |  |  |  |
| 2.750 2.0                               | 3   5.833 | 56.90     | 8.917     | 3.05    | 12.00     | 2.03  |  |  |  |
|   | 5 5.917   | 56.90     |           | 3.05    |           | 1.02  |  |  |  |
| 2.917 3.0                               |           |           | 9.083     | 2.03    |           | 1.02  |  |  |  |
| 3.000 3.0                               |           |           | 9.167     | 2.03    |           | 1.02  |  |  |  |
| 3.083 2.0                               | 3   6.167 | 57.91     | 9.250     | 2.03    |           |       |  |  |  |
| Max.Eff.Inten.(mm/hr)=                  | 57.91     |           | 43.46     |         |           |       |  |  |  |
| over (min)                              | 5.00      |           | 10.00     |         |           |       |  |  |  |
| Storage Coeff. (min)=                   |           | (ii)      | 6.98 (ii  | )       |           |       |  |  |  |
| Unit Hyd. Tpeak (min)=                  | 5.00      |           | 10.00     |         |           |       |  |  |  |
| Unit Hyd. peak (cms)=                   | 0.24      |           | 0.14      |         |           |       |  |  |  |
| , |           |           |           | *T01    | ΓALS*     |       |  |  |  |
| PEAK FLOW (cms)=                        | 0.58      |           | 0.03      |         | 601 (iii) |       |  |  |  |
| TIME TO PEAK (hrs)=                     | 6.25      |           | 6.25      |         | 5.25      |       |  |  |  |
| RUNOFF VOLUME (mm)=                     | 61.75     |           | 36.96     |         | 9.27      |       |  |  |  |
| TOTAL RAINFALL (mm)=                    | 63.75     |           | 53.75     |         | 3.75      |       |  |  |  |
| Page 84                                 |           |           |           |         |           |       |  |  |  |

# $\label{eq:coefficient} \begin{array}{lll} & LangstaffRd\_EA\_Existing\_WestDonWatershd \\ RUNOFF \ COEFFICIENT & = \ 0.97 & 0.58 & 0.5 \\ \end{array}$

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: CN\* = 88.0 Ia = Dep. Storage (Above) (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COFFFICIENT. (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD ( 0440) | 1 + 2 = 3 | AREA QPEAK (ha) 3.81 (cms) 0.601 (hrs) 6.25 (mm) 60.27 ID1= 1 ( 0150): + ID2= 2 ( 0430): 0.99 0.123 49.15 ID = 3 ( 0440): 4.80 0.724 6.25

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----STANDHYD ( 0185) Area (ha)= 0.47 
Total Imp(%)= 48.00 Dir. Conn.(%)= 48.00 IMPERVIOUS Surface Area (ha)=
Dep. Storage (mm)=
Average Slope
Length (m)=
Mannings n = 0.24 5.00 2.00 0.23 2.00 1.00 20.00

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TRANSFORMED HYETOGRAPH RAIN | TIME RAIN | TIME mm/hr | hrs RAIN | TIME mm/hr | hrs mm/hr mm/hr | hrs 2.03 | 6.253 3.05 | 6.417 3.05 | 6.590 3.05 | 6.583 2.03 | 6.667 2.03 | 6.667 2.03 | 6.833 3.05 | 6.917 3.05 | 7.000 3.05 | 7.083 2.03 | 7.167 mm/hr mm/hr 57.91 | 11.18 | 11.18 | 11.18 | 11.18 | 9.33 9.42 9.50 9.58 9.67 9.75 0.083 0.167 0.250 0.333 0.417 0.00 0.00 0.00 1.02 1.02 3.167 2.03 3.167 3.250 3.333 3.417 3.500 3.583 2.03 2.03 2.03 2.03 2.03 0.583 2.03 3.667 11.18 9.83 2.03 0.667 2.03 3.750 9.92 2.03 5.08 | 5.08 | 5.08 | 5.08 | 2.03 | 1.02 | 1.02 | 1.02 | 3.833 3.917 4.000 4.083 2.03 2.03 2.03 2.03 2.03 0.750

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LangstaffRd\_EA\_Existing\_WestDonWatershd 1) = 2.00 5.00 6) = 1.00 2.00 (mm)= (%)= (m)= Average Slope Length Mannings n 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TRANSFORMED HYETOGRAPH
ME RAIN | TIME
rs mm/hr | hrs m mm/hr | 0.00 | 0.00 | 1.02 | 1.02 | 1.02 | 2.03 | hrs hrs 3.167 mm/hr hrs mm/hr | 57.91 | mm/hr 2.03 0.083 6.250 6.333 6.417 6.500 6.583 6.667 7.000 7.003 7.167 7.250 7.333 7.417 9.33 2.03 2.03 | 2.03 | 3.05 | 3.05 | 3.05 | 2.03 | 2.03 | 57.91 | 11.18 | 11.18 | 11.18 | 11.18 | 11.18 | 11.18 | 0.167 3.250 2.03 0.167 0.250 0.333 0.417 0.500 0.583 3.417 3.500 3.583 3.667 0.667 2.03 3.750 2.03 5.08 5.08 0.750 2.03 3.833 3.05 1.02 1.02 1.02 1.02 1.02 1.02 3.833 3.917 4.000 4.083 4.167 4.250 4.333 4.417 3.05 3.05 3.05 2.03 2.03 2.03 5.08 5.08 5.08 5.08 5.08 5.08 4.06 4.06 4.06 0.833 2.03 0.917 1.000 1.083 1.167 1.250 1.333 1.02 5.08 7.500 1.02 1.417 1.02 4.500 5.08 7.583 7.667 7.750 7.833 7.917 8.000 8.083 8.167 8.250 8.333 8.417 8.500 8.583 4.06 4.06 | 4.06 | 4.06 | 4.06 | 4.06 | 4.06 4.06 4.06 4.06 4.06 3.05 1.02 2.03 2.03 2.03 4.583 4.667 4.750 4.833 4.917 1.917 4.06 1.02 5.083 5.08 3.05 11.25 2.083 1.02 5.167 5.08 3.05 1.02 1.02 3.05 3.05 5.250 5.333 5.417 5.500 5.583 5.08 7.11 7.11 7.11 3.05 3.05 3.05 2.03 2.03 2.167 7.11 | 8.583 8.13 | 8.667 8.13 | 8.750 8.13 | 8.833 56.90 | 8.917 56.90 | 9.000 56.90 | 9.083 57.91 | 9.167 57.91 | 9.250 11.75 3.05 1.02 2.583 2.03 5.667 2.03 2.03 2.667 2.03 5.750 3.05 11.92 2.03 2.750 2.03 5.833 3.05 3.05 | 5.917 3.05 | 6.000 3.05 | 6.083 2.03 | 6.167 3.05 2.03 2.03 2.03 2.833 12.08 1.02

Max.Eff.Inten.(mm/hr)= 57.91 over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)= 5.00 15.00 2.47 (ii) 13.12 (ii) 5.00 15.00

```
LangstaffRd_EA_Existing_WestDonWatershd
1.02 | 4.167 | 2.03 | 7.250 | 5.08 | 1
1.02 | 4.250 | 2.03 | 7.333 | 4.06 | 1
1.02 | 4.253 | 2.03 | 7.333 | 4.06 | 1
1.02 | 4.333 | 5.08 | 7.417 | 4.06 | 1
1.02 | 4.540 | 5.08 | 7.500 | 4.06 | 1
1.02 | 4.593 | 4.06 | 7.567 | 4.06 | 1
1.02 | 4.583 | 4.06 | 7.567 | 4.06 | 1
2.03 | 4.667 | 4.06 | 7.753 | 4.06 | 1
2.04 | 4.750 | 4.06 | 7.753 | 4.06 | 1
                                 1.083
                                                           1.02
                                                                                                                                                          5.08 | 10.33
4.06 | 10.42
                                  1.167
                                 1.167
1.250
1.333
1.417
1.500
1.583
                                                                                                                                                                              10.50
10.58
10.67
10.75
                                                                                                                                                                                                          1.02
1.02
1.02
1.02
                                                           1.02
1.02
1.02
2.03
                                                                               4.750
4.833
4.917
5.000
5.083
5.167
5.250
5.333
                                  1.667
                                                           2.03
                                                                                                                                7.833
                                  1.750
                                                           2.03
                                                                                                            4.06
                                                                                                                                7.917
                                                                                                                                                           4.06
                                                                                                                                                                              11.00
                                                                                                   4.06 | 8.000
4.06 | 8.083
5.08 | 8.167
5.08 | 8.250
7.11 | 8.417
7.11 | 8.500
7.11 | 8.583
8.13 | 8.667
8.13 | 8.833
56.90 | 9.000
56.90 | 9.083
57.91 | 9.167
57.91 | 9.250
                                  1.833
                                                           1.02
                                                                                                            4.06
                                                                                                                                8.000
                                                                                                                                                           4.06
                                  1.917
2.000
2.083
2.167
                                                           1.02
                                                                                                                                                                              11.17
                                  2.250
                                                            1.02
                                                                                                                                                                              11.50
                                                                                                                                                                                                           1.02
                                  2.333
                                                            3.05
                                                                                 5.417
                                                                               5.417
5.500
5.583
5.667
5.750
5.833
5.917
6.000
                                  2.417
                                                            3.05
                                                                                                                                                           2.03
                                                                                                                                                                              11.67
                                                                                                                                                                                                           1.02
                                                            3.05
                                                                                                                                                                               11.75
                                  2.583
2.667
2.750
2.833
                                                           2.03
2.03
2.03
3.05
3.05
                                                                                                                                                                              11.83
11.92
12.00
12.08
                                  2.917
                                                                                                                                                           2.03
                                                                                                                                                                                                           1.02
                                                            3.05
                                                                                6.083
                                                                                                                                                           2.03
                                 3.083
                                                                               6.167
Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                                                   57.91
5.00
5.37 (ii)
5.00
                                                                                                                           32.68
                                                                                                                          15.00
14.29 (ii)
                                                                                      0.21
                                                                                                                            0.08
                                                                                                                                                                  *TOTALS*
PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                                                                                                                                     TOTALS*
0.051 (iii)
6.25
43.84
63.75
0.69
                                                                                      0.04
                                                                                                                             9.92
                                                                                    6.25
61.75
63.75
0.97
      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 (1) CN* = 79.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

| CALIB | STANDHYD ( 0180)| Area (ha)= 0.65 |ID= 1 DT= 5.0 min | Total Imp(%)= 33.00 Dir. Conn.(%)= 33.00 IMPERVIOUS PERVIOUS (i) = 0.21 0.44

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LangstaffRd\_EA\_Existing\_WestDonWatershd
)= 0.29 0.08

Unit Hyd. peak (cms)= PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 0.067 (iii) 6.25 6.33 6.25 61.75 31.16 41.24

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 83.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0445)| | 1 + 2 = 3 | QPEAK (cms) 0.067 0.051 ARFA TPFAK ID = 3 ( 0445): 1.12 0.118 6.25 42.33

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB | STANDHYD ( 0165) |ID= 1 DT= 5.0 min | Area (ha)= 0.60 Total Imp(%)= 40.00 Dir. Conn.(%)= 40.00 IMPERVIOUS PERVIOUS (i) 0.24 2.00 1.00 250.00 0.013 Surface Area 0.36 5.00 2.00 Dep. Storage Average Slope Length (mm)= (%)= (m)= Mannings n

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TRANSFORMED HYETOGRAPH |       |       |       |        |       |      |       |  |  |  |  |
|------------------------|-------|-------|-------|--------|-------|------|-------|--|--|--|--|
| TIME                   | RAIN  | TIME  | RAIN  | ' TIME | RAIN  | TIME | RAIN  |  |  |  |  |
| hrs                    | mm/hr | hrs   | mm/hr | ' hrs  | mm/hr | hrs  | mm/hr |  |  |  |  |
| 0.083                  | 0.00  | 3.167 | 2.03  | 6.250  | 57.91 | 9.33 | 2.03  |  |  |  |  |
| 0.167                  | 0.00  | 3.250 | 2.03  | 6.333  | 11.18 | 9.42 | 2.03  |  |  |  |  |
| 0.250                  | 0.00  | 3.333 | 3.05  | 6.417  | 11.18 | 9.50 | 2.03  |  |  |  |  |
| 0.333                  | 1.02  | 3.417 | 3.05  | 6.500  | 11.18 | 9.58 | 2.03  |  |  |  |  |
| 0.417                  | 1.02  | 3.500 | 3.05  | 6.583  | 11.18 | 9.67 | 2.03  |  |  |  |  |
| 0.500                  | 1.02  | 3.583 | 2.03  | 6.667  | 11.18 | 9.75 | 2.03  |  |  |  |  |

| Lä   | ngstaffRd E              | A Existi             | ng WestDo | nWaters | hd             |      |  |
|--|--------------------------|----------------------|-----------|---------|----------------|------|--|
|  | 03   3.667               |                      | 6.750     |         |                | 2.03 |  |
|  | 03   3.750               |                      | 6.833     | 5.08    | 9.92           | 2.03 |  |
| 0.750 2.0  | 93   3.833               | 3.05                 | 6.917     | 5.08    | 10.00          | 2.03 |  |
| 0.833 1.0  | 02   3.917               | 3.05<br>3.05<br>2.03 | 7.000     |         | 10.08          | 2.03 |  |
|  | 92 4.000                 | 3.05                 | 7.083     |         | 10.17          | 2.03 |  |
| 1.000 1.0  | 02   4.083               | 2.03                 | 7.167     | 5.08    | 10.25          | 2.03 |  |
| 1.083 1.0  | 02   4.167<br>02   4.250 | 2.03                 | 7.250     | 5.08    | 10.33          | 1.02 |  |
| 1.167 1.0  | 02   4.250               | 2.03                 | 7.333     | 4.06    | 10.42          | 1.02 |  |
| 1.250 1.0  | 02   4.333<br>02   4.417 | 5.08                 | 7.417     | 4.06    | 10.50          | 1.02 |  |
| 1.333 1.0  | 02   4.417               | 5.08                 | 7.500     | 4.06    | 10.58          | 1.02 |  |
| 1.417 1.0  | 02   4.500               | 5.08                 | 7.583     | 4.06    | 10.67          | 1.02 |  |
| 1.500 1.0  | 02   4.583<br>03   4.667 | 4.06                 | 7.667     | 4.06    | 10.75          | 1.02 |  |
| 1.583 2.0  | 03   4.667               | 4.06                 | 7.750     | 4.06    | 10.83          | 2.03 |  |
| 1.667 2.0  | 03   4.750<br>03   4.833 | 4.06                 | 7.833     | 4.06    | 10.92          | 2.03 |  |
| 1.750 2.0  | 03   4.833               | 4.06                 | 7.917     | 4.06    | 11.00          | 2.03 |  |
| 1.833 1.0  | 02   4.917<br>02   5.000 | 4.06                 | 8.000     | 4.06    | 11.08          | 1.02 |  |
| 1.917 1.0  | 02   5.000               | 4.06                 | 8.083     | 3.05    | 11.17          |      |  |
| 2.000 1.0  | 02   5.083               | 5.08                 | 8.167     | 3.05    | 11.25          | 1.02 |  |
| 2.083 1.0<br>2.167 1.0   | 02   5.167               | 5.08                 | 8.250     | 3.05    | 11.33          |      |  |
| 2.167 1.0  | 02   5.250               | 5.08                 | 8.333     | 3.05    | 11.42          | 1.02 |  |
| 2.250 1.0  | 02   5.333<br>05   5.417 | 7.11                 | 8.417     |         | 11.50          | 1.02 |  |
| 2.333 3.0  | 05   5.417               | 7.11                 | 8.500     | 3.05    | 11.58          | 1.02 |  |
| 2.417 3.0  | 05   5.500<br>05   5.583 | 7.11                 | 8.583     | 2.03    | 11.67          | 1.02 |  |
| 2.500 3.0  | 05   5.583               | 8.13                 | 8.667     | 2.03    | 11.75          | 1.02 |  |
| 2.583 2.0  | 03   5.667               | 8.13                 | 8.750     | 2.03    | 11.83          | 2.03 |  |
| 2.583 2.0<br>2.667 2.0<br>2.750 2.0  | 03   5.750               | 8.13                 | 8.833     | 3.05    | 11.92          | 2.03 |  |
| 21/30 21   | 05   5.055               |                      |           |         | 12.00          | 2.03 |  |
| 2.833 3.0  | 05   5.917               | 56.90                | 9.000     | 3.05    | 12.08          | 1.02 |  |
| 2.917 3.0  |                          | 56.90                | 9.083     | 2.03    | 12.08<br>12.17 | 1.02 |  |
|  | 05   6.083               | 5/.91                | 1 9.16/   | 2.03    | 12.25          | 1.02 |  |
| 3.083 2.0  | 03   6.167               | 57.91                | 9.250     | 2.03    |                |      |  |
| Max.Eff.Inten.(mm/hr)=   | 57.91                    |                      | 37.09     |         |                |      |  |
| over (min)   | 5.00                     |                      | 15.00     |         |                |      |  |
| Storage Coeff. (min)=  | 5.51                     | (ii) :               | 12.43 (ii | )       |                |      |  |
| Unit Hyd. Tpeak (min)=   | 5.00                     |                      | 15.00     |         |                |      |  |
| Unit Hyd. peak (cms)=  | 0.20                     |                      | 0.08      |         |                |      |  |
|  |                          |                      |           |         | TALS*          |      |  |
| PEAK FLOW (cms)=   | 0.04                     |                      | 0.03      |         | .065 (iii      | )    |  |
| TIME TO PEAK (hrs)=  | 6.25                     |                      | 6.33      |         | 5.25           |      |  |
| RUNOFF VOLUME (mm)=  | 61.75                    |                      | 31.16     |         | 3.38           |      |  |
| TOTAL RAINFALL (mm)=   | 63.75                    |                      | 63.75     |         | 3.75           |      |  |
| RUNOFF COEFFICIENT =   | 0.97                     |                      | 0.49      | •       | 0.68           |      |  |
| (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  CN™ = 83.0 Ia = Dep. Storage (Above)  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  THAN THE STORAGE COEFFICIENT.  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY. |                          |                      |           |         |                |      |  |
|  |                          |                      |           |         |                |      |  |

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#### 57.91 44.85 5.00 15.00 5.51 (ii) 11.93 (ii) 5.00 15.00 0.20 0.09 Max.Eff.Inten.(mm/hr)= over (min)= Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)= PEAK FLOW (cms)= TIME TO PEAK (hrs)= RUNOFF VOLUME (mm)= TOTAL RAINFALL (mm)= RUNOFF COEFFICIENT = 0.04 6.25 61.75 63.75 0.02 6.33 38.29 63.75 0.057 (iii) 6.25 51.65 63.75 0.97 0.60 0.81 (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: CN\* = 89.0 Ia = Dep. Storage (Above) (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COFFFICIENT. (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY. ADD HYD ( 0450)| 1 + 2 = 3 | QPEAK (cms) 0.065 R.V. (mm) 43.38 (ha) 0.60 (hrs) 6.25 ID1= 1 ( 0165): + ID2= 2 ( 0170): 6.25 0.43 0.057 51.65 ID = 3 ( 0450): 1.03 0.122 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY. AREA (ha) 1.03 1.12 QPEAK (cms) 0.122 0.118 TPEAK (hrs) 6.25 6.25 R.V. (mm) 46.83 42.33 ID = 1 ( 0450): 2.15 0.240 6.25 44.49 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

IMPERVIOUS PERVIOUS (i)

0.50 Page 91

0.36

Surface Area (ha)=

CALIB | CALIB | STANDHYD ( 0170) |ID= 1 DT= 5.0 min Area (ha)= 0.43 Total Imp(%)= 57.00 Dir. Conn.(%)= 57.00 IMPERVIOUS PERVIOUS (i) 0.25 2.00 1.00 0.18 5.00 2.00 (mm) = (%) = (m) = Dep. Storage Average Slope Length Mannings n 250.00 20.00

0.013 NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

LangstaffRd\_EA\_Existing\_WestDonWatershd

0.250

|       |       | TR    | ANSFORME | HYETOGR | APH   | -     |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250   | 57.91 | 9.33  | 2.03  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333   | 11.18 | 9.42  | 2.03  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417   | 11.18 | 9.50  | 2.03  |
| 0.333 | 1.02  | 3.417 | 3.05     | 6.500   | 11.18 | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05     | 6.583   | 11.18 | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03     | 6.667   | 11.18 | 9.75  | 2.03  |
| 0.583 | 2.03  | 3.667 | 2.03     | 6.750   | 11.18 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 2.03     | 6.833   | 5.08  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 3.05     | 6.917   | 5.08  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 3.05     | 7.000   | 5.08  | 10.08 | 2.03  |
| 0.917 | 1.02  | 4.000 | 3.05     | 7.083   | 5.08  | 10.17 | 2.03  |
| 1.000 | 1.02  | 4.083 | 2.03     | 7.167   | 5.08  | 10.25 | 2.03  |
| 1.083 | 1.02  | 4.167 | 2.03     | 7.250   | 5.08  | 10.33 | 1.02  |
| 1.167 |       | 4.250 | 2.03     | 7.333   | 4.06  | 10.42 | 1.02  |
| 1.250 |       | 4.333 | 5.08     | 7.417   | 4.06  | 10.50 | 1.02  |
| 1.333 |       | 4.417 | 5.08     | 7.500   | 4.06  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 5.08     | 7.583   | 4.06  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 4.06     | 7.667   | 4.06  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 4.06     | 7.750   | 4.06  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 4.06     | 7.833   | 4.06  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 4.06     | 7.917   | 4.06  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 4.06     | 8.000   | 4.06  | 11.08 | 1.02  |
| 1.917 | 1.02  | 5.000 | 4.06     | 8.083   | 3.05  | 11.17 | 1.02  |
| 2.000 | 1.02  | 5.083 | 5.08     | 8.167   | 3.05  | 11.25 | 1.02  |
| 2.083 | 1.02  | 5.167 | 5.08     | 8.250   | 3.05  | 11.33 | 1.02  |
| 2.167 | 1.02  | 5.250 | 5.08     | 8.333   | 3.05  | 11.42 | 1.02  |
| 2.250 | 1.02  | 5.333 | 7.11     | 8.417   | 3.05  | 11.50 | 1.02  |
| 2.333 | 3.05  | 5.417 | 7.11     | 8.500   | 3.05  | 11.58 | 1.02  |
| 2.417 | 3.05  | 5.500 | 7.11     | 8.583   | 2.03  | 11.67 | 1.02  |
| 2.500 | 3.05  | 5.583 | 8.13     | 8.667   | 2.03  | 11.75 | 1.02  |
| 2.583 | 2.03  | 5.667 | 8.13     | 8.750   | 2.03  | 11.83 | 2.03  |
| 2.667 | 2.03  | 5.750 | 8.13     | 8.833   | 3.05  | 11.92 | 2.03  |
| 2.750 | 2.03  | 5.833 | 56.90    | 8.917   | 3.05  | 12.00 | 2.03  |
| 2.833 | 3.05  | 5.917 | 56.90    | 9.000   | 3.05  | 12.08 | 1.02  |
| 2.917 | 3.05  | 6.000 | 56.90    | 9.083   | 2.03  | 12.17 | 1.02  |
| 3.000 | 3.05  | 6.083 | 57.91    | 9.167   | 2.03  | 12.25 | 1.02  |

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|               | LangstaffRd_EA_Existing_WestDonWatersh |        |       |  |  |  |  |  |
|---------------|--|--------|-------|--|--|--|--|--|
| Dep. Storage  | (mm)=                                  | 2.00   | 5.00  |  |  |  |  |  |
| Average Slope | (%)=                                   | 1.00   | 2.00  |  |  |  |  |  |
| Length        | (m)=                                   | 340.00 | 50.00 |  |  |  |  |  |
| Mannings n    | =                                      | 0.013  | 0.250 |  |  |  |  |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TRANSFORMED HYETOGRAPH |       |       |       |        |       |       |       |  |  |  |
|------------------------|-------|-------|-------|--------|-------|-------|-------|--|--|--|
| TIME                   | RAIN  | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |  |  |
| hrs                    | mm/hr | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |  |  |
| 0.083                  | 0.00  | 3.167 | 2.03  | 6.250  | 57.91 | 9.33  | 2.03  |  |  |  |
| 0.167                  | 0.00  | 3.250 | 2.03  | 6.333  | 11.18 | 9.42  | 2.03  |  |  |  |
| 0.250                  | 0.00  | 3.333 | 3.05  | 6.417  | 11.18 | 9.50  | 2.03  |  |  |  |
| 0.333                  | 1.02  | 3.417 | 3.05  | 6.500  | 11.18 | 9.58  | 2.03  |  |  |  |
| 0.417                  | 1.02  | 3.500 | 3.05  | 6.583  | 11.18 | 9.67  | 2.03  |  |  |  |
| 0.500                  | 1.02  | 3.583 | 2.03  | 6.667  | 11.18 | 9.75  | 2.03  |  |  |  |
| 0.583                  | 2.03  | 3.667 | 2.03  | 6.750  | 11.18 | 9.83  | 2.03  |  |  |  |
| 0.667                  | 2.03  | 3.750 | 2.03  | 6.833  | 5.08  | 9.92  | 2.03  |  |  |  |
| 0.750                  | 2.03  | 3.833 | 3.05  | 6.917  | 5.08  | 10.00 | 2.03  |  |  |  |
| 0.833                  | 1.02  | 3.917 | 3.05  | 7.000  | 5.08  | 10.08 | 2.03  |  |  |  |
| 0.917                  | 1.02  | 4.000 | 3.05  | 7.083  | 5.08  | 10.17 | 2.03  |  |  |  |
| 1.000                  | 1.02  | 4.083 | 2.03  | 7.167  | 5.08  | 10.25 | 2.03  |  |  |  |
| 1.083                  | 1.02  | 4.167 | 2.03  | 7.250  | 5.08  | 10.33 | 1.02  |  |  |  |
| 1.167                  | 1.02  | 4.250 | 2.03  | 7.333  | 4.06  | 10.42 | 1.02  |  |  |  |
| 1.250                  | 1.02  | 4.333 | 5.08  | 7.417  | 4.06  | 10.50 | 1.02  |  |  |  |
| 1.333                  | 1.02  | 4.417 | 5.08  | 7.500  | 4.06  | 10.58 | 1.02  |  |  |  |
| 1.417                  | 1.02  | 4.500 | 5.08  | 7.583  | 4.06  | 10.67 | 1.02  |  |  |  |
| 1.500                  | 1.02  | 4.583 | 4.06  | 7.667  | 4.06  | 10.75 | 1.02  |  |  |  |
| 1.583                  | 2.03  | 4.667 | 4.06  | 7.750  | 4.06  | 10.83 | 2.03  |  |  |  |
| 1.667                  | 2.03  | 4.750 | 4.06  | 7.833  | 4.06  | 10.92 | 2.03  |  |  |  |
| 1.750                  | 2.03  | 4.833 | 4.06  | 7.917  | 4.06  | 11.00 | 2.03  |  |  |  |
| 1.833                  | 1.02  | 4.917 | 4.06  | 8.000  | 4.06  | 11.08 | 1.02  |  |  |  |
| 1.917                  | 1.02  | 5.000 | 4.06  | 8.083  | 3.05  | 11.17 | 1.02  |  |  |  |
| 2.000                  | 1.02  | 5.083 | 5.08  | 8.167  | 3.05  | 11.25 | 1.02  |  |  |  |
| 2.083                  | 1.02  | 5.167 | 5.08  | 8.250  | 3.05  | 11.33 | 1.02  |  |  |  |
| 2.167                  | 1.02  | 5.250 | 5.08  | 8.333  | 3.05  | 11.42 | 1.02  |  |  |  |
| 2.250                  | 1.02  | 5.333 | 7.11  | 8.417  | 3.05  | 11.50 | 1.02  |  |  |  |
| 2.333                  | 3.05  | 5.417 | 7.11  | 8.500  | 3.05  | 11.58 | 1.02  |  |  |  |
| 2.417                  | 3.05  | 5.500 | 7.11  | 8.583  | 2.03  | 11.67 | 1.02  |  |  |  |
| 2.500                  | 3.05  | 5.583 | 8.13  | 8.667  | 2.03  | 11.75 | 1.02  |  |  |  |
| 2.583                  | 2.03  | 5.667 | 8.13  | 8.750  | 2.03  | 11.83 | 2.03  |  |  |  |
| 2.667                  | 2.03  | 5.750 | 8.13  | 8.833  | 3.05  | 11.92 | 2.03  |  |  |  |
| 2.750                  | 2.03  | 5.833 | 56.90 | 8.917  | 3.05  | 12.00 | 2.03  |  |  |  |
| 2.833                  | 3.05  | 5.917 | 56.90 | 9.000  | 3.05  | 12.08 | 1.02  |  |  |  |
| 2.917                  | 3.05  | 6.000 | 56.90 | 9.083  | 2.03  | 12.17 | 1.02  |  |  |  |
| 3.000                  | 3.05  | 6.083 | 57.91 | 9.167  | 2.03  | 12.25 | 1.02  |  |  |  |
| 3.083                  | 2.03  | 6.167 | 57.91 | 9.250  | 2.03  |       |       |  |  |  |

Max.Eff.Inten.(mm/hr)= 57.91 over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)= 5.00 20.00 6.62 (ii) 18.79 (ii) 5.00 20.00

| LangstaffRd_EA_Existing_WestDonWatershd |        |       |       |             |  |  |  |  |  |
|---|--------|-------|-------|-------------|--|--|--|--|--|
| Unit Hyd. peak                          | (cms)= | 0.18  | 0.06  |             |  |  |  |  |  |
|   |        |       |       | *TOTALS*    |  |  |  |  |  |
| PEAK FLOW                               | (cms)= | 0.06  | 0.03  | 0.086 (iii) |  |  |  |  |  |
| TIME TO PEAK                            | (hrs)= | 6.25  | 6.42  | 6.25        |  |  |  |  |  |
| RUNOFF VOLUME                           | (mm)=  | 61.75 | 31.16 | 44.00       |  |  |  |  |  |
| TOTAL RAINFALL                          | (mm)=  | 63.75 | 63.75 | 63.75       |  |  |  |  |  |
| RUNOFF COEFFICI                         | ENT =  | 0.97  | 0.49  | 0.69        |  |  |  |  |  |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |          |       |         |           |       |  |
|-------------------|-------|----------|-------|---------|-----------|-------|--|
| STANDHYD ( 0195)  | Area  | (ha)=    | 0.79  |         |           |       |  |
| ID= 1 DT= 5.0 min | Total | Imp(%)=  | 42.00 | Dir.    | Conn.(%)= | 42.00 |  |
|                   |       |          |       |         |           |       |  |
|                   |       | IMPERVIO | OUS   | PERVIOL | JS (i)    |       |  |
| Surface Area      | (ha)= | 0.3      | 3     | 0.46    | 5         |       |  |
| Dep. Storage      | (mm)= | 2.00     | Э     | 5.00    | 9         |       |  |
| Average Slope     | (%)=  | 1.00     | а     | 2.00    | 9         |       |  |
| Length            | (m)=  | 340.00   | а     | 20.00   | 9         |       |  |
| Mannings n        | =     | 0.01     | 3     | 0.256   | 9         |       |  |
|                   |       |          |       |         |           |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       | TRANSFORMED HYETOGRAPH |       |       |        |       |       |       |  |  |  |  |  |
|-------|------------------------|-------|-------|--------|-------|-------|-------|--|--|--|--|--|
| TIME  | RAIN                   | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |  |  |  |  |
| hrs   | mm/hr                  | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |  |  |  |  |
| 0.083 | 0.00                   | 3.167 | 2.03  | 6.250  | 57.91 | 9.33  | 2.03  |  |  |  |  |  |
| 0.167 | 0.00                   | 3.250 | 2.03  | 6.333  | 11.18 | 9.42  | 2.03  |  |  |  |  |  |
| 0.250 | 0.00                   | 3.333 | 3.05  | 6.417  | 11.18 | 9.50  | 2.03  |  |  |  |  |  |
| 0.333 | 1.02                   | 3.417 | 3.05  | 6.500  | 11.18 | 9.58  | 2.03  |  |  |  |  |  |
| 0.417 | 1.02                   | 3.500 | 3.05  | 6.583  | 11.18 | 9.67  | 2.03  |  |  |  |  |  |
| 0.500 | 1.02                   | 3.583 | 2.03  | 6.667  | 11.18 | 9.75  | 2.03  |  |  |  |  |  |
| 0.583 | 2.03                   | 3.667 | 2.03  | 6.750  | 11.18 | 9.83  | 2.03  |  |  |  |  |  |
| 0.667 | 2.03                   | 3.750 | 2.03  | 6.833  | 5.08  | 9.92  | 2.03  |  |  |  |  |  |
| 0.750 | 2.03                   | 3.833 | 3.05  | 6.917  | 5.08  | 10.00 | 2.03  |  |  |  |  |  |
| 0.833 | 1.02                   | 3.917 | 3.05  | 7.000  | 5.08  | 10.08 | 2.03  |  |  |  |  |  |
| 0.917 | 1.02                   | 4.000 | 3.05  | 7.083  | 5.08  | 10.17 | 2.03  |  |  |  |  |  |
| 1.000 | 1.02                   | 4.083 | 2.03  | 7.167  | 5.08  | 10.25 | 2.03  |  |  |  |  |  |
| 1.083 | 1.02                   | 4.167 | 2.03  | 7.250  | 5.08  | 10.33 | 1.02  |  |  |  |  |  |
| 1.167 | 1.02                   | 4.250 | 2.03  | 7.333  | 4.06  | 10.42 | 1.02  |  |  |  |  |  |
| 1.250 | 1.02                   | 4.333 | 5.08  | 7.417  | 4.06  | 10.50 | 1.02  |  |  |  |  |  |
| 1.333 | 1.02                   | 4.417 | 5.08  | 7.500  | 4.06  | 10.58 | 1.02  |  |  |  |  |  |
| 1.417 | 1.02                   | 4.500 | 5.08  | 7.583  | 4.06  | 10.67 | 1.02  |  |  |  |  |  |
| 1.500 | 1.02                   | 4.583 | 4.06  | 7.667  | 4.06  | 10.75 | 1.02  |  |  |  |  |  |
| 1.583 | 2.03                   | 4.667 | 4.06  | 7.750  | 4.06  | 10.83 | 2.03  |  |  |  |  |  |

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## LangstaffRd\_EA\_Existing\_WestDonWatershd

| ADD HYD ( 0458)   |      |       |       |       |
|-------------------|------|-------|-------|-------|
| 1 + 2 = 3         | AREA | QPEAK | TPEAK | R.V.  |
|                   | (ha) | (cms) | (hrs) | (mm)  |
| ID1= 1 ( 0450):   | 2.15 | 0.240 | 6.25  | 44.49 |
| + ID2= 2 ( 0455): | 1.65 | 0.172 | 6.25  | 44.00 |
| ============      |      |       |       |       |
| ID = 3 ( 0458):   | 3.80 | 0.412 | 6.25  | 44.28 |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB             |       |         |       |                |       |
|-------------------|-------|---------|-------|----------------|-------|
| STANDHYD ( 0300)  | Area  | (ha)=   | 10.00 |                |       |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 80.00 | Dir. Conn.(%)= | 80.00 |
|                   |       |         |       |                |       |
|                   |       | IMPERVI | OUS   | PERVIOUS (i)   |       |
| Surface Area      | (ha)= | 8.0     | 0     | 2.00           |       |
| Dep. Storage      | (mm)= | 1.0     | 0     | 5.00           |       |
| Average Slope     | (%)=  | 1.0     | 0     | 2.00           |       |
| Length            | (m)=  | 258.2   | 0     | 40.00          |       |
| Mannings n        | =     | 0.01    |       | 0.250          |       |
|                   |       |         |       |                |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       |       |       | D HYETOGR |       |       |       |
|-------|-------|-------|-------|-----------|-------|-------|-------|
| TIME  | RAIN  | TIME  |       | ' TIME    | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr | ' hrs     | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03  | 6.250     | 57.91 |       | 2.03  |
| 0.167 | 0.00  | 3.250 | 2.03  | 6.333     | 11.18 | 9.42  | 2.03  |
| 0.250 | 0.00  | 3.333 | 3.05  | 6.417     | 11.18 | 9.50  | 2.03  |
| 0.333 | 1.02  | 3.417 | 3.05  | 6.500     | 11.18 | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05  | 6.583     | 11.18 | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03  | 6.667     | 11.18 | 9.75  | 2.03  |
| 0.583 | 2.03  | 3.667 | 2.03  | 6.750     | 11.18 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 2.03  | 6.833     | 5.08  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 3.05  | 6.917     | 5.08  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 3.05  | 7.000     | 5.08  | 10.08 | 2.03  |
| 0.917 | 1.02  | 4.000 | 3.05  | 7.083     | 5.08  | 10.17 | 2.03  |
| 1.000 | 1.02  | 4.083 | 2.03  | 7.167     | 5.08  | 10.25 | 2.03  |
| 1.083 | 1.02  | 4.167 | 2.03  | 7.250     | 5.08  | 10.33 | 1.02  |
| 1.167 | 1.02  | 4.250 | 2.03  | 7.333     | 4.06  | 10.42 | 1.02  |
| 1.250 | 1.02  | 4.333 | 5.08  | 7.417     | 4.06  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 5.08  | 7.500     | 4.06  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 5.08  | 7.583     | 4.06  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 4.06  | 7.667     | 4.06  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 4.06  | 7.750     | 4.06  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 4.06  | 7.833     | 4.06  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 4.06  | 7.917     | 4.06  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 4.06  | 8.000     | 4.06  | 11.08 | 1.02  |
| 1.917 | 1.02  | 5.000 | 4.06  | 8.083     | 3.05  | 11.17 | 1.02  |
| 2.000 | 1.02  | 5.083 | 5.08  | 8.167     | 3.05  | 11.25 | 1.02  |
| 2.083 | 1.02  | 5.167 | 5.08  | 8.250     | 3.05  | 11.33 | 1.02  |

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| Langs   | staffRd_E                                       | A Exist           | ing WestD                       | onWaters | hd       |      |
|---|---|-------------------|---------------------------------|----------|----------|------|
| 1.667 2.03  | 1 4.750   | 4.06              | I 7.833                         | 4.06     | 10.92    | 2.03 |
| 1.750 2.03  | 4.833   | 4.06              | 7.917                           | 4.06     | 11.00    | 2.03 |
| Lange<br>1.667 2.03<br>1.750 2.03<br>1.833 1.02<br>1.917 1.02<br>2.000 1.02<br>2.083 1.02<br>2.167 1.02<br>2.250 1.02<br>2.250 1.02<br>2.333 3.05<br>2.417 3.05<br>2.500 3.05<br>2.583 2.03<br>2.667 2.03<br>2.667 2.03<br>2.833 3.05<br>2.917 3.05<br>3.000 3.05<br>3.000 3.05 | 4.917   | 4.06              | 8.000                           | 4.06     | 11.08    | 1.02 |
| 1.917 1.02  | 5.000   | 4.06              | 8.083                           | 3.05     | 11.17    | 1.02 |
| 2.000 1.02  | 5.083   | 5.08              | 8.167                           | 3.05     | 11.25    | 1.02 |
| 2.083 1.02  | 5.167   | 5.08              | 8.250                           | 3.05     | 11.33    | 1.02 |
| 2.167 1.02  | 5.250   | 5.08              | 8.333                           | 3.05     | 11.42    | 1.02 |
| 2.250 1.02  | 5.333   | 7.11              | 8.417                           | 3.05     | 11.50    | 1.02 |
| 2.333 3.05  | 5.417   | 7.11              | 8.500                           | 3.05     | 11.58    | 1.02 |
| 2.417 3.05  | 5.500   | 7.11              | 8.583                           | 2.03     | 11.67    | 1.02 |
| 2.500 3.05  | 5.583   | 8.13              | 8.667                           | 2.03     | 11.75    | 1.02 |
| 2.583 2.03  | 5.667   | 8.13              | 8.750                           | 2.03     | 11.83    | 2.03 |
| 2.667 2.03  | 5.750   | 8.13              | 8.833                           | 3.05     | 11.92    | 2.03 |
| 2.750 2.03  | 5.833   | 56.90             | 8.917                           | 3.05     | 12.00    | 2.03 |
| 2 833 3 05  | 5 917   | 56 90             | 9 999                           | 3 05     | 12 08    | 1 02 |
| 2 917 3 05  | 6 999   | 56 90             | 9 083                           | 2 03     | 12 17    | 1 02 |
| 3 000 3 05  | 6 083   | 57 91             | 9 167                           | 2 03     | 12 25    | 1 02 |
| 3 083 2 03  | 6 167   | 57 91             | 9 250                           | 2 03     | 12.25    | 2.02 |
| 3.003 2.03  | 0.10  | 37.132            | 7 3.230                         | 2.05     |          |      |
| Max.Eff.Inten.(mm/hr)=<br>over (min)<br>Storage Coeff. (min)=<br>Unit Hyd. Tpeak (min)=<br>Unit Hyd. peak (cms)=  | 57 91   |                   | 37 09                           |          |          |      |
| over (min)  | 5 00  |                   | 15 00                           |          |          |      |
| Storage Coeff (min)=  | 6 62  | (ii)              | 13.55 (i                        | i)       |          |      |
| Unit Hyd Theak (min)=   | 5 00  | ()                | 15 00                           | -/       |          |      |
| Unit Hyd neak (cms)=  | 0 18  |                   | 0 08                            |          |          |      |
|   |   |                   |                                 |          | ALS*     |      |
| PEAK FLOW (cms)=  | 0 05  |                   | 0 03                            | .o.      | 086 (iii | )    |
| TIME TO PEAK (hrs)=   | 6.25  |                   | 6 33                            |          | 25       | ,    |
| RUNOFE VOLUME (mm)=   | 61 75   |                   | 31 16                           | 44       | 1 00     |      |
| TOTAL RATNEALL (mm)=  | 63.75   |                   | 63 75                           | 44<br>63 | 75       |      |
| PEAK FLOW (cms)= TIME TO PEAK (hrs)= RUNOFF VOLUME (mm)= TOTAL RAINFALL (mm)= RUNOFF COEFFICIENT =  | 0 97  |                   | 0 49                            | 9        | .69      |      |
| NONOTT COLITICIENT -  | 0.57  |                   | 0.43                            |          |          |      |
| (i) CN PROCEDURE SELECT<br>CN* = 83.0 Ia<br>(ii) TIME STEP (DT) SHOU<br>THAN THE STORAGE CO<br>(iii) PEAK FLOW DOES NOT   | = Dep. S<br>LD BE SMA<br>EFFICIENT<br>INCLUDE B | torage<br>LLER OR | (Above)<br>R EQUAL<br>W IF ANY. |          |          |      |
|   |   |                   |                                 |          |          |      |
| ADD HYD ( 0455)   |   |                   |                                 |          |          |      |
| 1 + 2 = 3   Al<br>(1<br>ID1= 1 ( 0190): 0<br>+ ID2= 2 ( 0195): 0  | REA QP  | EAK               | TPEAK                           | R.V.     |          |      |
| (1  | ha) (c  | ms)               | (hrs)                           | (mm)     |          |      |
| ID1= 1 ( 0190): 0   | .86 0.0   | 86                | 6.25                            | 44.00    |          |      |
| + ID2= 2 ( 0195): 0   | .79 0.0   | 86                | 6.25                            | 44.00    |          |      |
|   |   |                   |                                 | =====    |          |      |
| ID = 3 ( 0455): 1   | .65 0.1   | 72                | 6.25                            | 44.00    |          |      |
|   |   |                   |                                 |          |          |      |
| NOTE: PEAK FLOWS DO NOT   | INCLUDE B                                       | ASEFLOW           | IS IF ANY                       |          |          |      |
|   |   |                   |                                 |          |          |      |

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|                    | Langs    | taffRd E | A Exist | ing WestDon | Waters | hd         |      |
|--------------------|----------|----------|---------|-------------|--------|------------|------|
| 2.167              | 1.02     |          |         | 8.333       | 3.05   |            | 1.02 |
| 2.250              | 1.02     | 5.333    | 7.11    | 8.417       | 3.05   | 11.50      | 1.02 |
| 2.333              | 3.05     | 5.417    | 7.11    | 8.500       | 3.05   | 11.58      | 1.02 |
| 2.417              | 3.05     | 5.500    | 7.11    | 8.583       | 2.03   | 11.67      | 1.02 |
| 2.500              | 3.05     | 5.583    | 8.13    | 8.667       | 2.03   | 11.75      | 1.02 |
| 2.583              | 2.03     | 5.667    | 8.13    | 8.750       | 2.03   | 11.83      | 2.03 |
| 2.667              | 2.03     | 5.750    | 8.13    | 8.833       | 3.05   | 11.92      | 2.03 |
|                    |          | 5.833    |         | 8.917       | 3.05   | 12.00      | 2.03 |
|                    |          | 5.917    |         | 9.000       |        | 12.08      | 1.02 |
|                    |          | 6.000    |         | 9.083       |        | 12.17      | 1.02 |
|                    | 3.05     |          |         | 9.167       | 2.03   |            | 1.02 |
| 3.083              | 2.03     | 6.167    | 57.91   | 9.250       | 2.03   | l          |      |
| Max.Eff.Inten.(mm/ | 'hr)=    | 57.91    |         | 31.36       |        |            |      |
| over (m            |          | 5.00     |         | 20.00       |        |            |      |
|                    | nin)=    | 5.62     | (ii)    | 16.84 (ii)  |        |            |      |
| Unit Hyd. Tpeak (m | nin)=    | 5.00     |         | 20.00       |        |            |      |
| Unit Hyd. peak (c  | :ms)=    | 0.20     |         | 0.06        |        |            |      |
| , , ,              |          |          |         |             | *T0    | TALS*      |      |
| PEAK FLOW (c       | :ms)=    | 1.28     |         | 0.12        | 1      | .382 (iii) |      |
| TIME TO PEAK (H    | ırs)=    | 6.25     |         | 6.42        |        | 6.25       |      |
| RUNOFF VOLUME (    | mm)=     | 62.75    |         | 27.34       | 5      | 5.67       |      |
| TOTAL RAINFALL (   | mm)=     | 63.75    |         | 63.75       | 6      | 3.75       |      |
| RUNOFF COEFFICIENT | =        | 0.98     |         | 0.43        | (      | 0.87       |      |
|                    |          |          |         |             |        |            |      |
| ///                |          |          |         |             |        |            |      |
| (i) CN PROCEDURE   |          |          |         |             |        |            |      |
| CN* = 79.          |          | = Dep. S |         | (Above)     |        |            |      |
| (ii) TIME STEP (D  |          |          |         | EQUAL       |        |            |      |
| THAN THE STO       | KAGE COE | FFTCTENT |         |             |        |            |      |

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |               |                  |       |
|-------------------|-------|---------------|------------------|-------|
| STANDHYD ( 0350)  | Area  | (ha)= 0.9     | 10               |       |
| ID= 1 DT= 5.0 min | Total | Imp(%) = 70.6 | 0 Dir. Conn.(%)= | 70.00 |
| ·                 |       |               |                  |       |
|                   |       | IMPERVIOUS    | PERVIOUS (i)     |       |
| Surface Area      | (ha)= | 0.63          | 0.27             |       |
| Dep. Storage      | (mm)= | 1.00          | 5.00             |       |
| Average Slope     | (%)=  | 1.00          | 2.00             |       |
| Length            | (m)=  | 77.46         | 40.00            |       |
| Mannings n        | =     | 0.013         | 0.250            |       |
|                   |       |               |                  |       |

NOTE: RAINFALL WAS TRANSFORMED TO  $\,$  5.0 MIN. TIME STEP.

|       |         | TRA   | NSFORMFI | D HYETOGRA | APH   |      |       |
|-------|---------|-------|----------|------------|-------|------|-------|
| TIME  |         |       |          | ' TIME     |       | TIME | RAIN  |
| hrs r | mm/hr İ | hrs   | mm/hr    | ' hrs      | mm/hr | hrs  | mm/hr |
|       |         |       |          | 6.250      |       |      |       |
| 0.167 | 0.00    | 3.250 | 2.03     | 6.333      | 11.18 | 9.42 | 2.03  |

```
LangstaffRd_EA_Existing_WestDonWatershd
0.00 | 3.333 | 3.05 | 6.417 | 11.18 |
1.02 | 3.417 | 3.05 | 6.500 | 11.18 |
1.02 | 3.500 | 3.05 | 6.500 | 11.18 |
1.02 | 3.583 | 2.03 | 6.667 | 11.18 |
1.02 | 3.583 | 2.03 | 6.667 | 11.18 |
1.02 | 3.583 | 2.03 | 6.70 | 11.18 |
1.02 | 3.750 | 2.03 | 6.750 | 11.18 |
1.03 | 3.750 | 2.03 | 6.750 | 11.18 |
1.04 | 3.917 | 3.05 | 6.917 | 5.08 | 1 |
1.02 | 4.000 | 3.05 | 7.000 | 5.08 | 1 |
1.02 | 4.083 | 2.03 | 7.167 | 5.08 | 1 |
1.02 | 4.250 | 2.03 | 7.250 | 5.08 | 1 |
1.02 | 4.417 | 2.03 | 7.350 | 5.08 | 1 |
1.02 | 4.417 | 5.08 | 7.500 | 4.06 | 1 |
1.02 | 4.590 | 5.08 | 7.580 | 4.06 | 1 |
1.02 | 4.590 | 5.08 | 7.580 | 4.06 | 1 |
1.02 | 4.583 | 4.06 | 7.667 | 4.06 | 1 |
1.02 | 4.583 | 4.06 | 7.667 | 4.06 | 1 |
                                     0.250
                                                                                                                                                                                                          9.50
9.58
                                     0.333
                                                                                                                                                                                                                                      2.03
                                    0.533
0.417
0.500
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0.750
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2.03
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2.03
                                     0.833
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                                     0.917
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5.08
5.08
4.06
4.06
4.06
4.06
4.06
                                     1.000
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                                                                                        4.083
4.167
4.250
4.333
4.417
4.500
4.583
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4.06
                                     1.083
1.167
1.250
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                                     1.417
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4.06
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4.06
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5.08
                                     1.583
                                                                  2.03
                                                                                          4.667
                                                                                                                                                7.750
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                                                                                                                                                                                                                                      2.03
                                     1.667
                                                                                          4.750
                                                                                                                                               7.833
7.917
8.000
8.083
8.167
8.250
8.333
8.417
8.500
8.583
8.667
8.750
8.833
                                                                                                                                                                                                       10.92
                                                                 2.03
1.02
1.02
1.02
                                                                                        4.833
4.917
5.000
5.083
                                                                                                                                                                                                       11.00
11.08
11.17
11.25
                                                                                                                                                                                                                                      2.03
1.02
1.02
1.02
                                     1.750
                                     2.083
                                                                  1.02
                                                                                         5.167
                                                                                                                                                                                                       11.33
                                                                                                                                                                                                                                      1.02
                                     2.167
                                                                   1.02
                                                                                          5,250
                                                                                                                                                                                                       11.42
                                                                                                                                                                                                                                      1.02
                                                                                                                         7.11
7.11
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8.13
                                     2.250
                                                                  1.02
                                                                                          5.333
                                                                                                                                                                                                       11.50
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                                                                  3.05
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3.05
2.03
2.03
                                                                                          5.333
5.417
5.500
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5.833
                                      2 333
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                                     2.333
2.417
2.500
2.583
2.667
                                                                                                                                                                                                       11.58
11.67
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11.92
                                                                                                                                                                                                                                      1.02
1.02
1.02
2.03
2.03
                                                                                                                    8.13 | 8.833
56.90 | 8.917
56.90 | 9.000
56.90 | 9.083
57.91 | 9.167
57.91 | 9.250
                                                                  2.03
                                     2.750
                                                                                                                                                                                                       12.00
                                                                                                                                                                                                                                      2.03
                                     2.833
                                                                   3.05
                                                                                          5.917
                                                                                                                                                                                                       12.08
                                                                                                                                                                                                                                      1.02
                                     2.917
                                                                  3.05
                                                                                          6.000
                                                                                                                                                                               2.03
                                                                                                                                                                                                       12.17
                                                                                                                                                                                                                                      1.02
                                                                                           6 083
                                                                                                                                                                                                       12.25
                                     3.083
                                                                 2.03
                                                                                          6.167
                                                                                             57.91
5.00
2.73 (ii)
5.00
                                                                                                                                         31.36
15.00
13.95 (ii)
15.00
Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                                                                0.29
                                                                                                                                             0.08
                                                                                                                                                                                       *TOTALS*
```

\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =

Max.Eff.Inten.(mm/hr)= over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: CN\* = 79.0 Ia = Dep. Storage (Above) (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

0.10 6.25 62.75 63.75

0.98

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a a2 6.33 27.34 63.75

0.43

0.118 (iii) 6.25 52.12 63.75

LangstaffRd\_EA\_Existing\_WestDonWatershd (m)= 531.00 40.00 = 0.013 0.250 Mannings n

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```
TRANSFORMED HYFTOGRAPH -
                                         RAIN | TIME
mm/hr | hrs
0.00 | 3.167
0.00 | 3.250
0.00 | 3.333
                                                                                                                                                                                                                   RAIN | TIME
mm/hr | hrs
67.05 | 9.33
13.21 | 9.42
13.21 | 9.50
TIME
hrs
0.083
                                                                                                                                 RAIN |'
mm/hr |'
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' hrs
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0.06 Page 99

\*TOTALS\*

20.00

10.00 20.00 8.16 (ii) 17.46 (ii)

10.00

10.00

 $Lang staff Rd\_EA\_Existing\_WestDonWatershd \\ THAN \ THE \ STORAGE \ COEFFICIENT.$ (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0375)                  |   |           |           |                |           |            |      |
|----------------------------------|---|-----------|-----------|----------------|-----------|------------|------|
| 1 + 2 = 3                        | Al  | REA QF    | PEAK      | TPEAK          | R.V.      |            |      |
|                                  | (1  | ha) (c    | ms)       | (hrs)          | (mm)      |            |      |
| ID1= 1 ( 030                     | 0): 10  | .00 1.3   | 182       | 6.25           | 55.67     |            |      |
| ID1= 1 ( 030<br>+ ID2= 2 ( 035   | 0): 0   | .90 0.1   | .18       | 6.25           | 52.12     |            |      |
| ID = 3 ( 037                     |   |           |           | ======<br>6.25 |           |            |      |
| NOTE: PEAK FLOW                  | IS DO NOT   | TNCLUDE E | SASFFI OW | S TF ANY       | · .       |            |      |
| *******                          |   |           |           |                |           |            |      |
|                                  |   | **        |           |                |           |            |      |
| ** SIMULATION:Run 05 *********** |   |           |           |                |           |            |      |
| *******                          | *****   | **        |           |                |           |            |      |
|                                  |   |           |           |                |           |            |      |
| READ STORM                       | Filenar   | ne: C:\Us | ers\ray   | .zhao\Ap       | pD        |            |      |
| j i                              |   |           | ocal\Te   |                | •         |            |      |
| i i                              |   |           |           |                | 819-1b449 | 900a1c25\d | 155f |
| Ptotal= 74.42 mm                 | Comment   | ts: 25yr- | 12hrSCS   |                |           |            |      |
|                                  |   |           |           |                |           |            |      |
| TIME                             | RAIN mm/hr 0.00 1.002 2.03 1.02 2.03 1.02 2.03 3.05 3.05 3.05 | TIME      | RAIN      | TIME           | RAIN      | TIME       | R.   |
| hrs                              | mm/hr   | hrs       | mm/hr     | hrs            | mm/hr     | hrs        | mm,  |
| 0.25                             | 0.00  | 3.50      | 3.05      | 6.75           | 13.21     | 10.00      | 2.0  |
| 0.50                             | 1.02  | 3.75      | 3.05      | 7.00           | 6.10      | 10.25      | 2.0  |
| 0.75                             | 2.03  | 4.00      | 3.05      | 7.25           | 6.10      | 10.50      | 2.0  |
| 1.00                             | 1.02  | 4.25      | 3.05      | 7.50           | 5.08      | 10.75      | 1.0  |
| 1.25                             | 2.03  | 4.50      | 5.08      | /./5           | 4.06      | 11.00      | 2.0  |
| 1.50                             | 1.02  | 4.75      | 5.08      | 8.00           | 4.06      | 11.25      | 1.0  |
| 1.75                             | 2.03  | 5.00      | 6.10      | 8.25           | 5.08      | 11.50      | 2.0  |
| 2.00                             | 1.02  | 5.25      | 5.08      | 8.50           | 3.05      | 11.75      | 1.0  |
| 2.25                             | 2.03  | 5.50      | 8.13      | 8.75           | 3.05      | 12.00      | 2.0  |
| 2.50                             | 3.05  | 1 6 00    | 67.00     | 9.00           | 3.05      | 1 12.25    | 1.1  |
| 2./3                             | 3.05  | 1 6.00    | 67.00     | 9.25           | 2.05      | 1          |      |
| 3.00                             | 3.05<br>2.03  | 6.23      | 13 21     | 0.75           | 2 03      | ŀ          |      |
| 3.23                             | 2.03  | 0.50      | 13.21     | 1 3.73         | 2.03      |            |      |
|                                  |   |           |           |                |           |            |      |
|                                  |   |           |           |                |           |            |      |
| CALIB                            |   |           |           |                |           |            |      |
| STANDHYD ( 0145)                 | Area  | (ha)=     | 3.05      |                |           |            |      |
| ID= 1 DT= 5.0 min                | Total In  | np(%)= 6  | 2.00      | Dir. Con       | n.(%)= (  | 62.00      |      |
| ·                                |   |           |           |                |           |            |      |
|                                  |   | IMPERVIOL |           |                | i)        |            |      |
| Surface Area<br>Dep. Storage     | (ha)=   | 1.89      |           | 1.16           |           |            |      |
| Dep. Storage                     | (mm)=   | 2.00      |           | 5.00           |           |            |      |
| Average Slope                    | (%)=  | 1.00      |           | 2.00           |           |            |      |
|                                  |   |           |           |                |           |            |      |

|                 | Lana   | -+    | xisting WestDor | al-last a a a b d |
|-----------------|--------|-------|-----------------|-------------------|
| PEAK FLOW       | (cms)= | 0.34  | 0.11            |                   |
|                 |        |       |                 | 0.438 (iii)       |
| TIME TO PEAK    | (hrs)= | 6.25  | 6.42            | 6.25              |
| RUNOFF VOLUME   | (mm)=  | 72.42 | 43.51           | 61.43             |
| TOTAL RAINFALL  | (mm)=  | 74.42 | 74.42           | 74.42             |
| RUNOFF COEFFICI | FNT =  | 0.97  | 0.58            | 0.83              |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 86.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB | | STANDHYD ( 0140) | |ID= 1 DT= 5.0 min | Area (ha)= 1.27 Total Imp(%)= 52.00 Dir. Conn.(%)= 52.00

IMPERVIOUS PERVIOUS (i) 0.66 2.00 1.00 503.00 0.013 0.61 5.00 2.00 25.00 0.250 Surface Area Dep. Storage Average Slope Length (mm)= (%)= (m)= Mannings n

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TRANSFORMED HYETOGRAPH TIME hrs 3.167 RAIN mm/hr 2.03 2.03 RAIN | mm/hr | 67.05 | TIME hrs 0.083 RAIN mm/hr 0.00 0.00 | TIME | TIME | 6.250 | 6.333 | 6.417 | 6.500 | 6.583 | 6.667 | 6.750 | 6.833 | 6.917 | 7.000 | 7.083 TIME hrs 9.33 9.42 RAIN mm/hr 3.05 0.167 3.250 13.21 3.05 0.250 0.00 3.333 3.05 13.21 9.50 9.58 3.05 0.333 1.02 3.417 3.05 13.21 2.03 3.417 3.500 3.583 3.667 3.750 3.833 3.917 13.21 13.21 13.21 13.21 6.10 6.10 0.533 0.417 0.500 0.583 0.667 0.750 1.02 1.02 2.03 2.03 2.03 3.05 3.05 3.05 3.05 3.05 9.67 9.75 9.83 9.92 2.03 2.03 2.03 2.03 3.05 10.00 2.03 0.833 1.02 3.05 10.08 2.03 0.917 1.02 4.000 3.05 6.10 10.17 2.03 7.167 7.250 7.333 7.417 7.500 7.583 1.000 1.02 4.083 4.167 4.250 4.333 4.417 4.500 4.583 4.667 4.750 4.833 3.05 10.25 2.03 1.083 1.167 1.250 1.333 2.03 2.03 2.03 1.02 1.02 3.05 3.05 5.08 5.08 6.10 5.08 5.08 5.08 4.06 10.23 10.33 10.42 10.50 10.58 2.03 2.03 2.03 2.03 1.02 1.02 5.08 1.417 10.67 7.667 7.750 7.833 7.917 1.500 1.02 5.08 4.06 10.75 1.02 1.583 2.03 5.08 4.06 10.83 2.03 1 667 2 03 5 08 4 96 10 92 1.750 2.03 6.10 11.00

|           | 1.833    |        |       |       | ing_WestDor<br>  8.000 |      | 11.08      | 1.6 |
|-----------|----------|--------|-------|-------|------------------------|------|------------|-----|
|           | 1.917    | 1.02   | 5.000 | 6.10  | 8.083                  | 5.08 |            | 1.0 |
|           | 2.000    | 1.02   | 5.083 | 5.08  | 8.167                  | 5.08 | 11.25      | 1.0 |
|           | 2.083    | 2.03   | 5.167 | 5.08  | 8.250                  | 5.08 | 11.33      | 2.0 |
|           | 2.167    | 2.03   | 5.250 | 5.08  | 8.333                  | 3.05 | 11.42      | 2.  |
|           | 2.250    | 2.03   | 5.333 | 8.13  | 8.417                  | 3.05 | 11.50      | 2.  |
|           | 2.333    | 3.05   | 5.417 | 8.13  | 8.500                  | 3.05 | 11.58      | 1.  |
|           | 2.417    | 3.05   | 5.500 | 8.13  | 8.583                  | 3.05 | 11.67      | 1.  |
|           | 2.500    | 3.05   | 5.583 | 9.14  | 8.667                  | 3.05 | 11.75      | 1.  |
|           | 2.583    | 3.05   | 5.667 | 9.14  | 8.750                  | 3.05 | 11.83      | 2.  |
|           | 2.667    | 3.05   | 5.750 | 9.15  | 8.833                  | 3.05 | 11.92      | 2.  |
|           | 2.750    | 3.05   | 5.833 | 67.06 | 8.917                  | 3.05 | 12.00      | 2.  |
|           | 2.833    | 3.05   | 5.917 | 67.06 | 9.000                  | 3.05 | 12.08      | 1.  |
|           | 2.917    | 3.05   | 6.000 | 67.06 | 9.083                  | 2.03 | 12.17      | 1.  |
|           | 3.000    | 3.05   | 6.083 | 67.06 | 9.167                  | 2.03 | 12.25      | 1.  |
|           | 3.083    | 2.03   | 6.167 | 67.06 | 9.250                  | 2.03 | İ          |     |
| Max.Eff.I | nten.(mr | m/hr)= | 67.06 |       | 46.22                  |      |            |     |
|           | over     | (min)  | 10.00 |       | 20.00                  |      |            |     |
| Storage C | oeff.    | (min)= | 7.90  | (ii)  | 15.15 (ii)             |      |            |     |
| Jnit Hyd. | Tpeak    | (min)= | 10.00 |       | 20.00                  |      |            |     |
| Jnit Hyd. | peak     | (cms)= | 0.13  |       | 0.07                   |      |            |     |
|           |          |        |       |       |                        | *T0  | TALS*      |     |
| PEAK FLOW |          | (cms)= | 0.12  |       | 0.05                   | 0    | .168 (iii) |     |
| IME TO P  | EAK      | (hrs)= | 6.25  |       | 6.33                   |      | 5.25       |     |
| RUNOFF VO | LUME     | (mm)=  | 72.42 |       | 39.68                  | 50   | 5.70       |     |
|           | NFALL    | (mm)=  | 74.42 |       | 74.42                  | 74   | 4.42       |     |
| TOTAL RAI |          | NT =   | 0.97  |       | 0.53                   |      | 2.76       |     |

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB | STANDHYD ( 0135)| |ID= 1 DT= 5.0 min | Area (ha)= 1.43 Total Imp(%)= 40.00 Dir. Conn.(%)= 40.00 IMPERVIOUS PERVIOUS (i) Surface Area Dep. Storage Average Slope (ha)= (mm)= (%)= (m)= 0.57 2.00 1.00 503.00 0.86 5.00 2.00 30.00 Length Mannings n 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

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LangstaffRd\_EA\_Existing\_WestDonWatershd
(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN\* = 84.0 I a= Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COFFFICENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD ( 0420)| 1 + 2 = 3 | QPEAK (cms) 0.174 0.168 R.V. (mm) 53.51 56.70 AREA (hrs) 6.25 6.25 (ha) 1.43 1.27

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD ( 0425)| 1 + 2 = 3 | ID1= 1 ( 0145): + ID2= 2 ( 0420): AREA (ha) 3.05 2.70 QPEAK (cms) 0.438 0.342 TPEAK (hrs) 6.25 6.25 R.V. (mm) 61.43 55.01 ID = 3 ( 0425): 5.75 0.780

Area (ha)= 0.96 Total Imp(%)= 44.00 Dir. Conn.(%)= 44.00 IMPERVIOUS PERVIOUS (i) Surface Area Dep. Storage Average Slope (ha)= (mm)= (%)= (m)= 0.54 5.00 2.00 20.00 Length Mannings n 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       |       |       | HYETOGR |         |      |       |
|-------|-------|-------|-------|---------|---------|------|-------|
| TIME  | RAIN  | TIME  | RAIN  | ' TIME  | RAIN    | TIME | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr | ' hrs   | mm/hr   | hrs  | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03  | 6.250   | 67.05   | 9.33 | 3.05  |
| 0.167 | 0.00  | 3.250 | 2.03  | 6.333   | 13.21   | 9.42 | 3.05  |
| 0.250 | 0.00  | 3.333 | 3.05  | 6.417   | 13.21   | 9.50 | 3.05  |
| 0.333 | 1.02  | 3.417 | 3.05  | 6.500   | 13.21 İ | 9.58 | 2.03  |

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| LangstaffRd EA Existing WestDonWatershd |                          |       |            |        |           |       |  |  |
|---|--------------------------|-------|------------|--------|-----------|-------|--|--|
|   | IN   TIME                |       | l' TIME    | RAIN   |           | RAIN  |  |  |
| hrs mm/                                 |                          | mm/hr |            | mm/hr  |           | mm/hr |  |  |
|   | 00   3.167               | 2.03  |            | 67.05  |           | 3.05  |  |  |
|   | 00   3.250               | 2.03  |            | 13.21  |           | 3.05  |  |  |
|   | 00   3.333               | 3.05  |            | 13.21  |           | 3.05  |  |  |
|   | 02   3.417               | 3.05  |            | 13.21  |           | 2.03  |  |  |
|   | 02   3.500               | 3.05  |            | 13.21  |           | 2.03  |  |  |
|   | 02   3.583               | 3.05  |            | 13.21  |           | 2.03  |  |  |
|   | 03   3.667               |       | 6.750      | 13.21  |           | 2.03  |  |  |
|   | 03   3.750               | 3.05  |            | 6.10   |           | 2.03  |  |  |
|   | 03   3.833               |       |            | 6.10   |           | 2.03  |  |  |
|   | 02   3.917               | 3.05  |            | 6.10   |           | 2.03  |  |  |
|   | 02   4.000               | 3.05  |            | 6.10   |           | 2.03  |  |  |
|   | 02   4.083               |       |            | 6.10   |           | 2.03  |  |  |
|   | 03   4.167               |       |            | 6.10   |           | 2.03  |  |  |
|   | 03   4.107               | 3.05  |            | 5.08   |           | 2.03  |  |  |
|   | 03   4.230               |       |            | 5.08   |           | 2.03  |  |  |
|   | 02   4.417               |       |            | 5.08   |           | 1.02  |  |  |
|   | 02   4.417               | 5.08  |            | 4.06   |           | 1.02  |  |  |
|   | 02   4.588               |       |            | 4.06   |           | 1.02  |  |  |
|   | 03   4.667               |       |            | 4.06   |           | 2.03  |  |  |
|   |                          |       |            | 4.06   |           |       |  |  |
|   | 03   4.750<br>03   4.833 | 5.08  |            |        |           | 2.03  |  |  |
|   | 02   4.833               |       |            | 4.06   |           |       |  |  |
|   |                          |       | 8.000      | 4.06   |           | 1.02  |  |  |
|   | 02   5.000               |       |            | 5.08   |           | 1.02  |  |  |
|   | 02   5.083               |       | 8.167      | 5.08   |           | 1.02  |  |  |
|   | 03   5.167               |       |            | 5.08   |           | 2.03  |  |  |
|   | 03   5.250               |       | 8.333      | 3.05   |           | 2.03  |  |  |
|   | 03   5.333               |       | 8.417      | 3.05   |           | 2.03  |  |  |
|   | 05   5.417               |       |            | 3.05   |           | 1.02  |  |  |
|   | 05   5.500               | 8.13  |            | 3.05   |           | 1.02  |  |  |
|   | 05   5.583               | 9.14  |            | 3.05   |           | 1.02  |  |  |
|   | 05   5.667               |       | 8.750      | 3.05   |           | 2.03  |  |  |
|   | 05   5.750               |       |            | 3.05   |           | 2.03  |  |  |
|   | 05   5.833               |       |            | 3.05   |           | 2.03  |  |  |
|   | 05   5.917               |       |            | 3.05   |           | 1.02  |  |  |
|   | 05   6.000               |       |            | 2.03   |           | 1.02  |  |  |
|   | 05   6.083               | 67.06 |            | 2.03   |           | 1.02  |  |  |
| 3.083 2.                                | 03   6.167               | 67.06 | 9.250      | 2.03   |           |       |  |  |
| Max.Eff.Inten.(mm/hr)=                  | 67.06                    |       | 47.54      |        |           |       |  |  |
| over (min)                              | 10.00                    |       | 20.00      |        |           |       |  |  |
| Storage Coeff. (min)=                   |                          |       | 15.90 (ii) |        |           |       |  |  |
| Unit Hyd. Tpeak (min)=                  |                          |       | 20.00      | ,      |           |       |  |  |
| Unit Hyd. peak (min)=                   |                          |       | 0.07       |        |           |       |  |  |
| Unit nyu. peak (Cms)=                   | 0.13                     |       | 0.07       | ****** | ALS*      |       |  |  |
| PEAK FLOW (cms)=                        | 0.10                     |       | 0.08       |        | 174 (iii) |       |  |  |
| TIME TO PEAK (hrs)=                     |                          |       | 6.42       |        | 5.25      |       |  |  |
| RUNOFF VOLUME (mm)=                     |                          |       | 40.91      |        | 3.51      |       |  |  |
| TOTAL RAINFALL (mm)=                    |                          |       | 74.42      |        | 1.42      |       |  |  |
|   |                          |       |            |        |           |       |  |  |
| RUNOFF COEFFICIENT =                    | 0.97                     |       | 0.55       |        | 1.72      |       |  |  |

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|                        | t- CCD4 F                  |                   | !!+В.     |         |           |              |
|------------------------|----------------------------|-------------------|-----------|---------|-----------|--------------|
|                        | angstaffRd_E<br>02   3.500 | :A_EX1ST1<br>3.05 |           | nWaters |           | 2.03         |
|                        | 02   3.583                 | 3.05              |           | 13.21   |           | 2.03         |
|                        | 03   3.667                 | 3.05              | 6.750     | 13.21   | 9.73      | 2.03         |
|                        | 03   3.750                 | 3.05              | 6.833     | 6.10    |           | 2.03         |
|                        | 03   3.833                 | 3.05              | 6.917     | 6.10    |           | 2.03         |
|                        | 02   3.917                 | 3.05              |           | 6.10    |           | 2.03         |
|                        | 02   4.000                 | 3.05              | 7.083     | 6.10    |           | 2.03         |
|                        | 02   4.083                 | 3.05              | 7.167     | 6.10    |           | 2.03         |
|                        | 03   4.167                 | 3.05              | 7.250     | 6.10    |           | 2.03         |
|                        | 03   4.250                 | 3.05              | 7.333     | 5.08    |           | 2.03         |
|                        | 03   4.333                 | 5.08              | 7.417     | 5.08    |           | 2.03         |
|                        | 02   4.417                 | 5.08              | 7.500     | 5.08    |           | 1.02         |
| 1.417 1.               | 02   4.500                 | 5.08              | 7.583     | 4.06    | 10.67     | 1.02         |
| 1.500 1.               | 02 4.583                   | 5.08              | 7.667     | 4.06    | 10.75     | 1.02         |
| 1.583 2.               | 03   4.667                 | 5.08              | 7.750     | 4.06    |           | 2.03         |
| 1.667 2.               | 03   4.750                 | 5.08              | 7.833     | 4.06    | 10.92     | 2.03         |
| 1.750 2.               | 03   4.833                 | 6.10              | 7.917     | 4.06    | 11.00     | 2.03         |
| 1.833 1.               | 02   4.917                 | 6.10              | 8.000     | 4.06    | 11.08     | 1.02         |
| 1.917 1.               | 02   5.000                 | 6.10              |           | 5.08    |           | 1.02         |
|                        | 02   5.083                 | 5.08              |           | 5.08    |           | 1.02         |
|                        | 03   5.167                 | 5.08              |           | 5.08    |           | 2.03         |
|                        | 03   5.250                 | 5.08              |           | 3.05    |           | 2.03         |
|                        | 03   5.333                 | 8.13              |           | 3.05    |           | 2.03         |
|                        | 05   5.417                 | 8.13              |           | 3.05    |           | 1.02         |
|                        | 05   5.500                 | 8.13              |           | 3.05    |           | 1.02         |
|                        | 05   5.583                 | 9.14              |           | 3.05    |           | 1.02         |
|                        | 05   5.667                 | 9.14              |           | 3.05    |           | 2.03         |
|                        | 05   5.750                 | 9.15              | 8.833     | 3.05    |           | 2.03         |
|                        | 05   5.833<br>05   5.917   | 67.06<br>67.06    |           | 3.05    |           | 2.03<br>1.02 |
|                        | 05   6.000                 | 67.06             |           | 2.03    |           | 1.02         |
|                        | 05   6.083                 | 67.06             |           | 2.03    |           | 1.02         |
|                        | 03   6.167                 | 67.06             |           | 2.03    |           | 1.02         |
| 3.003 2.               | 03   0.107                 | 07.00             | 3.230     | 2.03    |           |              |
| Max.Eff.Inten.(mm/hr)= | 67.06                      |                   | 46.22     |         |           |              |
| over (min)             | 10.00                      |                   | 15.00     |         |           |              |
| Storage Coeff. (min)=  |                            |                   | 13.93 (ii | )       |           |              |
| Unit Hyd. Tpeak (min)= | 10.00                      |                   | 15.00     |         |           |              |
| Unit Hyd. peak (cms)=  | 0.13                       |                   | 0.08      |         |           |              |
|                        |                            |                   |           | *T01    | TALS*     |              |
| PEAK FLOW (cms)=       |                            |                   | 0.05      |         | .126 (iii | )            |
| TIME TO PEAK (hrs)=    |                            |                   | 6.33      |         | 5.25      |              |
| RUNOFF VOLUME (mm)=    |                            |                   | 39.68     |         | 1.08      |              |
| TOTAL RAINFALL (mm)=   |                            |                   | 74.42     |         | 1.42      |              |
| RUNOFF COEFFICIENT =   | 0.97                       |                   | 0.53      | 6       | 9.73      |              |

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 83.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

#### LangstaffRd\_EA\_Existing\_WestDonWatershd

| CALIB<br>  STANDHYD ( 0205) <br> ID= 1 DT= 5.0 min | Area<br>Total | (ha)=<br>Imp(%)= | 1.11<br>38.00 | Dir. Conn.(%)= | 38.00 |
|--|---------------|------------------|---------------|----------------|-------|
|  |               |                  |               |                |       |
|  |               | IMPERVIOUS       |               | PERVIOUS (i)   |       |
| Surface Area                                       | (ha)=         | 0.42             |               | 0.69           |       |
| Dep. Storage                                       | (mm)=         | 2.00             |               | 5.00           |       |
| Average Slope                                      | (%)=          | 1.00             |               | 2.00           |       |
| Length   | (m)=          | 470.00           |               | 20.00          |       |
| Mannings n   | =             | 0.013            |               | 0.250          |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   | -     |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250   | 67.05 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333   | 13.21 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417   | 13.21 | 9.50  | 3.05  |
| 0.333 | 1.02  | 3.417 | 3.05     | 6.500   | 13.21 | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05     | 6.583   | 13.21 | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 3.05     | 6.667   | 13.21 | 9.75  | 2.03  |
| 0.583 | 2.03  | 3.667 | 3.05     | 6.750   | 13.21 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 3.05     | 6.833   | 6.10  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 3.05     | 6.917   | 6.10  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 3.05     | 7.000   | 6.10  | 10.08 | 2.03  |
| 0.917 | 1.02  | 4.000 | 3.05     | 7.083   | 6.10  | 10.17 | 2.03  |
| 1.000 | 1.02  | 4.083 | 3.05     | 7.167   | 6.10  | 10.25 | 2.03  |
| 1.083 | 2.03  | 4.167 | 3.05     | 7.250   | 6.10  | 10.33 | 2.03  |
| 1.167 | 2.03  | 4.250 | 3.05     | 7.333   | 5.08  | 10.42 | 2.03  |
| 1.250 | 2.03  | 4.333 | 5.08     | 7.417   | 5.08  | 10.50 | 2.03  |
| 1.333 | 1.02  | 4.417 | 5.08     | 7.500   | 5.08  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 5.08     | 7.583   | 4.06  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 5.08     | 7.667   | 4.06  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 5.08     | 7.750   | 4.06  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 5.08     | 7.833   | 4.06  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 6.10     | 7.917   | 4.06  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 6.10     | 8.000   | 4.06  | 11.08 | 1.02  |
| 1.917 | 1.02  | 5.000 | 6.10     | 8.083   | 5.08  | 11.17 | 1.02  |
| 2.000 | 1.02  | 5.083 | 5.08     | 8.167   | 5.08  | 11.25 | 1.02  |
| 2.083 | 2.03  | 5.167 | 5.08     | 8.250   | 5.08  | 11.33 | 2.03  |
| 2.167 | 2.03  | 5.250 | 5.08     | 8.333   | 3.05  | 11.42 | 2.03  |
| 2.250 | 2.03  | 5.333 | 8.13     | 8.417   | 3.05  | 11.50 | 2.03  |
| 2.333 | 3.05  | 5.417 | 8.13     | 8.500   | 3.05  | 11.58 | 1.02  |
| 2.417 | 3.05  | 5.500 | 8.13     | 8.583   | 3.05  | 11.67 | 1.02  |
| 2.500 | 3.05  | 5.583 | 9.14     | 8.667   | 3.05  | 11.75 | 1.02  |
| 2.583 | 3.05  | 5.667 | 9.14     | 8.750   | 3.05  | 11.83 | 2.03  |
| 2.667 | 3.05  | 5.750 | 9.15     | 8.833   | 3.05  | 11.92 | 2.03  |
| 2.750 | 3.05  | 5.833 | 67.06    | 8.917   | 3.05  | 12.00 | 2.03  |
| 2.833 | 3.05  | 5.917 | 67.06    | 9.000   | 3.05  | 12.08 | 1.02  |

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|                  | Langs  | taffRd_E |       | ing_WestDo |       |       |       |
|------------------|--------|----------|-------|------------|-------|-------|-------|
| hrs              | mm/hr  | hrs      | mm/hr | ' hrs      | mm/hr | hrs   | mm/hr |
| 0.083            |        | 3.167    |       | 6.250      | 67.05 | 9.33  | 3.05  |
| 0.167            | 0.00   | 3.250    | 2.03  | 6.333      | 13.21 | 9.42  | 3.05  |
| 0.250            | 0.00   | 3.333    | 3.05  | 6.417      | 13.21 | 9.50  | 3.05  |
| 0.333            | 1.02   | 3.417    | 3.05  | 6.500      | 13.21 | 9.58  | 2.03  |
| 0.417            | 1.02   | 3.500    | 3.05  | 6.583      | 13.21 | 9.67  | 2.03  |
| 0.500            |        | 3.583    |       |            | 13.21 |       | 2.03  |
| 0.583            |        | 3.667    |       | 6.750      | 13.21 |       | 2.03  |
| 0.667            |        | 3.750    |       |            | 6.10  |       | 2.03  |
| 0.750            |        | 3.833    |       | 6.917      | 6.10  |       | 2.03  |
| 0.833            |        | 3.917    |       | 7.000      | 6.10  |       | 2.03  |
| 0.917            |        | 4.000    |       | 7.083      | 6.10  |       | 2.03  |
| 1.000            |        | 4.083    |       | 7.167      | 6.10  |       | 2.03  |
| 1.083            |        | 4.167    |       | 7.250      | 6.10  |       | 2.03  |
| 1.167            |        | 4.250    | 3.05  |            | 5.08  |       | 2.03  |
|                  |        | 4.230    |       |            |       |       | 2.03  |
| 1.250            |        |          |       | 7.417      | 5.08  |       |       |
| 1.333            |        | 4.417    |       |            | 5.08  |       | 1.02  |
| 1.417            |        | 4.500    |       | 7.583      | 4.06  |       | 1.02  |
| 1.500            |        | 4.583    |       |            | 4.06  |       | 1.02  |
| 1.583            |        | 4.667    | 5.08  |            | 4.06  |       | 2.03  |
| 1.667            |        | 4.750    |       | 7.833      |       | 10.92 | 2.03  |
| 1.750            |        | 4.833    |       | 7.917      | 4.06  |       | 2.03  |
| 1.833            |        | 4.917    |       | 8.000      | 4.06  |       | 1.02  |
| 1.917            |        | 5.000    |       | 8.083      | 5.08  |       | 1.02  |
| 2.000            |        | 5.083    |       | 8.167      | 5.08  |       | 1.02  |
| 2.083            |        | 5.167    |       | 8.250      | 5.08  |       | 2.03  |
| 2.167            |        | 5.250    |       | 8.333      | 3.05  |       | 2.03  |
| 2.250            | 2.03   | 5.333    | 8.13  | 8.417      | 3.05  | 11.50 | 2.03  |
| 2.333            | 3.05   | 5.417    | 8.13  | 8.500      | 3.05  | 11.58 | 1.02  |
| 2.417            | 3.05   | 5.500    | 8.13  | 8.583      | 3.05  | 11.67 | 1.02  |
| 2.500            | 3.05   | 5.583    | 9.14  | 8.667      | 3.05  | 11.75 | 1.02  |
| 2.583            | 3.05   | 5.667    | 9.14  | 8.750      | 3.05  | 11.83 | 2.03  |
| 2.667            | 3.05   | 5.750    | 9.15  | 8.833      | 3.05  | 11.92 | 2.03  |
| 2.750            |        | 5.833    |       | 8.917      | 3.05  |       | 2.03  |
| 2.833            |        | 5.917    |       | 9.000      | 3.05  |       | 1.02  |
| 2.917            |        | 6.000    |       | 9.083      | 2.03  |       | 1.02  |
| 3.000            |        | 6.083    |       | 9.167      | 2.03  |       | 1.02  |
| 3.083            |        | 6.167    |       | 9.250      | 2.03  |       | 1.02  |
|                  |        | 0.107    | 07.00 | 7.230      | 2.03  | '     |       |
| Max.Eff.Inten.(m | m/hr)= | 67.06    |       | 43.68      |       |       |       |
| over             | (min)  | 5.00     |       | 15.00      |       |       |       |
| Storage Coeff.   | (min)= | 6.02     |       | 14.13 (ii) |       |       |       |
| Unit Hyd. Tpeak  | (min)= | 5.00     |       | 15.00      |       |       |       |
| Unit Hyd. peak   | (cms)= | 0.19     |       | 0.08       |       |       |       |
| •                |        |          |       |            | *T0   | TALS* |       |

<sup>(</sup>i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

0.07 6.25 72.42 74.42 0.97

PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =

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0.03 6.33 37.36 74.42 0.50

\*TOTALS\*
0.100 (iii)
6.25
57.33
74.42
0.77

| 2.917 3<br>3.000 3<br>3.083 2  | .05   6.000                                     |                           | ıg_wesτι                                | DonWater |                |     |
|--|---|---------------------------|---|----------|----------------|-----|
| 3 000 3  |   | 67.06                     | 9.083                                   | 2.03     | 12.17          | 1.6 |
| 2.000 3  | .05   6.083                                     | 67.06                     | 9.167                                   | 2.03     | 12.25          | 1.6 |
| 3.083 2  | .03   6.167                                     | 67.06                     | 9.250                                   | 2.03     | :              |     |
| Max.Eff.Inten.(mm/hr) over (min) Storage Coeff. (min) Unit Hyd. Tpeak (min) Unit Hyd. peak (cms) |   |                           |   |          |                |     |
| over (min)   | 10.00   | 1                         | 5.00                                    |          |                |     |
| Storage Coeff. (min)   | = 7.59  | (ii) 1                    | 3.93 (i                                 | i)       |                |     |
| Unit Hyd. Tpeak (min)  | = 10.00   | 1                         | 5.00                                    |          |                |     |
| Unit Hyd. peak (cms)   | = 0.13  |                           | 0.08                                    |          |                |     |
|  |   |                           |   |          | OTALS*         |     |
| PEAK FLOW (cms) TIME TO PEAK (hrs) RUNOFF VOLUME (mm) TOTAL RAINFALL (mm) RUNOFF COEFFICIENT     | = 0.08  |                           | 0.07                                    |          | 0.140 (iii)    | 1   |
| TIME TO PEAK (hrs)   | = 6.25  |                           | 6.33                                    |          | 6.25           |     |
| RUNUFF VULUME (MM):  | = /2.42   | 3                         | 9.68                                    |          | 52.12<br>74.42 |     |
| DUNCE COFFEE (MIII)  | = /4.42   | ,                         | 4.42                                    |          | 0.70           |     |
| KUNOFF COEFFICIENT   | = 0.97  |                           | 0.55                                    |          | 0.70           |     |
| (i) CN PROCEDURE SE CN* = 83.0 (ii) TIME STEP (DT): THAN THE STORAG (iii) PEAK FLOW DOES         | Ia = Dep. S<br>SHOULD BE SMA<br>E COEFFICIEN    | Storage<br>ALLER OR<br>F. | (Above)<br>EQUAL                        |          |                |     |
| ADD HYD ( 0460) <br>1 + 2 = 3  <br>ID1= 1 ( 0205):<br>+ ID2= 2 ( 0210):                          | ADEA O  | DEAU T                    | DEAK                                    | B.V      |                |     |
| 1 + 2 - 3  | (ha) (r   | eme) (                    | hne)                                    | (mm)     |                |     |
| TD1= 1 ( 0205):  | 1.11 0.1  | 140 6                     | . 25                                    | 52.12    |                |     |
| + ID2= 2 ( 0210):  | 0.96 0.1  | 126 6                     | . 25                                    | 54.08    |                |     |
| ============   |   |                           |   |          |                |     |
| ID = 3 ( 0460):  | 2.07 0.2  | 266 6                     | . 25                                    | 53.03    |                |     |
|  |   |                           |   |          |                |     |
| NOTE: PEAK FLOWS DO  |   |                           |   |          |                |     |
| CALTR  | a (ha)=   | 0.70                      |   |          |                |     |
| CALIB  | a (ha)=<br>al Imp(%)= !                         | 0.70<br>57.00 D           | ir. Con                                 | n.(%)=   | 57.00          |     |
| CALIB<br>  STANDHYD ( 0230)  Are<br> ID= 1 DT= 5.0 min   Tot                                     | THRERVITO                                       | ıc nen                    | VITOUS (                                |          | 57.00          |     |
| CALIB<br>  STANDHYD ( 0230)  Are<br> ID= 1 DT= 5.0 min   Tot                                     | THRERVITO                                       | ıc nen                    | VITOUS (                                |          | 57.00          |     |
| CALIB<br>  STANDHYD ( 0230)  Are<br> ID= 1 DT= 5.0 min   Tot                                     | THRERVITO                                       | ıc nen                    | VITOUS (                                |          | 57.00          |     |
| CALIB<br>  STANDHYD ( 0230)  Are<br> ID= 1 DT= 5.0 min   Tot                                     | THRERVITO                                       | ıc nen                    | VITOUS (                                |          | 57.00          |     |
| CALIB<br>  STANDHYD ( 0230)  Are<br> ID= 1 DT= 5.0 min   Tot                                     | THRERVITO                                       | ıc nen                    | VITOUS (                                |          | 57.00          |     |
| CALIB<br>  STANDHYD ( 0230)  Are<br> ID= 1 DT= 5.0 min   Tot                                     | THRERVITO                                       | ıc nen                    | VITOUS (                                |          | 57.00          |     |
| CALIB<br>  STANDHYD ( 0230)  Are<br> ID= 1 DT= 5.0 min   Tot                                     | IMPERVIOL = 0.40 = 2.00 = 1.00 = 320.00 = 0.013 | JS PER<br>2<br>0          | VIOUS (<br>0.30<br>5.00<br>2.00<br>5.00 | i)       |                |     |

TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN

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LangstaffRd\_EA\_Existing\_WestDonWatershd
CN\* = 81.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COFFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |         |               |                         |
|-------------------|---------|---------------|-------------------------|
| STANDHYD ( 0225)  | Area    | (ha)= 0.9     |                         |
| ID= 1 DT= 5.0 min | Total   | Imp(%) = 53.0 | 00 Dir. Conn.(%)= 53.00 |
|                   |         |               |                         |
|                   |         | IMPERVIOUS    | PERVIOUS (i)            |
| Surface Area      | (ha)=   | 0.48          | 0.42                    |
| Dep. Storage      | (mm)=   | 2.00          | 5.00                    |
| Average Slope     | (%)=    | 1.00          | 2.00                    |
| Length            | (m)=    | 320.00        | 25.00                   |
| Mannings n        | =       | 0.013         | 0.250                   |
| NOTE: RATNE       | A11 MAC | TRANSFORMED : | TO 5.0 MTN TIME STEP    |

| • | MAINI ALL              | · WAS | I IVANOI OIUIE | 0 10  | J.O MIN. | TIME STE | -1 -  |       |  |  |  |  |
|---|------------------------|-------|----------------|-------|----------|----------|-------|-------|--|--|--|--|
|   |                        |       |                |       |          |          |       |       |  |  |  |  |
|   | TRANSFORMED HYETOGRAPH |       |                |       |          |          |       |       |  |  |  |  |
|   | TIME                   | RAIN  | TIME           | RAIN  | ' TIME   | RAIN     | TIME  | RAIN  |  |  |  |  |
|   | hrs                    | mm/hr | hrs            | mm/hr | ' hrs    | mm/hr    | hrs   | mm/hr |  |  |  |  |
|   | 0.083                  | 0.00  | 3.167          | 2.03  | 6.250    | 67.05    | 9.33  | 3.05  |  |  |  |  |
|   | 0.167                  | 0.00  | 3.250          | 2.03  | 6.333    | 13.21    | 9.42  | 3.05  |  |  |  |  |
|   | 0.250                  | 0.00  | 3.333          | 3.05  | 6.417    | 13.21    | 9.50  | 3.05  |  |  |  |  |
|   | 0.333                  | 1.02  | 3.417          | 3.05  | 6.500    | 13.21    | 9.58  | 2.03  |  |  |  |  |
|   | 0.417                  | 1.02  | 3.500          | 3.05  | 6.583    | 13.21    | 9.67  | 2.03  |  |  |  |  |
|   | 0.500                  | 1.02  | 3.583          | 3.05  | 6.667    | 13.21    | 9.75  | 2.03  |  |  |  |  |
|   | 0.583                  | 2.03  | 3.667          | 3.05  | 6.750    | 13.21    | 9.83  | 2.03  |  |  |  |  |
|   | 0.667                  | 2.03  | 3.750          | 3.05  | 6.833    | 6.10     |       | 2.03  |  |  |  |  |
|   | 0.750                  | 2.03  | 3.833          | 3.05  | 6.917    | 6.10     |       | 2.03  |  |  |  |  |
|   | 0.833                  | 1.02  | 3.917          | 3.05  | 7.000    | 6.10     |       | 2.03  |  |  |  |  |
|   | 0.917                  | 1.02  | 4.000          | 3.05  | 7.083    | 6.10     | 10.17 | 2.03  |  |  |  |  |
|   | 1.000                  | 1.02  | 4.083          | 3.05  | 7.167    | 6.10     | 10.25 | 2.03  |  |  |  |  |
|   | 1.083                  | 2.03  | 4.167          | 3.05  | 7.250    | 6.10     | 10.33 | 2.03  |  |  |  |  |
|   | 1.167                  | 2.03  |                | 3.05  | 7.333    | 5.08     | 10.42 | 2.03  |  |  |  |  |
|   | 1.250                  | 2.03  | 4.333          | 5.08  | 7.417    | 5.08     | 10.50 | 2.03  |  |  |  |  |
|   | 1.333                  | 1.02  | 4.417          | 5.08  | 7.500    | 5.08     | 10.58 | 1.02  |  |  |  |  |
|   | 1.417                  | 1.02  | 4.500          | 5.08  | 7.583    | 4.06     |       | 1.02  |  |  |  |  |
|   | 1.500                  | 1.02  | 4.583          | 5.08  | 7.667    | 4.06     | 10.75 | 1.02  |  |  |  |  |
|   | 1.583                  | 2.03  | 4.667          | 5.08  | 7.750    | 4.06     | 10.83 | 2.03  |  |  |  |  |
|   | 1.667                  | 2.03  |                | 5.08  | 7.833    | 4.06     |       | 2.03  |  |  |  |  |
|   | 1.750                  | 2.03  |                | 6.10  | 7.917    | 4.06     |       | 2.03  |  |  |  |  |
|   | 1.833                  | 1.02  | 4.917          | 6.10  | 8.000    | 4.06     |       | 1.02  |  |  |  |  |
|   | 1.917                  | 1.02  | 5.000          | 6.10  | 8.083    | 5.08     |       | 1.02  |  |  |  |  |
|   | 2.000                  | 1.02  | 5.083          | 5.08  | 8.167    | 5.08     | 11.25 | 1.02  |  |  |  |  |
|   | 2.083                  | 2.03  | 5.167          | 5.08  | 8.250    | 5.08     | 11.33 | 2.03  |  |  |  |  |
|   | 2.167                  | 2.03  | 5.250          | 5.08  | 8.333    | 3.05     | 11.42 | 2.03  |  |  |  |  |
|   | 2.250                  | 2.03  | 5.333          | 8.13  | 8.417    | 3.05     | 11.50 | 2.03  |  |  |  |  |
|   | 2.333                  | 3.05  | 5.417          | 8.13  | 8.500    | 3.05     | 11.58 | 1.02  |  |  |  |  |
|   | 2.417                  | 3.05  | 5.500          | 8.13  | 8.583    | 3.05     | 11.67 | 1.02  |  |  |  |  |
|   |                        |       |                |       |          |          |       |       |  |  |  |  |

|                 | Langs   | taffRd_E | A_Exist | ing_WestDor | Waters | hd        |      |
|-----------------|---------|----------|---------|-------------|--------|-----------|------|
| 2.50            | 0 3.05  | 5.583    | 9.14    | 8.667       | 3.05   | 11.75     | 1.0  |
| 2.58            | 3 3.05  | 5.667    | 9.14    | 8.750       | 3.05   | 11.83     | 2.03 |
| 2.66            | 7 3.05  | 5.750    | 9.15    | 8.833       | 3.05   | 11.92     | 2.03 |
| 2.75            | 0 3.05  | 5.833    | 67.06   | 8.917       | 3.05   | 12.00     | 2.03 |
| 2.83            | 3 3.05  | 5.917    | 67.06   | 9.000       | 3.05   | 12.08     | 1.02 |
| 2.91            | 7 3.05  | 6.000    | 67.06   | 9.083       | 2.03   | 12.17     | 1.02 |
| 3.00            | 0 3.05  | 6.083    | 67.06   | 9.167       | 2.03   | 12.25     | 1.02 |
| 3.08            | 3 2.03  | 6.167    | 67.06   | 9.250       | 2.03   | İ         |      |
|                 |         |          |         |             |        |           |      |
| Max.Eff.Inten.( | mm/hr)= | 67.06    |         | 46.22       |        |           |      |
| over            | (min)   | 5.00     |         | 15.00       |        |           |      |
| Storage Coeff.  | (min)=  | 6.02     | (ii)    | 13.27 (ii)  |        |           |      |
| Unit Hyd. Tpeak | (min)=  | 5.00     |         | 15.00       |        |           |      |
| Unit Hyd. peak  | (cms)=  | 0.19     |         | 0.08        |        |           |      |
|                 |         |          |         |             | *T0    | TALS*     |      |
| PEAK FLOW       | (cms)=  | 0.09     |         | 0.04        | 0      | .128 (iii | )    |
| TIME TO PEAK    | (hrs)=  | 6.25     |         | 6.33        |        | 5.25      |      |
| RUNOFF VOLUME   | (mm)=   | 72.42    |         | 39.68       | 5      | 7.02      |      |
| TOTAL RAINFALL  | (mm)=   | 74.42    |         | 74.42       | 74     | 4.42      |      |
| RUNOFF COEFFICI | ENT =   | 0.97     |         | 0.53        |        | 0.77      |      |
|                 |         |          |         |             |        |           |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: CN\* = 83.0 Ia = Dep. Storage (Above) (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COFFFICIENT. (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0475) <br>  1 + 2 = 3 |      | QPEAK<br>(cms)<br>0.128<br>0.100 | TPEAK<br>(hrs)<br>6.25<br>6.25 | R.V.<br>(mm)<br>57.02<br>57.33 |
|---------------------------------|------|----------------------------------|--------------------------------|--------------------------------|
| ID = 3 ( 0475):                 | 1.60 | 0.228                            | 6.25                           | 57.16                          |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB             | _     |                |                |       |
|-------------------|-------|----------------|----------------|-------|
| STANDHYD ( 0220)  | Area  | (ha)= 0.65     |                |       |
| ID= 1 DT= 5.0 min | Total | Imp(%) = 46.06 | Dir. Conn.(%)= | 46.00 |
|                   |       |                |                |       |
|                   |       | IMPERVIOUS     | PERVIOUS (i)   |       |
| Surface Area      | (ha)= | 0.30           | 0.35           |       |
| Dep. Storage      | (mm)= | 2.00           | 5.00           |       |
| Average Slope     | (%)=  | 1.00           | 2.00           |       |
| Length            | (m)=  | 260.00         | 20.00          |       |
| Mannings n        | =     | 0.013          | 0.250          |       |
|                   |       |                |                |       |

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- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |         |       |        |           |       |  |
|-------------------|-------|---------|-------|--------|-----------|-------|--|
| STANDHYD ( 0215)  | Area  | (ha)=   | 0.58  |        |           |       |  |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 57.00 | Dir.   | Conn.(%)= | 57.00 |  |
|                   |       |         |       |        |           |       |  |
|                   |       | IMPERVI | OUS   | PERVIO | US (i)    |       |  |
| Surface Area      | (ha)= | 0.3     | 3     | 0.2    | 5         |       |  |
| Dep. Storage      | (mm)= | 2.0     | 10    | 5.00   | 9         |       |  |
| Average Slope     | (%)=  | 1.0     | 10    | 2.00   | 9         |       |  |
| Length            | (m)=  | 260.0   | 10    | 30.00  | 9         |       |  |
| Mannings n        |       | 0.01    | .3    | 0.250  | 9         |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       | TRANSFORMED HYETOGRAPH |       |       |        |       |       |       |  |  |  |
|-------|------------------------|-------|-------|--------|-------|-------|-------|--|--|--|
| TIME  | RAIN                   | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |  |  |
| hrs   | mm/hr                  | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |  |  |
| 0.083 | 0.00                   | 3.167 | 2.03  | 6.250  | 67.05 | 9.33  | 3.05  |  |  |  |
| 0.167 | 0.00                   | 3.250 | 2.03  | 6.333  | 13.21 | 9.42  | 3.05  |  |  |  |
| 0.250 | 0.00                   | 3.333 | 3.05  | 6.417  | 13.21 | 9.50  | 3.05  |  |  |  |
| 0.333 | 1.02                   | 3.417 | 3.05  | 6.500  | 13.21 | 9.58  | 2.03  |  |  |  |
| 0.417 | 1.02                   | 3.500 | 3.05  | 6.583  | 13.21 | 9.67  | 2.03  |  |  |  |
| 0.500 | 1.02                   | 3.583 | 3.05  | 6.667  | 13.21 | 9.75  | 2.03  |  |  |  |
| 0.583 | 2.03                   | 3.667 | 3.05  | 6.750  | 13.21 | 9.83  | 2.03  |  |  |  |
| 0.667 | 2.03                   | 3.750 | 3.05  | 6.833  | 6.10  | 9.92  | 2.03  |  |  |  |
| 0.750 | 2.03                   | 3.833 | 3.05  | 6.917  | 6.10  | 10.00 | 2.03  |  |  |  |
| 0.833 | 1.02                   | 3.917 | 3.05  | 7.000  | 6.10  | 10.08 | 2.03  |  |  |  |
| 0.917 | 1.02                   | 4.000 | 3.05  | 7.083  | 6.10  | 10.17 | 2.03  |  |  |  |
| 1.000 | 1.02                   | 4.083 | 3.05  | 7.167  | 6.10  | 10.25 | 2.03  |  |  |  |
| 1.083 | 2.03                   | 4.167 | 3.05  | 7.250  | 6.10  | 10.33 | 2.03  |  |  |  |
| 1.167 | 2.03                   | 4.250 | 3.05  | 7.333  | 5.08  | 10.42 | 2.03  |  |  |  |
| 1.250 | 2.03                   | 4.333 | 5.08  | 7.417  | 5.08  | 10.50 | 2.03  |  |  |  |
| 1.333 | 1.02                   | 4.417 | 5.08  | 7.500  | 5.08  | 10.58 | 1.02  |  |  |  |
| 1.417 | 1.02                   | 4.500 | 5.08  | 7.583  | 4.06  | 10.67 | 1.02  |  |  |  |
| 1.500 | 1.02                   | 4.583 | 5.08  | 7.667  | 4.06  | 10.75 | 1.02  |  |  |  |
| 1.583 | 2.03                   | 4.667 | 5.08  | 7.750  | 4.06  | 10.83 | 2.03  |  |  |  |
| 1.667 | 2.03                   | 4.750 | 5.08  | 7.833  | 4.06  | 10.92 | 2.03  |  |  |  |
| 1.750 | 2.03                   | 4.833 | 6.10  | 7.917  | 4.06  | 11.00 | 2.03  |  |  |  |
| 1.833 | 1.02                   | 4.917 | 6.10  | 8.000  | 4.06  | 11.08 | 1.02  |  |  |  |
| 1.917 | 1.02                   | 5.000 | 6.10  | 8.083  | 5.08  | 11.17 | 1.02  |  |  |  |
| 2.000 | 1.02                   | 5.083 | 5.08  | 8.167  | 5.08  | 11.25 | 1.02  |  |  |  |

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# LangstaffRd\_EA\_Existing\_WestDonWatershd NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|                 |                  | TRA   | NSFORME | ED HYETOGR   | ΔРН            | _          |       |
|-----------------|------------------|-------|---------|--------------|----------------|------------|-------|
| TIM             | E RAIN           |       | RAIN    |              | RAIN           |            | RAIN  |
| hr:             |                  |       |         |              | mm/hr          |            | mm/hr |
| 0.08            |                  | 3.167 |         | 6.250        | 67.05          |            | 3.05  |
| 0.16            |                  | 3.250 |         | 6.333        | 13.21          |            | 3.05  |
| 0.25            |                  | 3.333 |         | 6.417        | 13.21          |            | 3.05  |
|                 |                  |       |         |              |                |            |       |
| 0.33            |                  | 3.417 |         | 6.500        | 13.21<br>13.21 |            | 2.03  |
| 0.41            |                  |       |         |              |                |            | 2.03  |
| 0.50            |                  | 3.583 |         | 6.667        | 13.21          |            | 2.03  |
| 0.58            |                  | 3.667 | 3.05    |              | 13.21          |            | 2.03  |
| 0.66            |                  | 3.750 |         | 6.833        | 6.10           |            | 2.03  |
| 0.75            |                  | 3.833 |         | 6.917        |                | 10.00      | 2.03  |
| 0.83            |                  | 3.917 |         | 7.000        |                | 10.08      | 2.03  |
| 0.91            |                  | 4.000 |         | 7.083        |                | 10.17      | 2.03  |
| 1.00            |                  | 4.083 |         | 7.167        |                | 10.25      | 2.03  |
| 1.08            |                  | 4.167 |         | 7.250        |                | 10.33      | 2.03  |
| 1.16            |                  | 4.250 |         | 7.333        |                | 10.42      | 2.03  |
| 1.25            |                  | 4.333 |         | 7.417        |                | 10.50      | 2.03  |
| 1.33            |                  | 4.417 |         | 7.500        |                | 10.58      | 1.02  |
| 1.41            |                  | 4.500 | 5.08    |              |                | 10.67      | 1.02  |
| 1.50            |                  | 4.583 |         |              |                | 10.75      | 1.02  |
| 1.58            | 3 2.03           | 4.667 | 5.08    | 7.750        | 4.06           | 10.83      | 2.03  |
| 1.66            |                  | 4.750 |         | 7.833        |                | 10.92      | 2.03  |
| 1.75            | 2.03             | 4.833 | 6.10    | 7.917        | 4.06           | 11.00      | 2.03  |
| 1.83            | 3 1.02           | 4.917 | 6.10    | 8.000        | 4.06           | 11.08      | 1.02  |
| 1.91            | 7 1.02           | 5.000 | 6.10    | 8.083        | 5.08           | 11.17      | 1.02  |
| 2.00            | 0 1.02           | 5.083 | 5.08    | 8.167        | 5.08           | 11.25      | 1.02  |
| 2.08            | 3 2.03           | 5.167 | 5.08    | 8.250        | 5.08           | 11.33      | 2.03  |
| 2.16            | 7 2.03           | 5.250 | 5.08    | 8.333        | 3.05           | 11.42      | 2.03  |
| 2.25            | 2.03             | 5.333 | 8.13    | 8.417        | 3.05           | 11.50      | 2.03  |
| 2.33            | 3 3.05           | 5.417 | 8.13    | 8.500        | 3.05           | 11.58      | 1.02  |
| 2.41            | 7 3.05           | 5.500 | 8.13    | 8.583        | 3.05           | 11.67      | 1.02  |
| 2.50            | 3.05             | 5.583 | 9.14    | 8.667        | 3.05           | 11.75      | 1.02  |
| 2.58            | 3 3.05           | 5.667 | 9.14    | 8.750        | 3.05           | 11.83      | 2.03  |
| 2.66            | 7 3.05           | 5.750 | 9.15    | 8.833        | 3.05           | 11.92      | 2.03  |
| 2.75            | 3.05             | 5.833 | 67.06   | 8.917        | 3.05           | 12.00      | 2.03  |
| 2.83            | 3 3.05           | 5.917 | 67.06   | 9.000        | 3.05           | 12.08      | 1.02  |
| 2.91            | 7 3.05           | 6.000 | 67.06   | 9.083        | 2.03           | 12.17      | 1.02  |
| 3.00            | 3.05             | 6.083 | 67.06   | 9.167        | 2.03           | 12.25      | 1.02  |
| 3.08            | 3 2.03           | 6.167 | 67.06   | 9.250        | 2.03           | j          |       |
|                 |                  |       |         |              |                |            |       |
| Max.Eff.Inten.( |                  | 67.06 |         | 46.22        |                |            |       |
|                 | (min)            | 5.00  |         | 15.00        |                |            |       |
| Storage Coeff.  | (min)=           | 5.32  | (11)    | 11.66 (ii    | )              |            |       |
| Unit Hyd. Tpeak |                  | 5.00  |         | 15.00        |                |            |       |
| Unit Hyd. peak  | (cms)=           | 0.21  |         | 0.09         |                |            |       |
| PEAK FLOW       | (cms)=           | 0.06  |         | 0.02         |                | TALS*      |       |
|                 | (cms)=<br>(hrs)= |       |         | 0.03<br>6.33 |                | .090 (iii) |       |
| TIME TO PEAK    |                  | 6.25  |         |              |                | 6.25       |       |
| RUNOFF VOLUME   | (mm)=            | 72.42 |         | 39.68        | 54             | 4.73       |       |
|                 |                  |       | Page    | 110          |                |            |       |

|                  | Lange  | +-4404 5 | A Evict | ing WestDon | Watone | hd         |      |
|------------------|--------|----------|---------|-------------|--------|------------|------|
| 2.083            |        | 5.167    | 5.08    |             | 5.08   | 11.33      | 2.03 |
| 2.167            |        | 5.250    | 5.08    |             | 3.05   |            | 2.03 |
| 2.250            |        | 5.333    |         |             | 3.05   |            | 2.03 |
| 2.333            |        | 5.417    |         |             | 3.05   |            | 1.02 |
| 2.417            |        | 5.500    | 8.13    |             | 3.05   |            | 1.02 |
| 2.417            |        | 5.583    |         |             | 3.05   |            | 1.02 |
|                  |        |          |         |             | 3.05   |            | 2.03 |
| 2.583            |        |          |         |             |        |            |      |
| 2.667            |        | 5.750    | 9.15    |             | 3.05   | 11.92      | 2.03 |
| 2.750            |        |          | 67.06   |             | 3.05   |            | 2.03 |
| 2.833            |        | 5.917    | 67.06   |             | 3.05   |            | 1.02 |
| 2.917            |        | 6.000    | 67.06   |             | 2.03   |            | 1.02 |
| 3.000            |        | 6.083    | 67.06   |             | 2.03   |            | 1.02 |
| 3.083            | 2.03   | 6.167    | 67.06   | 9.250       | 2.03   | l          |      |
|                  |        |          |         |             |        |            |      |
| Max.Eff.Inten.(m |        | 67.06    |         | 46.22       |        |            |      |
| over             |        | 5.00     |         | 15.00       |        |            |      |
|                  | (min)= |          |         | 13.40 (ii)  |        |            |      |
| Unit Hyd. Tpeak  | (min)= | 5.00     |         | 15.00       |        |            |      |
| Unit Hyd. peak   | (cms)= | 0.21     |         | 0.08        |        |            |      |
|                  |        |          |         |             |        | TALS*      |      |
| PEAK FLOW        | (cms)= | 0.06     |         | 0.02        | 0      | .085 (iii) |      |
| TIME TO PEAK     | (hrs)= | 6.25     |         | 6.33        |        | 6.25       |      |
| RUNOFF VOLUME    | (mm)=  | 72.42    |         | 39.68       | 58     | 8.33       |      |
| TOTAL RAINFALL   | (mm)=  | 74.42    |         | 74.42       | 74     | 4.42       |      |
| RUNOFF COEFFICIE | NT =   | 0.97     |         | 0.53        |        | 0.78       |      |
|                  |        |          |         |             |        |            |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: CN\* = 83.0 Ia = Dep. Storage (Above)

| (ii) TIME STEP (DT) :  | SHOULD BI | E SMALLER  | OR EQUAL  |       |      |
|------------------------|-----------|------------|-----------|-------|------|
| THAN THE STORAGE       | E COEFFIC | CIENT.     |           |       |      |
| (iii) PEAK FLOW DOES I | NOT INCL  | UDE BASEFL | OW IF AN  | Υ.    |      |
|                        |           |            |           |       |      |
|                        |           |            |           |       | <br> |
|                        |           |            |           |       |      |
|                        |           |            |           |       |      |
| ADD HYD ( 0470)        |           |            |           |       |      |
|                        | ARFA      | QPEAK      | TPFAK     | R.V.  |      |
|                        |           | (cms)      |           |       |      |
| ID1= 1 ( 0215):        |           |            |           |       |      |
| + ID2= 2 ( 0220):      |           |            |           |       |      |
| 1 102- 2 ( 0220).      |           |            | 0.25      | 54.75 |      |
| ID = 3 ( 0470):        |           | 0 175      | 6 25      | E6 42 |      |
| 10 - 3 ( 04/0).        | 1.23      | 0.1/3      | 0.23      | 30.43 |      |
| NOTE: DEAK FLOWS DO I  | NOT THE   | IDE DACEEL | OUG TE 41 |       |      |
| NOTE: PEAK FLOWS DO I  | NOT INCLU | DDE BASEFL | .UWS IF A | NY.   |      |
|                        |           |            |           |       | <br> |
|                        |           |            |           |       |      |
| 1                      |           |            |           |       |      |
| ADD HYD ( 0480)        |           |            |           |       |      |
| 1 1 1 2 - 3            | AREA      | ODEAK      | TDEAK     | P V   |      |

| ADD HYD ( 0480)   |      |       |       |       |
|-------------------|------|-------|-------|-------|
| 1 + 2 = 3         | AREA | QPEAK | TPEAK | R.V.  |
|                   | (ha) | (cms) | (hrs) | (mm)  |
| ID1= 1 ( 0470):   | 1.23 | 0.175 | 6.25  | 56.43 |
| + ID2= 2 ( 0475): | 1.60 | 0.228 | 6.25  | 57.16 |
|                   |      |       |       |       |

#### LangstaffRd\_EA\_Existing\_WestDonWatershd

ID = 3 ( 0480): 2.83 0.402 6.25 56.84

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB             |       |                |                           |       |
|-------------------|-------|----------------|---------------------------|-------|
| STANDHYD ( 0160)  | Area  | (ha)= 0.43     | 3                         |       |
| ID= 1 DT= 5.0 min | Total | Imp(%) = 56.00 | <pre>Dir. Conn.(%)=</pre> | 56.00 |
|                   |       |                |                           |       |
|                   |       | IMPERVIOUS     | PERVIOUS (i)              |       |
| Surface Area      | (ha)= | 0.24           | 0.19                      |       |
| Dep. Storage      | (mm)= | 2.00           | 5.00                      |       |
| Average Slope     | (%)=  | 1.00           | 2.00                      |       |
| Length            | (m)=  | 260.00         | 20.00                     |       |
| Mannings n        | ` =   | 0.013          | 0.250                     |       |
|                   |       |                |                           |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250   | 67.05 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333   | 13.21 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417   | 13.21 | 9.50  | 3.05  |
| 0.333 | 1.02  | 3.417 | 3.05     | 6.500   | 13.21 | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05     | 6.583   | 13.21 | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 3.05     | 6.667   | 13.21 | 9.75  | 2.03  |
| 0.583 | 2.03  | 3.667 | 3.05     | 6.750   | 13.21 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 3.05     | 6.833   | 6.10  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 3.05     | 6.917   | 6.10  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 3.05     | 7.000   | 6.10  | 10.08 | 2.03  |
| 0.917 | 1.02  | 4.000 | 3.05     | 7.083   | 6.10  | 10.17 | 2.03  |
| 1.000 | 1.02  | 4.083 | 3.05     | 7.167   | 6.10  | 10.25 | 2.03  |
| 1.083 | 2.03  | 4.167 | 3.05     | 7.250   | 6.10  | 10.33 | 2.03  |
| 1.167 | 2.03  | 4.250 | 3.05     | 7.333   | 5.08  | 10.42 | 2.03  |
| 1.250 | 2.03  | 4.333 | 5.08     | 7.417   | 5.08  | 10.50 | 2.03  |
| 1.333 | 1.02  | 4.417 | 5.08     | 7.500   | 5.08  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 5.08     | 7.583   | 4.06  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 5.08     | 7.667   | 4.06  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 5.08     | 7.750   | 4.06  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 5.08     | 7.833   | 4.06  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 6.10     | 7.917   | 4.06  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 6.10     | 8.000   | 4.06  | 11.08 | 1.02  |
| 1.917 | 1.02  | 5.000 | 6.10     | 8.083   | 5.08  | 11.17 | 1.02  |
| 2.000 | 1.02  | 5.083 | 5.08     | 8.167   | 5.08  | 11.25 | 1.02  |
| 2.083 | 2.03  | 5.167 | 5.08     | 8.250   | 5.08  | 11.33 | 2.03  |
| 2.167 | 2.03  | 5.250 | 5.08     | 8.333   | 3.05  | 11.42 | 2.03  |
| 2.250 | 2.03  | 5.333 | 8.13     | 8.417   | 3.05  | 11.50 | 2.03  |
| 2.333 | 3.05  | 5.417 | 8.13     | 8.500   | 3.05  | 11.58 | 1.02  |
| 2.417 | 3.05  | 5.500 | 8.13     | 8.583   | 3.05  | 11.67 | 1.02  |
| 2.500 | 3.05  | 5.583 | 9.14     | 8.667   | 3.05  | 11.75 | 1.02  |

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| LangstaffRd_EA_Existing_MestDonWatershol   0.667   2.08   3.750   3.05   6.833   6.10   9.92   2.03     0.750   2.03   3.833   3.05   6.017   6.10   10.08   2.03     0.833   1.02   3.917   3.05   7.080   6.10   10.08   2.03     0.917   1.02   4.080   3.05   7.083   6.10   10.17   2.03     1.080   1.02   4.083   3.05   7.083   6.10   10.17   2.03     1.1060   1.02   4.083   3.05   7.167   6.10   10.25   2.03     1.167   2.03   4.250   3.05   7.335   5.08   10.42   2.03     1.150   2.03   4.353   5.08   7.417   5.08   10.50   2.03     1.333   1.02   4.417   5.08   7.500   5.08   10.58   1.02     1.417   1.02   4.590   5.08   7.583   4.06   10.67   1.02     1.580   2.03   4.657   5.08   7.570   4.06   10.675   1.02     1.147   1.02   4.590   5.08   7.583   4.06   10.67   1.02     1.580   1.03   4.667   5.08   7.750   4.06   10.675   1.02     1.581   2.03   4.667   5.08   7.750   4.06   10.675   1.02     1.583   2.03   4.667   5.08   7.750   4.06   10.675   1.02     1.667   2.03   4.750   5.08   7.575   4.06   10.83   2.03     1.667   2.03   4.363   6.10   7.917   4.06   11.00   2.03     1.833   1.02   4.917   6.10   8.000   4.06   11.00   2.03     1.833   1.02   4.917   6.10   8.000   4.06   11.00   2.03     1.833   1.02   5.000   6.10   8.808   5.08   11.17   1.02     2.000   1.02   5.003   5.08   5.08   8.167   5.08   11.17   1.02     2.001   1.02   5.000   6.10   8.000   4.06   11.00   2.03     2.03   2.03   5.167   5.08   8.167   5.08   11.25   1.02     2.03   3.05   5.667   9.14   8.750   3.05   11.45   1.02     2.150   2.03   5.533   8.13   8.417   3.05   11.55   2.03     2.250   2.03   5.333   8.13   8.417   3.05   11.55   1.02     2.501   3.05   5.500   8.13   8.583   3.05   11.67   1.02     2.502   3.05   5.83   67.06   9.167   2.03   12.25   1.02     2.503   3.05   5.667   9.14   8.750   3.05   11.58   1.02     2.503   3.05   5.667   9.14   8.750   3.05   11.58   1.02     2.513   3.05   5.667   9.15   8.833   3.05   11.55   1.02     2.503   3.05   5.667   9.15   8.833   3.05   11.57   1.02     3.000      |                       |           |         |             |        |       |      |
|--|-----------------------|-----------|---------|-------------|--------|-------|------|
| 0.667 2.03   3.756 3.05   6.833 6.10   9.92 2.03   0.833 1.02   3.917 3.05   7.000 6.10   10.00 2.03   0.833 1.02   3.917 3.05   7.000 6.10   10.00 2.03   0.833 1.02   3.917 3.05   7.000 6.10   10.00 2.03   1.000 1.02   4.003 3.05   7.003 6.10   10.17 2.03   1.000 1.02   4.003 3.05   7.167 6.10   10.25 2.03   1.003 2.03   4.167 3.05   7.250 6.10   10.25 2.03   1.167 2.03   4.256 3.05   7.333 5.08   10.42 2.03   1.250 2.03   4.333 5.08   7.417 5.08   10.50 2.03   1.250 2.03   4.355   7.500 5.08   10.50 2.03   1.417 1.02   4.500 5.08   7.530 4.06   10.57 1.02   1.417 1.02   4.500 5.08   7.583 4.06   10.57 1.02   1.583 2.03   4.667 5.08   7.583 4.06   10.75 1.02   1.583 2.03   4.567 5.08   7.333 4.06   10.57 1.02   1.583 2.03   4.550 5.08   7.333 4.06   10.92 2.03   1.750 2.03   4.750 5.08   7.333 4.06   11.00 2.03   1.750 2.03   4.750 6.08   7.333 4.06   11.00 2.03   1.750 2.03   4.750 6.08   7.333 4.06   11.00 2.03   1.750 2.03   4.750 6.08   7.333 4.06   11.00 2.03   1.750 2.03   4.550 5.08   7.333 4.06   11.00 2.03   1.750 2.03   4.750 6.08   7.333 4.06   11.00 2.03   1.750 2.03   4.750 6.08   7.333 4.06   11.00 2.03   1.750 2.03   5.500 5.08   7.333 4.06   11.00 2.03   1.200 1.02   4.917 6.10 8.000 4.06   11.08 1.02   2.000 1.02   5.000 6.10 8.03 5.08   11.17 1.02   2.000 1.02   5.000 5.08   8.33 3.05   11.33 2.03   2.167 2.03   5.250 5.08 5.08   8.33 3.05   11.32 2.03   2.167 2.03   5.250 5.08   8.33 3.05   11.52   2.250 2.03   5.353 8.13 8.417 3.05   11.50   2.250 2.03   5.583 9.14 8.667 3.05   11.50   2.583 3.05   5.583 9.14 8.667 3.05   11.50   2.583 3.05   5.575 9.15   8.833 3.05   11.57   2.60 3.000 3.05   5.683 6.06 6.06 9.083 3.05   11.52   2.101 1.101 1.102   5.00   3.000 3.05   6.000 6.00 6.00 9.03   12.00   3.000 3.05   6.000 6.00 6.00 9.03   12.00   3.000 3.05   6.000 6.00 6.00 9.03   12.00   3.000 3.05   6.000 6.00 9.03   12.00   3.000 3.05   6.000 6.00 9.03   12.00   3.000 3.05   6.000 6.00 9.03   12.00   3.000 3.05   6.000 6.000 9.000 3.05   12.00   3.000 3.05   6.000 6.000 9.000 3.05   12.00   | Lang                  | staffRd E | A Exist | ing WestDon | Waters | hd    |      |
| 0.750  |                       |           |         |             |        |       | 2.03 |
| 0.917   1.02   4.000   3.05   7.083   6.10   10.17   2.03     1.000   1.02   4.083   3.05   7.167   6.10   10.25   2.03     1.083   2.03   4.167   3.05   7.250   6.10   10.25   2.03     1.167   2.03   4.250   3.05   7.353   5.08   10.42   2.03     1.150   2.03   4.333   5.08   7.417   5.08   10.50   2.03     1.333   1.02   4.417   5.08   7.500   5.08   10.58   1.02     1.417   1.02   4.500   5.08   7.533   4.06   10.67   1.02     1.500   1.02   4.583   5.08   7.667   4.06   10.67   1.02     1.583   2.03   4.667   5.08   7.750   4.06   10.75   1.02     1.667   2.03   4.675   5.08   7.575   4.06   10.83   2.03     1.667   2.03   4.458   5.08   7.667   4.06   10.75   1.02     1.670   2.03   4.853   6.10   7.917   4.06   11.09   2.03     1.833   1.02   4.917   6.10   8.000   4.06   11.09   2.03     1.833   1.02   4.917   6.10   8.000   4.06   11.09   2.03     1.833   1.02   5.000   6.10   8.000   4.06   11.08   1.02     1.017   1.02   5.000   6.10   8.000   4.06   11.08   1.02     2.083   2.03   5.167   5.08   8.167   5.08   11.37   1.02     2.083   2.03   5.167   5.08   8.167   5.08   11.33   2.03     2.250   2.03   5.567   5.08   8.133   3.05   11.50   2.03     2.250   2.03   5.550   8.13   8.417   3.05   11.50   2.03     2.417   3.05   5.500   8.13   8.583   3.05   11.50   2.03     2.590   3.05   5.500   8.13   8.583   3.05   11.58   1.02     2.590   3.05   5.500   8.13   8.583   3.05   11.50   2.03     2.501   3.05   5.500   8.13   8.583   3.05   11.50   2.03     2.502   2.03   5.500   8.13   8.583   3.05   11.50   2.03     2.503   3.05   5.667   9.14   8.750   3.05   11.58   1.02     2.591   3.05   5.500   8.13   8.583   3.05   11.50   11.50     2.500   3.05   5.833   67.06   8.917   3.05   12.00   2.03     2.501   3.05   5.500   8.13   8.583   3.05   11.50   1.00     2.917   3.06   5.500   6.06   6.06   6.07   6.05   1.155   1.02     3.000   3.05   6.000   67.06   9.083   2.03   12.77   1.02     3.000   3.05   6.000   67.06   9.083   2.03   12.75   1.02     3.000   3.05   6.000   67.06   9.083   2.03   12.7   |                       |           |         |             |        |       |      |
| 1.000  | 0.833 1.02            | 3.917     | 3.05    | 7.000       | 6.10   | 10.08 | 2.03 |
| 1.083 2.03   4.167 3.05   7.250   6.10   10.33 2.03  | 0.917 1.02            | 4.000     | 3.05    | 7.083       | 6.10   | 10.17 | 2.03 |
| 1.167   2.03   4.250   3.05   7.333   5.08   10.42   2.03     1.250   2.03   4.333   5.08   7.417   5.08   10.50   2.03     1.333   1.02   4.417   5.08   7.500   5.08   10.58   1.02     1.417   1.02   4.500   5.08   7.583   4.06   10.57   1.02     1.500   1.02   4.583   5.08   7.667   4.06   10.67   1.02     1.583   2.03   4.567   5.08   7.533   4.06   10.57   1.02     1.583   2.03   4.750   5.08   7.333   4.06   10.92   2.03     1.750   2.03   4.833   6.10   7.917   4.06   11.00   2.03     1.750   2.03   4.833   6.10   7.917   4.06   11.00   2.03     1.917   1.02   5.000   6.10   8.083   5.08   11.17   1.02     2.000   1.02   5.083   5.08   8.167   5.08   11.15   1.02     2.083   2.03   5.167   5.08   8.167   5.08   11.15   1.02     2.083   2.03   5.167   5.08   8.167   5.08   11.15   1.02     2.083   2.03   5.167   5.08   8.167   5.08   11.15   1.02     2.083   2.03   5.167   5.08   8.167   5.08   11.15   1.02     2.167   2.03   5.550   5.08   8.333   3.05   11.42   2.03     2.250   2.03   5.333   8.13   8.417   3.05   11.50   2.03     2.333   3.05   5.157   5.08   8.13   8.583   3.05   11.57   1.02     2.417   3.05   5.583   9.14   8.679   3.05   11.58   1.02     2.580   3.05   5.583   9.14   8.679   3.05   11.57   1.02     2.583   3.05   5.583   9.14   8.679   3.05   11.58   1.02     2.667   3.05   5.750   9.15   8.833   3.05   11.92   2.03     2.833   3.05   5.917   67.06   9.083   2.03   12.17   1.02     2.833   3.05   6.083   67.06   9.083   2.03   12.17   1.02     2.833   3.05   6.083   67.06   9.083   2.03   12.15   1.02     3.080   3.05   6.083   67.06   9.083   2.03   12.15   1.02     3.080   3.05   6.083   67.06   9.083   2.03   12.15   1.02     3.080   3.05   6.083   67.06   9.083   2.03   12.15   1.02     3.080   3.05   6.083   67.06   9.083   2.03   12.15   1.02     4.084   5.084      | 1.000 1.02            | 4.083     | 3.05    | 7.167       | 6.10   | 10.25 | 2.03 |
| 1.250  | 1.083 2.03            | 4.167     | 3.05    | 7.250       | 6.10   | 10.33 | 2.03 |
| 1.333 1.02   4.417   5.08   7.500   5.08   10.58   1.02   1.417 1.02   4.500   5.08   7.583   4.06   10.675   1.02   1.590   1.02   4.583   5.08   7.667   4.06   10.675   1.02   1.583 2.03   4.750   5.08   7.750   4.06   10.75   1.02   1.667 2.03   4.750   5.08   7.750   4.06   10.83   2.03   1.750 2.03   4.750   5.08   7.733   4.06   10.83   2.03   1.750 2.03   4.833   6.10   7.917   4.06   11.00   2.03   1.917 1.02   5.000   6.10   8.080   4.06   11.08   10.2   2.000 1.02   5.083   5.08   8.167   5.08   11.17   1.02   2.003 2.03   5.167   5.08   8.250   5.08   11.25   1.02   2.003 2.167   2.03   5.550   5.08   8.333   3.05   11.50   2.03   2.250 2.03   5.333   8.13   8.417   3.05   11.50   2.03   2.250 2.03   5.550   5.08   8.350   3.05   11.50   2.03   2.250 2.03   5.550   8.13   8.590   3.05   11.50   2.03   2.250 2.03   5.550   8.13   8.583   3.05   11.57   1.02   2.417   3.05   5.583   9.14   8.67   3.05   11.57   1.02   2.503   3.05   5.567   9.15   8.833   3.05   11.77   1.02   2.503   3.05   5.563   9.15   8.833   3.05   11.2   2.667   3.06   5.583   6.06   8.917   3.05   11.20   2.03   2.833   3.05   5.567   9.15   8.833   3.05   11.20   2.03   2.833   3.05   5.567   9.15   8.833   3.05   11.20   2.03   2.833   3.05   5.583   9.14   8.67   3.05   11.58   1.02   2.500   3.05   5.683   6.06   6.983   6.06   9.083   2.03   12.17   1.02   2.833   3.05   5.917   67.06   9.083   2.03   12.10   2.03   2.833   3.05   6.000   67.06   9.083   2.03   12.15   1.02   3.000   3.05   6.083   67.06   9.083   2.03   12.15   1.02   3.000   3.05   6.083   67.06   9.083   2.03   12.15   1.02   3.000   3.05   6.083   67.06   9.083   2.03   12.15   1.02   3.000   3.05   6.080   67.06   9.083   2.03   12.15   1.02   3.000   3.05   6.083   67.06   9.093   2.03   12.15   1.02   3.000   3.05   6.080   67.06   9.083   2.03   12.15   1.02   3.000   3.05   6.000   67.06   9.083   2.03   12.15   1.02   3.000   3.05   6.000   67.06   9.083   2.03   12.15   1.02   3.000   3.05   6.000   67.06   9.083   2.03   12.15   1.02   3.000    | 1.167 2.03            | 4.250     | 3.05    | 7.333       | 5.08   | 10.42 | 2.03 |
| 1.417 1.02   4.500   5.08   7.583   4.06   10.67   1.02   1.590 1.02   4.583   5.08   7.667   4.06   10.57   1.02   1.583 2.03   4.667   5.08   7.750   4.06   10.83   2.03   1.667   2.03   4.750   5.08   7.750   4.06   10.92   2.03   1.667   2.03   4.833   6.10   7.917   4.06   11.00   2.03   1.833   1.02   4.917   6.10   8.000   4.06   11.08   1.02   1.917   1.02   5.000   6.10   8.083   5.08   11.17   1.02   2.000   1.02   5.083   5.08   8.167   5.08   11.15   1.02   2.000   1.02   5.833   5.08   8.167   5.08   11.15   1.02   2.167   2.03   5.250   5.08   8.333   3.05   11.42   2.03   2.167   2.03   5.333   8.13   8.417   3.05   11.50   2.03   2.250   2.03   5.547   8.13   8.590   3.05   11.50   2.03   2.417   3.05   5.500   8.13   8.583   3.05   11.57   1.02   2.500   3.05   5.560   9.14   8.560   3.05   11.57   1.02   2.583   3.05   5.667   9.14   8.750   3.05   11.53   2.03   2.567   3.05   5.583   67.06   8.917   3.05   11.20   2.167   3.05   5.583   67.06   8.917   3.05   12.00   2.03   2.750   3.05   5.833   67.06   9.083   2.03   12.17   1.02   2.917   3.05   6.080   67.06   9.083   2.03   12.25   1.02   2.917   3.05   6.080   67.06   9.083   2.03   12.25   1.02   3.080   3.05   5.532   67.06   9.15   8.83   3.05   12.08   1.02   2.917   3.05   6.080   67.06   9.083   2.03   12.27   1.02   3.080   3.05   6.083   67.06   9.083   2.03   12.27   1.02   3.080   3.09   6.167   67.06   9.090   3.05   12.08   1.02   2.917   3.05   6.083   67.06   9.150   2.03   12.25   1.02   3.083   2.093   6.167   67.06   9.050   2.03   12.25   1.02   3.084   2.093   6.167   67.06   9.050   2.03   12.25   1.02   4011 Hyd. Tpeak (min) =   | 1.250 2.03            | 4.333     | 5.08    | 7.417       | 5.08   | 10.50 | 2.03 |
| 1.500 1.02   4.583   5.08   7.667   4.06   10.75   1.02   1.583   2.03   4.667   5.08   7.759   4.06   10.83   2.03   1.667   2.03   4.759   5.08   7.833   4.06   10.93   2.03   1.750   2.03   4.4759   5.08   7.833   4.06   10.92   2.03   1.750   2.03   4.917   6.10   8.000   4.06   11.00   2.03   1.917   1.02   5.000   6.10   8.000   4.06   11.08   1.02   1.917   1.02   5.000   5.00   6.10   8.000   4.06   11.08   1.02   2.000   1.02   5.083   5.08   8.167   5.08   11.25   1.02   2.003   2.03   5.167   5.08   8.250   5.08   11.25   1.02   2.083   2.03   5.167   5.08   8.250   5.08   11.33   2.03   2.167   2.03   5.250   5.08   8.333   3.05   11.42   2.03   2.250   2.03   5.533   8.13   8.417   3.05   11.50   2.03   2.250   2.03   5.500   8.13   8.500   3.05   11.50   2.03   2.417   3.05   5.500   8.13   8.583   3.05   11.57   1.02   2.590   3.05   5.567   9.14   8.667   3.05   11.57   1.02   2.583   3.05   5.667   9.14   8.667   3.05   11.75   1.02   2.583   3.05   5.567   9.15   8.83   3.05   11.92   2.03   2.667   3.05   5.500   9.15   8.83   3.05   11.20   2.03   2.675   3.05   5.590   6.00   6.00   9.00   3.05   12.00   2.03   2.833   3.05   5.567   9.15   8.83   3.05   11.92   2.03   2.667   3.05   5.590   6.00   6.00   9.00   3.05   12.00   2.03   2.833   3.05   5.667   9.15   8.83   3.05   11.92   2.03   2.833   3.05   5.550   9.15   8.83   3.05   11.20   2.03   2.833   3.05   5.567   9.15   8.83   3.05   11.92   2.03   2.833   3.05   5.500   5.500   9.003   2.03   12.17   1.02   3.000   3.05   6.000   67.06   9.083   2.03   12.17   1.02   3.000   3.05   6.000   67.06   9.083   2.03   12.17   1.02   3.000   3.05   6.000   67.06   9.003   2.03   12.15   1.02   3.000   3.05   6.000   67.06   9.003   2.03   12.17   1.02   3.000   3.05   6.000   67.06   9.003   2.03   12.17   1.02   4.000   5.00 | 1.333 1.02            | 4.417     |         |             | 5.08   | 10.58 |      |
| 1.583 2.03   4.667   5.08   7.750   4.06   10.83   2.03   1.667 2.08   4.750   5.08   7.833   4.06   10.92   2.03   1.750 2.03   4.833   6.10   7.917   4.06   11.00   2.03   1.833 1.02   4.917   6.10   8.080   4.06   11.00   2.03   1.917 1.02   5.080   6.10   8.083   5.08   11.17   1.02   2.080 1.02   5.080   5.08   8.157   5.08   11.17   1.02   2.083 2.03   5.167   5.08   8.250   5.08   11.25   1.02   2.167 2.03   5.250   5.08   8.333   3.05   11.33   2.03   2.167 2.03   5.250   5.08   8.333   3.05   11.42   2.03   2.250 2.081   5.333   8.13   8.417   3.05   11.50   2.03   2.333   3.05   5.417   8.13   8.500   3.05   11.58   1.02   2.417   3.05   5.583   9.14   8.667   3.05   11.57   1.02   2.580   3.05   5.583   9.14   8.667   3.05   11.57   1.02   2.580   3.05   5.550   9.15   8.833   3.05   11.92   2.03   2.566   3.05   5.750   9.15   8.833   3.05   11.92   2.03   2.667   3.05   5.591   67.06   9.080   3.05   11.20   2.03   2.833   3.05   5.917   67.06   9.080   3.05   12.00   2.03   2.833   3.05   6.080   67.06   9.083   2.03   12.17   1.02   3.080   3.08   5.080   67.06   9.083   2.03   12.15   1.02   3.080   3.08   5.080   6.706   9.083   2.03   12.15   1.02   3.080   3.08   5.500   5.00   15.00   Unit Hyd. peak (cms) =   | 1.417 1.02            | 4.500     |         |             | 4.06   | 10.67 | 1.02 |
| 1.583 2.03   4.667   5.08   7.750   4.06   10.83   2.03   1.667 2.08   4.750   5.08   7.833   4.06   10.92   2.03   1.750 2.03   4.833   6.10   7.917   4.06   11.00   2.03   1.833 1.02   4.917   6.10   8.080   4.06   11.00   2.03   1.917 1.02   5.080   6.10   8.083   5.08   11.17   1.02   2.080 1.02   5.080   5.08   8.157   5.08   11.17   1.02   2.083 2.03   5.167   5.08   8.250   5.08   11.25   1.02   2.167 2.03   5.250   5.08   8.333   3.05   11.33   2.03   2.167 2.03   5.250   5.08   8.333   3.05   11.42   2.03   2.250 2.081   5.333   8.13   8.417   3.05   11.50   2.03   2.333   3.05   5.417   8.13   8.500   3.05   11.58   1.02   2.417   3.05   5.583   9.14   8.667   3.05   11.57   1.02   2.580   3.05   5.583   9.14   8.667   3.05   11.57   1.02   2.580   3.05   5.550   9.15   8.833   3.05   11.92   2.03   2.566   3.05   5.750   9.15   8.833   3.05   11.92   2.03   2.667   3.05   5.591   67.06   9.080   3.05   11.20   2.03   2.833   3.05   5.917   67.06   9.080   3.05   12.00   2.03   2.833   3.05   6.080   67.06   9.083   2.03   12.17   1.02   3.080   3.08   5.080   67.06   9.083   2.03   12.15   1.02   3.080   3.08   5.080   6.706   9.083   2.03   12.15   1.02   3.080   3.08   5.500   5.00   15.00   Unit Hyd. peak (cms) =   | 1.500 1.02            | 4.583     | 5.08    | 7.667       | 4.06   | 10.75 | 1.02 |
| 1.756  |                       | 4.667     | 5.08    | 7.750       | 4.06   | 10.83 | 2.03 |
| 1.833 1.02   4.917   6.10   8.000   4.06   11.08   1.02   1.917   1.02   5.000   6.10   8.000   4.06   11.05   1.02   2.000   1.02   5.083   5.08   8.157   5.08   11.15   1.02   2.083 2.03   5.167   5.08   8.259   5.08   11.25   1.02   2.167 2.03   5.256   5.08   8.259   5.08   11.25   1.02   2.250 2.03   5.333   8.13   8.417   3.05   11.50   2.03   2.250 2.03   5.333   8.13   8.417   3.05   11.50   2.03   2.417 3.05   5.500   8.13   8.583   3.05   11.67   1.02   2.417 3.05   5.500   8.13   8.583   3.05   11.57   1.02   2.583 3.05   5.667   9.14   8.750   3.05   11.57   1.02   2.583 3.05   5.667   9.14   8.750   3.05   11.58   1.02   2.583 3.05   5.583   67.06   8.917   3.05   11.02   2.1790 3.05   5.750   9.15   8.833   3.05   11.02   2.03   2.750 3.05   5.750   9.15   8.833   3.05   11.02   2.03   2.750 3.05   5.750   9.15   8.033   3.05   11.20   2.03   2.750 3.05   5.750   9.15   8.033   3.05   11.20   2.03   2.833 3.05   5.833   67.06   9.00   3.05   12.08   1.02   2.917 3.05   6.000   67.06   9.083   2.03   12.17   1.02   3.000 3.05   6.083   67.06   9.157   2.03   12.25   1.02   3.000 3.05   6.083   67.06   9.157   2.03   12.25   1.02   3.000 3.05   6.000   15.00   5torage Coeff. (min)=   5.32 (ti)   12.90 (ti)   Unit Hyd. Tpeak (min)=   5.00   15.00   Unit Hyd. Tpeak (min)=   5.00   15.00   Unit Hyd. Tpeak (min)=   6.25   6.33   6.25  |                       |           |         | 7.833       |        |       |      |
| 1.917   1.02   5.000   6.10   8.083   5.08   11.17   1.02  |                       |           |         |             |        |       |      |
| 2.000  |                       |           | 6.10    | 8.000       |        |       |      |
| 2.083 2.09   5.167   5.08   8.250   5.08   11.33 2.09   2.167 2.09   5.250   5.08   8.333 3.05   11.452 2.03   2.250 2.09   5.333 8.13   8.417 3.05   11.59 2.03   2.333 3.05   5.417 8.13   8.500 3.05   11.59 2.03   2.417 3.05   5.550 8.13   8.583 3.05   11.57 1.02   2.500 3.05   5.583 9.14   8.67 3.05   11.75 1.02   2.583 3.05   5.667 9.14   8.67 3.05   11.75 1.02   2.667 3.05   5.657 9.14   8.750 3.05   11.75 1.02   2.667 3.05   5.583 9.14   8.750 3.05   11.92 2.03   2.667 3.05   5.583 67.06   8.917 3.05   11.92 2.03   2.833 3.05   5.917 67.06   9.000 3.05   12.00 2.03   2.833 3.05   6.000 67.06   9.083 2.03   12.17 1.02   3.000 3.05   6.083 67.06   9.157 2.03   12.15 1.02   3.000 3.05   6.083 67.06   9.157 2.03   12.15 1.02   3.000 3.05   6.083 67.06   9.15 2.03   12.15 1.02   3.000 3.05   6.083 67.06   9.15 2.03   12.17 1.02   3.083 2.03   6.167 67.06   9.250 2.03    Max.Eff.Inten.(mm/hr)=  |                       |           |         |             |        |       |      |
| 2.167   2.03   5.250   5.08   8.333   3.05   11.42   2.03  |                       |           |         |             |        |       |      |
| 2.256   2.03   5.333   8.13   8.417   3.05   11.50   2.03  |                       |           | 5.08    | 8.250       |        |       |      |
| 2.333 3.05   5.417 8.13   8.500 3.05   11.58 1.02 2.417 3.05   5.500 8.13   8.583 3.05   11.58 1.02 2.500 3.05   5.583 9.14   8.667 3.05   11.67 1.02 2.583 3.05   5.583 9.14   8.667 3.05   11.75 1.02 2.583 3.05   5.567 9.14   8.750 3.05   11.83 2.03 2.750 3.05   5.750 9.15   8.833 3.05   11.83 2.03 2.750 3.05   5.750 9.15   8.833 3.05   12.02 2.03 2.750 3.05   5.917 67.06   9.000 3.05   12.02 1.02 2.03 2.93   2.917 3.05   6.000 67.06   9.000 3.05   12.02 1.02 2.03 2.917 3.05   6.000 67.06   9.083 2.03   12.17 1.02 3.000 3.05   6.083 67.06   9.157 2.03   12.25 1.02 3.083 2.03   6.167 67.06   9.250 2.03   12.25 1.02 3.08   2.03   12.17 1.02 3.000 67.06   9.250 2.03   12.25 1.02 3.08   12.02 1.02 3.000 3.05   6.167 67.06   9.250 2.03   12.25 1.02 3.05   12.02 3.05  |                       |           | 5.08    | 8.333       |        |       |      |
| 2.417   3.05   5.500   8.13   8.583   3.65   11.67   1.02  |                       |           |         |             |        |       |      |
| 2.590   3.05   5.583   9.14   8.667   3.05   11.75   1.02  |                       |           |         |             |        |       |      |
| 2.583 3.05   5.667 9.14   8.750 3.05   11.83 2.03 2.667 3.05   5.750 9.15   8.833 3.05   11.92 2.03 2.03 2.750 3.05   5.833 67.06   8.917 3.05   12.00 2.03 2.833 3.05   5.917 67.06   9.000 3.05   12.08 1.02 2.03 3.000 3.05   6.000 67.06   9.083 2.03   12.17 1.02 3.000 3.05   6.000 67.06   9.083 2.03   12.17 1.02 3.000 3.083 2.03   61.67 67.06   9.550 2.03   12.25 1.02 3.083 2.03   0.000 67.06   9.550 2.03   0.000 67.06   9.550 2.03   0.000 67.06   0.000 67.06   0.000 67.06   0.000 67.06   0.000 67.06   0.000 67.06   0.000 67.06   0.000 67.06   0.000 67.06   0.000 67.00  |                       |           |         |             |        |       |      |
| 2.667 3.05   5.750   9.15   8.833   3.05   11.92   2.03  |                       |           |         |             |        |       |      |
| 2.750   3.05   5.833   67.06   8.917   3.05   12.00   2.03     2.833   3.05   5.917   67.06   9.000   3.05   12.08   1.02     2.917   3.05   6.000   67.06   9.083   2.03   12.17   1.02     3.000   3.05   6.083   67.06   9.167   2.03   12.25   1.02     3.083   2.03   6.167   67.06   9.250   2.03   12.25   1.02     Max.Eff.Inten.(mm/hr)   |                       |           |         |             |        |       |      |
| 2.833 3.05   5.917 67.06   9.000 3.05   12.08 1.02 2.917 3.05   6.000 67.06   9.003 2.03   12.17 1.02 3.000 3.05   6.003 67.06   9.033 2.03   12.17 1.02 3.000 3.05   6.083 67.06   9.167 2.03   12.25 1.02 3.008   2.03   6.167 67.06   9.250 2.03   12.25 1.02 3.008   2.03   6.167 67.06   9.250 2.03   2.25 1.02 3.008   2.03   2.25 1.02 3.008   2.03   2.25 1.02 3.008   2.03   2.25 1.02 3.008   2.03   2.25 1.02 3.008   2.03   2.25 1.02 3.008   2.03   2.25 1.02 3.008   2.03   2.25 1.02 3.008   2.03   2.25 1.02 3.008   2.03   2.25 1.02 3.008   2.03   2.25 1.02 3.008   2.03   2.25 1.02 3.008   2.03   2.25 1.02 3.008   2.03   2.25 1.02 3.008   2.03 |                       |           |         |             |        |       |      |
| 2.917   3.05   6.000   67.06   9.083   2.03   12.17   1.02     3.000   3.05   6.083   67.06   9.167   2.03   12.25   1.02     3.003   2.03   6.167   67.06   9.250   2.03   12.25   1.02     Max.Eff.Inten.(mm/hr)   |                       |           |         |             |        |       |      |
| 3.000 3.05   6.083 67.06   9.167 2.03   12.25 1.02 3.083   2.03   61.07 67.06   9.250 2.03   12.25 1.02 3.083   3.083 2.03   6.167 67.06   9.250 2.03   12.25 1.02 3.08   15.00 15.0 |                       |           |         |             |        |       |      |
| 3.083 2.03   6.167 67.06   9.250 2.03    Max.Eff.Inten.(mm/hr)= 67.06 51.67 5.00 15.00 Storage Coeff. (min)= 5.32 (ii) 12.90 (ii) Unit Hyd. Tpeak (min)= 5.00 15.00 Unit Hyd. peak (cms)= 0.21 0.08 PEAK FLOW (cms)= 0.05 0.03 0.080 (iii) TIME TO PEAK (hrs)= 6.25 6.33 6.25  |                       |           |         |             |        |       |      |
| Max.Eff.Inten.(mm/hr)=   |                       |           |         |             |        |       | 1.02 |
| over (min)         5.00         15.00         Storage Coeff. (min)=         5.32 (ii)         12.90 (ii)           Unit Hyd. Tpeak (min)=         5.00         15.00         Unit Hyd. peak (cms)=         0.21         0.08         **TOTALS*           PEAK FLOW (cms)=         0.05         0.03         0.080 (iii)         TIME TO PEAK (hrs)=         6.25         6.33         6.25   | 3.083 2.03            | 6.16/     | 67.06   | 9.250       | 2.03   | l     |      |
| Storage Coeff. (min)=   5.32 (ii)   12.90 (ii)   Unit Hyd. Tpeak (min)=   5.00   15.00   Unit Hyd. peak (cms)=   0.21   0.08   *TOTALS*     PEAK FLOW (cms)=   0.05   0.03   0.080 (iii)   TIME TO PEAK (hrs)=   6.25   6.33   6.25  |                       |           |         |             |        |       |      |
| Unit Hyd. Tpeak (min)= 5.00 15.00 Unit Hyd. peak (cms)= 0.21 0.08  PEAK FLOW (cms)= 0.05 0.03 0.080 (iii) TIME TO PEAK (hrs)= 6.25 6.33 6.25   |                       |           |         |             |        |       |      |
| Unit Hyd. peak (cms)= 0.21 0.08 **TOTALS*  PEAK FLOW (cms)= 0.05 0.03 0.080 (iii)  TIME TO PEAK (hrs)= 6.25 6.33 6.25  |                       |           |         |             |        |       |      |
| *TOTALS* PEAK FLOW (cms)= 0.05 0.03 0.080(iii) TIME TO PEAK (hrs)= 6.25 6.33 6.25  |                       |           |         |             |        |       |      |
| PEAK FLOW (cms)= 0.05 0.03 0.080 (iii) TIME TO PEAK (hrs)= 6.25 6.33 6.25  | Unit Hyd. peak (cms)= | 0.21      |         | 0.08        |        |       |      |
| TIME TO PEAK (hrs)= 6.25 6.33 6.25   |                       |           |         |             |        |       |      |
|  |                       |           |         |             |        |       |      |
| RUNDEF VOLUME (mm)= /2.42 44.88 57.26  |                       |           |         |             |        |       |      |
|  |                       |           |         |             |        |       |      |
| TOTAL RAINFALL (mm)= 74.42 74.42 74.42 RUNOFF COEFFICIENT = 0.97 0.60 0.77   |                       |           |         |             |        |       |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 87.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
LangstaffRd_EA_Existing_WestDonWatershd
3.05 | 5.667 | 9.14 | 8.750 | 3.05 | 1
3.05 | 5.750 | 9.15 | 8.833 | 3.05 | 1
3.05 | 5.833 | 67.06 | 8.917 | 3.05 | 1
3.05 | 5.917 | 67.06 | 9.000 | 3.05 | 1
3.05 | 6.000 | 67.06 | 9.03 | 2.03 | 1
3.05 | 6.083 | 67.06 | 9.167 | 2.03 | 1
2.03 | 6.167 | 67.06 | 9.250 | 2.03 |
                                             2.583
2.667
2.750
2.833
2.917
3.000
3.083
                                                                                                                                                                                                                        3.05 | 11.83
3.05 | 11.92
3.05 | 12.00
3.05 | 12.08
2.03 | 12.17
2.03 | 12.25
2.03 |
                                                                                                                                                                                                                                                                                           2.03
2.03
2.03
1.02
1.02
                                                                                                                  67.06 54.54
5.00 15.00
5.32 (ii) 10.28 (ii)
5.00 15.00
0.21 0.09
 Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                                                                                                                                                                                                  *TOTALS*
0.068 (iii)
6.25
61.58
74.42
0.83
PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                                                                                     0.04
6.25
72.42
74.42
                                                                                                                                                                            0.02
6.25
47.80
74.42
                                                                                                                         0.97
```

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN\* = 89.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COFFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |         |       |                |       |
|-------------------|-------|---------|-------|----------------|-------|
| STANDHYD ( 0155)  | Area  | (ha)=   | 0.56  |                |       |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 45.00 | Dir. Conn.(%)= | 45.00 |
|                   |       |         |       |                |       |
|                   |       | IMPERVI | OUS   | PERVIOUS (i)   |       |
| Surface Area      | (ha)= | 0.2     | 5     | 0.31           |       |
| Dep. Storage      | (mm)= | 2.0     | 0     | 5.00           |       |
| Average Slope     | (%)=  | 1.0     | 0     | 2.00           |       |
| Length            | (m)=  | 260.0   | 0     | 25.00          |       |
| Mannings n        | ` =   | 0.01    | 3     | 0.290          |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | D HYETOGR | APH   |      |       |
|-------|-------|-------|----------|-----------|-------|------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME    | RAIN  | TIME | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs     | mm/hr | hrs  | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250     | 67.05 | 9.33 | 3.05  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333     | 13.21 | 9.42 | 3.05  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417     | 13.21 | 9.50 | 3.05  |
| 0.333 | 1.02  | 3.417 | 3.05     | 6.500     | 13.21 | 9.58 | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05     | 6.583     | 13.21 | 9.67 | 2.03  |
| 0.500 | 1.02  | 3.583 | 3.05     | 6.667     | 13.21 | 9.75 | 2.03  |
| 0.583 | 2.03  | 3.667 | 3.05     | 6.750     | 13.21 | 9.83 | 2.03  |

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| LangstaffRd | EA | Existing | _WestDonWatershd |
|-------------|----|----------|------------------|

| ADD HYD ( 0430)   |      |       |       |       |  |
|-------------------|------|-------|-------|-------|--|
| 1 + 2 = 3         | AREA | QPEAK | TPEAK | R.V.  |  |
|                   | (ha) | (cms) | (hrs) | (mm)  |  |
| ID1= 1 ( 0155):   | 0.56 | 0.080 | 6.25  | 57.26 |  |
| + ID2= 2 ( 0160): | 0.43 | 0.068 | 6.25  | 61.58 |  |
| ============      |      |       |       |       |  |
| ID = 3 (0430):    | 0.99 | 0.149 | 6.25  | 59.14 |  |

NOTE: DEAK FLOWS DO NOT THICHIDE BASEFLOWS TE ANY

| CALIB ( 0450)    | •     | (1)     | 2 04  |                |       |
|------------------|-------|---------|-------|----------------|-------|
| STANDHYD ( 0150) | Area  | (ha)=   | 3.81  |                |       |
| D= 1 DT= 5.0 min | Total | Imp(%)= | 94.00 | Dir. Conn.(%)= | 94.00 |
|                  |       |         |       |                |       |
|                  |       | IMPERVI | OUS   | PERVIOUS (i)   |       |
| Surface Area     | (ha)= | 3.5     | 8     | 0.23           |       |
| Dep. Storage     | (mm)= | 2.0     | 0     | 5.00           |       |
| Average Slope    | (%)=  | 1.0     | 0     | 2.00           |       |
| Length           | (m)=  | 150.0   | 0     | 40.00          |       |
| Mannings n       | ` ′ = | 0.01    | 3     | 0.250          |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| NATINI AL | LL WAS 11 | MANUEL CHAIR |       | J.O HIN. | TIME SIL |       |       |
|-----------|-----------|--------------|-------|----------|----------|-------|-------|
|           |           |              |       |          |          |       |       |
|           |           |              |       | HYETOGR  |          |       |       |
| TIME      | RAIN      | TIME         | RAIN  | ' TIME   | RAIN     | TIME  | RAIN  |
| hrs       | mm/hr     | hrs          | mm/hr | ' hrs    | mm/hr    |       | mm/hr |
| 0.083     | 0.00      | 3.167        | 2.03  | 6.250    | 67.05    |       | 3.05  |
| 0.167     | 0.00      | 3.250        | 2.03  |          | 13.21    |       | 3.05  |
| 0.250     | 0.00      |              | 3.05  |          | 13.21    |       | 3.05  |
| 0.333     | 1.02      | 3.417        | 3.05  |          | 13.21    | 9.58  | 2.03  |
| 0.417     | 1.02      | 3.500        | 3.05  | 6.583    | 13.21    | 9.67  | 2.03  |
| 0.500     | 1.02      | 3.583        | 3.05  | 6.667    | 13.21    | 9.75  | 2.03  |
| 0.583     | 2.03      | 3.667        | 3.05  | 6.750    | 13.21    | 9.83  | 2.03  |
| 0.667     | 2.03      | 3.750        | 3.05  | 6.833    | 6.10     | 9.92  | 2.03  |
| 0.750     | 2.03      | 3.833        | 3.05  | 6.917    | 6.10     | 10.00 | 2.03  |
| 0.833     | 1.02      | 3.917        | 3.05  | 7.000    | 6.10     | 10.08 | 2.03  |
| 0.917     | 1.02      | 4.000        | 3.05  | 7.083    | 6.10     | 10.17 | 2.03  |
| 1.000     | 1.02      | 4.083        | 3.05  | 7.167    | 6.10     | 10.25 | 2.03  |
| 1.083     | 2.03      | 4.167        | 3.05  | 7.250    | 6.10     | 10.33 | 2.03  |
| 1.167     | 2.03      | 4.250        | 3.05  | 7.333    | 5.08     | 10.42 | 2.03  |
| 1.250     | 2.03      | 4.333        | 5.08  | 7.417    | 5.08     | 10.50 | 2.03  |
| 1.333     | 1.02      | 4.417        | 5.08  | 7.500    | 5.08     | 10.58 | 1.02  |
| 1.417     | 1.02      | 4.500        | 5.08  | 7.583    | 4.06     | 10.67 | 1.02  |
| 1.500     | 1.02      | 4.583        | 5.08  | 7.667    | 4.06     | 10.75 | 1.02  |
| 1.583     | 2.03      | 4.667        | 5.08  | 7.750    | 4.06     | 10.83 | 2.03  |
| 1.667     | 2.03      | 4.750        | 5.08  | 7.833    | 4.06     | 10.92 | 2.03  |
| 1.750     | 2.03      | 4.833        | 6.10  | 7.917    | 4.06     | 11.00 | 2.03  |
| 1.833     | 1.02      | 4.917        | 6.10  | 8.000    | 4.06     | 11.08 | 1.02  |
| 1.917     | 1.02      | 5.000        | 6.10  | 8.083    | 5.08     | 11.17 | 1.02  |
| 2.000     | 1.02      | 5.083        | 5.08  | 8.167    | 5.08     | 11.25 | 1.02  |
| 2.083     | 2.03      | 5.167        | 5.08  | 8.250    | 5.08     | 11.33 | 2.03  |
|           |           |              |       |          |          |       |       |

```
LangstaffRd_EA_Existing_WestDonWatershd
2.03 | 5.250 | 5.08 | 8.333 | 3.05 | 1
2.03 | 5.333 | 8.13 | 8.417 | 3.05 | 1
3.05 | 5.417 | 8.13 | 8.500 | 3.05 | 1
3.05 | 5.500 | 8.13 | 8.583 | 3.05 | 1
3.05 | 5.580 | 8.13 | 8.583 | 3.05 | 1
3.05 | 5.583 | 9.14 | 8.750 | 3.05 | 1
3.05 | 5.667 | 9.14 | 8.750 | 3.05 | 1
3.05 | 5.333 | 67.06 | 8.917 | 3.05 | 1
3.05 | 5.333 | 67.06 | 9.083 | 3.05 | 1
3.05 | 5.917 | 67.06 | 9.083 | 2.03 | 1
3.05 | 6.083 | 67.06 | 9.167 | 2.03 | 1
2.03 | 6.167 | 67.06 | 9.250 | 2.03 |
                                                                                                                                                                 Natershd
3.05 | 11.42
3.05 | 11.50
3.05 | 11.58
3.05 | 11.67
3.05 | 11.75
3.05 | 11.75
3.05 | 11.93
3.05 | 12.00
3.05 | 12.00
                                             2.167
                                              2.250
                                                                                                                                                                                                                 2.03
                                             2.250
2.333
2.417
2.500
2.583
2.667
2.750
                                                                                                                                                                                                                1.02
1.02
1.02
2.03
2.03
                                              2.833
                                                                                                                                                                                                                 1.02
                                              2.917
                                                                                                                                                                                                                 1.02
                                                                                                                                                                                      12.25
             Max.Eff.Inten.(mm/hr)=
             over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                                                                                                   10.00
6.58 (ii)
                                                                                                5.00
3.82 (ii)
                                                                                                 5.00
                                                                                                                                   10.00
                                                                                                0.25
                                                                                                                                      0.14
                                                                                                                                                                          *TOTALS*
0.699 (iii)
6.25
70.86
             PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                                                              0.67
6.25
72.42
74.42
                                                                                                                                   0.03
6.25
46.31
74.42
                                                                                                0.97
                                                                                                                                      0.62
                                                                                                                                                                                  0.95
**** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
            (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN* = 88.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COFFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
    ADD HYD ( 0440)|
1 + 2 = 3 |
                                                                                                         QPEAK
                                                                                                                                   TPEAK
                                                                                                                                                          (mm)
70.86
59.14
                                                                                   (ha)
3.81
                                                                                                       (cms)
0.699
                                                                                                                                   (hrs)
6.25
                 ID1= 1 ( 0150):
+ ID2= 2 ( 0430):
                                                                                  0.99
                                                                                                       0.149
                                                                                                                                   6.25
                     ID = 3 ( 0440):
                                                                                 4.80
                                                                                                   0.847
                                                                                                                                   6.25
                                                                                                                                                          68.44
             NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

CALIB | | STANDHYD ( 0185)| |ID= 1 DT= 5.0 min | IMPERVIOUS PERVIOUS (i) 0.23 0.24

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Area (ha)= 0.47 Total Imp(%)= 48.00 Dir. Conn.(%)= 48.00

| LangstaffRd_EA_Existing_WestDonWatershd |        |       |       |             |  |  |  |  |  |
|---|--------|-------|-------|-------------|--|--|--|--|--|
| Unit Hyd. peak                          | (cms)= | 0.21  | 0.08  |             |  |  |  |  |  |
|   |        |       |       | *TOTALS*    |  |  |  |  |  |
| PEAK FLOW                               | (cms)= | 0.04  | 0.02  | 0.062 (iii) |  |  |  |  |  |
| TIME TO PEAK                            | (hrs)= | 6.25  | 6.33  | 6.25        |  |  |  |  |  |
| RUNOFF VOLUME                           | (mm)=  | 72.42 | 35.19 | 53.05       |  |  |  |  |  |
| TOTAL RAINFALL                          | (mm)=  | 74.42 | 74.42 | 74.42       |  |  |  |  |  |
| RUNOFF COEFFICI                         | ENT =  | 0.97  | 0.47  | 0.71        |  |  |  |  |  |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

- CN\* = 79.0 Ia = Dep. Storage (Above)
  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
  THAN THE STORAGE COEFFICIENT.
  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |         |       |        |           |       |
|-------------------|-------|---------|-------|--------|-----------|-------|
| STANDHYD ( 0180)  | Area  | (ha)=   | 0.65  |        |           |       |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 33.00 | Dir.   | Conn.(%)= | 33.00 |
|                   |       |         |       |        |           |       |
|                   |       | IMPERVI | OUS   | PERVIO | JS (i)    |       |
| Surface Area      | (ha)= | 0.2     | 1     | 0.4    | 4         |       |
| Dep. Storage      | (mm)= | 2.0     | 0     | 5.00   | 9         |       |
| Average Slope     | (%)=  | 1.0     | 0     | 2.00   | 9         |       |
| Length            | (m)=  | 65.8    | 3     | 40.00  | 9         |       |
| Mannings n        | =     | 0.01    | 3     | 0.25   | 9         |       |
|                   |       |         |       |        |           |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TRANSFORMED HYETOGRAPH |       |       |       |        |       |       |       |  |  |
|------------------------|-------|-------|-------|--------|-------|-------|-------|--|--|
| TIME                   | RAIN  | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |  |
| hrs                    | mm/hr | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |  |
| 0.083                  | 0.00  | 3.167 | 2.03  | 6.250  | 67.05 | 9.33  | 3.05  |  |  |
| 0.167                  | 0.00  | 3.250 | 2.03  | 6.333  | 13.21 | 9.42  | 3.05  |  |  |
| 0.250                  | 0.00  | 3.333 | 3.05  | 6.417  | 13.21 | 9.50  | 3.05  |  |  |
| 0.333                  | 1.02  | 3.417 | 3.05  | 6.500  | 13.21 | 9.58  | 2.03  |  |  |
| 0.417                  | 1.02  | 3.500 | 3.05  | 6.583  | 13.21 | 9.67  | 2.03  |  |  |
| 0.500                  | 1.02  | 3.583 | 3.05  | 6.667  | 13.21 | 9.75  | 2.03  |  |  |
| 0.583                  | 2.03  | 3.667 | 3.05  | 6.750  | 13.21 | 9.83  | 2.03  |  |  |
| 0.667                  | 2.03  | 3.750 | 3.05  | 6.833  | 6.10  | 9.92  | 2.03  |  |  |
| 0.750                  | 2.03  | 3.833 | 3.05  | 6.917  | 6.10  | 10.00 | 2.03  |  |  |
| 0.833                  | 1.02  | 3.917 | 3.05  | 7.000  | 6.10  | 10.08 | 2.03  |  |  |
| 0.917                  | 1.02  | 4.000 | 3.05  | 7.083  | 6.10  | 10.17 | 2.03  |  |  |
| 1.000                  | 1.02  | 4.083 | 3.05  | 7.167  | 6.10  | 10.25 | 2.03  |  |  |
| 1.083                  | 2.03  | 4.167 | 3.05  | 7.250  | 6.10  | 10.33 | 2.03  |  |  |
| 1.167                  | 2.03  | 4.250 | 3.05  | 7.333  | 5.08  | 10.42 | 2.03  |  |  |
| 1.250                  | 2.03  | 4.333 | 5.08  | 7.417  | 5.08  | 10.50 | 2.03  |  |  |
| 1.333                  | 1.02  | 4.417 | 5.08  | 7.500  | 5.08  | 10.58 | 1.02  |  |  |
| 1.417                  | 1.02  | 4.500 | 5.08  | 7.583  | 4.06  | 10.67 | 1.02  |  |  |
| 1.500                  | 1.02  | 4.583 | 5.08  | 7.667  | 4.06  | 10.75 | 1.02  |  |  |
| 1.583                  | 2.03  | 4.667 | 5.08  | 7.750  | 4.06  | 10.83 | 2.03  |  |  |

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LangstaffRd\_EA\_Existing\_WestDonWatershd i)= 2.00 5.00 i)= 1.00 2.00 Dep. Storage

Average Slope Length Mannings n (%)= (m)=

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|               |       | TRA   | NSFORME | D HYETOGR | APH   |       |       |
|---------------|-------|-------|---------|-----------|-------|-------|-------|
| TIME          | RAIN  |       |         | I' TIME   | RAIN  |       | RAIN  |
| hrs           | mm/hr | hrs   | mm/hr   | ' hrs     | mm/hr |       | mm/hr |
| 0.083         | 0.00  | 3.167 | 2.03    | 6.250     | 67.05 | 9.33  | 3.05  |
| 0.167         | 0.00  | 3.250 | 2.03    | 6.333     | 13.21 | 9.42  | 3.05  |
| 0.250         | 0.00  | 3.333 | 3.05    | 6.417     | 13.21 | 9.50  | 3.05  |
| 0.333         | 1.02  | 3.417 | 3.05    | 6.500     | 13.21 | 9.58  | 2.03  |
| 0.417         | 1.02  | 3.500 | 3.05    | 6.583     | 13.21 | 9.67  | 2.03  |
| 0.500         | 1.02  | 3.583 | 3.05    | 6.667     | 13.21 | 9.75  | 2.03  |
| 0.583         | 2.03  | 3.667 | 3.05    | 6.750     | 13.21 | 9.83  | 2.03  |
| 0.667         | 2.03  | 3.750 | 3.05    | 6.833     | 6.10  | 9.92  | 2.03  |
| 0.750         | 2.03  | 3.833 | 3.05    | 6.917     | 6.10  | 10.00 | 2.03  |
| 0.833         | 1.02  | 3.917 | 3.05    | 7.000     | 6.10  | 10.08 | 2.03  |
| 0.917         | 1.02  | 4.000 | 3.05    | 7.083     | 6.10  | 10.17 | 2.03  |
| 1.000         | 1.02  | 4.083 | 3.05    | 7.167     | 6.10  | 10.25 | 2.03  |
| 1.083         | 2.03  | 4.167 | 3.05    | 7.250     | 6.10  | 10.33 | 2.03  |
| 1.167         | 2.03  | 4.250 | 3.05    | 7.333     | 5.08  | 10.42 | 2.03  |
| 1.250         | 2.03  | 4.333 | 5.08    | 7.417     | 5.08  | 10.50 | 2.03  |
| 1.333         | 1.02  | 4.417 | 5.08    | 7.500     | 5.08  | 10.58 | 1.02  |
| 1.417         |       | 4.500 | 5.08    | 7.583     | 4.06  |       | 1.02  |
| 1.500         |       | 4.583 | 5.08    | 7.667     |       |       | 1.02  |
| 1.583         | 2.03  |       | 5.08    | 7.750     | 4.06  | 10.83 | 2.03  |
| 1.667         |       | 4.750 | 5.08    | 7.833     | 4.06  |       | 2.03  |
| 1.750         |       | 4.833 | 6.10    | 7.917     | 4.06  |       | 2.03  |
| 1.833         | 1.02  |       | 6.10    | 8.000     | 4.06  |       | 1.02  |
| 1.917         |       | 5.000 | 6.10    |           | 5.08  | 11.17 | 1.02  |
| 2.000         |       | 5.083 | 5.08    | 8.167     | 5.08  | 11.25 | 1.02  |
| 2.083         |       | 5.167 | 5.08    | 8.250     | 5.08  | 11.33 | 2.03  |
| 2.167         | 2.03  |       | 5.08    | 8.333     | 3.05  | 11.42 | 2.03  |
| 2.250         | 2.03  | 5.333 | 8.13    | 8.417     | 3.05  | 11.50 | 2.03  |
| 2.333         | 3.05  | 5.417 | 8.13    | 8.500     | 3.05  | 11.58 | 1.02  |
| 2.417         |       | 5.500 | 8.13    | 8.583     | 3.05  | 11.67 | 1.02  |
| 2.500         | 3.05  | 5.583 | 9.14    | 8.667     | 3.05  | 11.75 | 1.02  |
| 2.583         | 3.05  | 5.667 | 9.14    | 8.750     | 3.05  | 11.83 | 2.03  |
| 2.667         | 3.05  | 5.750 | 9.15    | 8.833     | 3.05  | 11.92 | 2.03  |
| 2.750         |       | 5.833 | 67.06   | 8.917     | 3.05  | 12.00 | 2.03  |
| 2.833         |       | 5.917 | 67.06   | 9.000     | 3.05  | 12.08 | 1.02  |
| 2.917         | 3.05  |       | 67.06   | 9.083     | 2.03  | 12.17 | 1.02  |
| 3.000         | 3.05  | 6.083 | 67.06   | 9.167     | 2.03  | 12.25 | 1.02  |
| 3.083         | 2.03  | 6.167 | 67.06   | 9.250     | 2.03  |       |       |
| Fff.Inten.(mm | /hr)= | 67.06 |         | 41.26     |       |       |       |

Max.Eff.Inten.(mm/hr)= over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)= 41.26 15.00 13.19 (ii) 15.00

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|                     | Langs | taffRd E      | Δ Frist | ing_WestDon         | Waters | hd    |      |
|---------------------|-------|---------------|---------|---------------------|--------|-------|------|
| 1.667               | 2.03  | 4.750         | 5.08    |                     | 4.06   |       | 2.03 |
| 1.750               | 2.03  | 4.833         | 6.10    | 7.917               | 4.06   | 11.00 | 2.03 |
| 1.833               | 1.02  | 4.917         | 6.10    | 8.000               | 4.06   | 11.08 | 1.02 |
| 1.917               | 1.02  | 5.000         | 6.10    | 8.083               | 5.08   | 11.17 | 1.02 |
| 2.000               | 1.02  | 5.083         | 5.08    | 8.167               | 5.08   | 11.25 | 1.02 |
| 2.083               | 2.03  | 5.167         | 5.08    | 8.250               | 5.08   | 11.33 | 2.03 |
| 2.167               | 2.03  | 5.250         | 5.08    | 8.333               | 3.05   | 11.42 | 2.03 |
| 2.250               | 2.03  | 5.333         | 8.13    | 8.417               | 3.05   | 11.50 | 2.03 |
| 2.333               | 3.05  | 5.417         | 8.13    | 8.500               | 3.05   | 11.58 | 1.02 |
| 2.417               | 3.05  | 5.500         | 8.13    | 8.583               | 3.05   | 11.67 | 1.02 |
| 2.500               | 3.05  | 5.583         | 9.14    | 8.667               | 3.05   | 11.75 | 1.02 |
| 2.583               | 3.05  |               | 9.14    |                     | 3.05   |       | 2.03 |
| 2.667               | 3.05  | 5.750         | 9.15    | 8.833               | 3.05   | 11.92 | 2.03 |
| 2.750               | 3.05  | 5.833         | 67.06   |                     | 3.05   | 12.00 | 2.03 |
| 2.833               | 3.05  | 5.917         | 67.06   | 9.000               | 3.05   | 12.08 | 1.02 |
| 2.917               | 3.05  | 6.000         | 67.06   | 9.083               | 2.03   | 12.17 | 1.02 |
| 3.000               | 3.05  | 6.083         | 67.06   | 9.167               | 2.03   | 12.25 | 1.02 |
| 3.083               | 2.03  | 6.167         | 67.06   | 9.250               | 2.03   |       |      |
| May FEE Totan /mm/h |       | 67.06         |         | 46.22               |        |       |      |
| Max.Eff.Inten.(mm/h |       | 67.06<br>5.00 |         | 15.00               |        |       |      |
| over (mi            | .n)=  |               | (22)    |                     |        |       |      |
|                     |       | 2.33          | (11)    | 11.94 (ii)<br>15.00 |        |       |      |
| Unit Hyd. Tpeak (mi |       |               |         | 0.09                |        |       |      |
| Unit Hyd. peak (cm  | ıs)=  | 0.30          |         | פט. ט               |        |       |      |

| max.err.inten.(mm | / nr.) = ( | 07.00     | 40.22      |             |
|-------------------|------------|-----------|------------|-------------|
| over (            | min)       | 5.00      | 15.00      |             |
| Storage Coeff. (  | min)=      | 2.33 (ii) | 11.94 (ii) |             |
| Unit Hyd. Tpeak ( | min)=      | 5.00      | 15.00      |             |
| Unit Hyd. peak (  | cms)=      | 0.30      | 0.09       |             |
|                   |            |           |            | *TOTALS*    |
| PEAK FLOW (       | cms)=      | 0.04      | 0.04       | 0.082 (iii) |
| TIME TO PEAK (    | hrs)=      | 6.17      | 6.33       | 6.25        |
| RUNOFF VOLUME     | (mm)=      | 72.42     | 39.68      | 50.48       |
| TOTAL RAINFALL    | (mm)=      | 74.42     | 74.42      | 74.42       |
| RUNOFF COEFFICIEN | T =        | 0.97      | 0.53       | 0.68        |
|                   |            |           |            |             |

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
- (1) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0445)   |      |       |       |       |
|-------------------|------|-------|-------|-------|
| 1 + 2 = 3         | AREA | QPEAK | TPEAK | R.V.  |
|                   | (ha) | (cms) | (hrs) | (mm)  |
| ID1= 1 ( 0180):   | 0.65 | 0.082 | 6.25  | 50.48 |
| + ID2= 2 ( 0185): | 0.47 | 0.062 | 6.25  | 53.05 |
| ID = 3 ( 0445):   | 1.12 | 0.144 | 6.25  | 51.56 |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS TE ANY.

## LangstaffRd\_EA\_Existing\_WestDonWatershd

| STANDHYD ( 0165) <br> ID= 1 DT= 5.0 min | Area<br>Total | (ha)=<br>Imp(%)= | 0.60<br>40.00 | Dir. Conn.(%)= | 40.00 |
|---|---------------|------------------|---------------|----------------|-------|
|   |               |                  |               |                |       |
|   |               | IMPERVIO         | OUS           | PERVIOUS (i)   |       |
| Surface Area                            | (ha)=         | 0.24             | 1             | 0.36           |       |
| Dep. Storage                            | (mm)=         | 2.00             | )             | 5.00           |       |
| Average Slope                           | (%)=          | 1.00             | )             | 2.00           |       |
| Length                                  | (m)=          | 250.00           | )             | 20.00          |       |
| Mannings n                              | =             | 0.013            | 3             | 0.250          |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TRANSFORMED HYETOGRAPH |       |       |       |        |       |       |       |  |
|------------------------|-------|-------|-------|--------|-------|-------|-------|--|
| TIME                   | RAIN  | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |
| hrs                    | mm/hr | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |
| 0.083                  | 0.00  | 3.167 | 2.03  | 6.250  | 67.05 | 9.33  | 3.05  |  |
| 0.167                  | 0.00  | 3.250 | 2.03  | 6.333  | 13.21 | 9.42  | 3.05  |  |
| 0.250                  | 0.00  | 3.333 | 3.05  | 6.417  | 13.21 | 9.50  | 3.05  |  |
| 0.333                  | 1.02  | 3.417 | 3.05  | 6.500  | 13.21 | 9.58  | 2.03  |  |
| 0.417                  | 1.02  | 3.500 | 3.05  | 6.583  | 13.21 | 9.67  | 2.03  |  |
| 0.500                  | 1.02  | 3.583 | 3.05  | 6.667  | 13.21 | 9.75  | 2.03  |  |
| 0.583                  | 2.03  | 3.667 | 3.05  | 6.750  | 13.21 | 9.83  | 2.03  |  |
| 0.667                  | 2.03  | 3.750 | 3.05  | 6.833  | 6.10  | 9.92  | 2.03  |  |
| 0.750                  | 2.03  | 3.833 | 3.05  | 6.917  | 6.10  | 10.00 | 2.03  |  |
| 0.833                  | 1.02  | 3.917 | 3.05  | 7.000  | 6.10  | 10.08 | 2.03  |  |
| 0.917                  | 1.02  | 4.000 | 3.05  | 7.083  | 6.10  | 10.17 | 2.03  |  |
| 1.000                  | 1.02  | 4.083 | 3.05  | 7.167  | 6.10  | 10.25 | 2.03  |  |
| 1.083                  | 2.03  | 4.167 | 3.05  | 7.250  | 6.10  | 10.33 | 2.03  |  |
| 1.167                  | 2.03  | 4.250 | 3.05  | 7.333  | 5.08  | 10.42 | 2.03  |  |
| 1.250                  | 2.03  | 4.333 | 5.08  | 7.417  | 5.08  | 10.50 | 2.03  |  |
| 1.333                  | 1.02  | 4.417 | 5.08  | 7.500  | 5.08  | 10.58 | 1.02  |  |
| 1.417                  | 1.02  | 4.500 | 5.08  | 7.583  | 4.06  | 10.67 | 1.02  |  |
| 1.500                  | 1.02  | 4.583 | 5.08  | 7.667  | 4.06  | 10.75 | 1.02  |  |
| 1.583                  | 2.03  | 4.667 | 5.08  | 7.750  | 4.06  | 10.83 | 2.03  |  |
| 1.667                  | 2.03  | 4.750 | 5.08  | 7.833  | 4.06  | 10.92 | 2.03  |  |
| 1.750                  | 2.03  | 4.833 | 6.10  | 7.917  | 4.06  | 11.00 | 2.03  |  |
| 1.833                  | 1.02  | 4.917 | 6.10  | 8.000  | 4.06  | 11.08 | 1.02  |  |
| 1.917                  | 1.02  | 5.000 | 6.10  | 8.083  | 5.08  | 11.17 | 1.02  |  |
| 2.000                  | 1.02  | 5.083 | 5.08  | 8.167  | 5.08  | 11.25 | 1.02  |  |
| 2.083                  | 2.03  | 5.167 | 5.08  | 8.250  | 5.08  | 11.33 | 2.03  |  |
| 2.167                  | 2.03  | 5.250 | 5.08  | 8.333  | 3.05  | 11.42 | 2.03  |  |
| 2.250                  | 2.03  | 5.333 | 8.13  | 8.417  | 3.05  | 11.50 | 2.03  |  |
| 2.333                  | 3.05  | 5.417 | 8.13  | 8.500  | 3.05  | 11.58 | 1.02  |  |
| 2.417                  | 3.05  | 5.500 | 8.13  | 8.583  | 3.05  | 11.67 | 1.02  |  |
| 2.500                  | 3.05  | 5.583 | 9.14  | 8.667  | 3.05  | 11.75 | 1.02  |  |
| 2.583                  | 3.05  | 5.667 | 9.14  | 8.750  | 3.05  | 11.83 | 2.03  |  |
| 2.667                  | 3.05  | 5.750 | 9.15  | 8.833  | 3.05  | 11.92 | 2.03  |  |
| 2.750                  | 3.05  | 5.833 | 67.06 | 8.917  | 3.05  | 12.00 | 2.03  |  |
| 2.833                  | 3.05  | 5.917 | 67.06 | 9.000  | 3.05  | 12.08 | 1.02  |  |
| 2.917                  | 3.05  | 6.000 | 67.06 | 9.083  | 2.03  | 12.17 | 1.02  |  |
| 3.000                  | 3.05  | 6.083 | 67.06 | 9.167  | 2.03  | 12.25 | 1.02  |  |

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|       | LangstaffRd_EA_Existing_WestDonWatershd |       |       |       |      |       |      |  |  |  |
|-------|---|-------|-------|-------|------|-------|------|--|--|--|
| 1.167 | 2.03                                    | 4.250 | 3.05  | 7.333 | 5.08 | 10.42 | 2.03 |  |  |  |
| 1.250 | 2.03                                    | 4.333 | 5.08  | 7.417 | 5.08 | 10.50 | 2.03 |  |  |  |
| 1.333 | 1.02                                    | 4.417 | 5.08  | 7.500 | 5.08 | 10.58 | 1.02 |  |  |  |
| 1.417 | 1.02                                    | 4.500 | 5.08  | 7.583 | 4.06 | 10.67 | 1.02 |  |  |  |
| 1.500 | 1.02                                    | 4.583 | 5.08  | 7.667 | 4.06 | 10.75 | 1.02 |  |  |  |
| 1.583 | 2.03                                    | 4.667 | 5.08  | 7.750 | 4.06 | 10.83 | 2.03 |  |  |  |
| 1.667 | 2.03                                    | 4.750 | 5.08  | 7.833 | 4.06 | 10.92 | 2.03 |  |  |  |
| 1.750 | 2.03                                    | 4.833 | 6.10  | 7.917 | 4.06 | 11.00 | 2.03 |  |  |  |
| 1.833 | 1.02                                    | 4.917 | 6.10  | 8.000 | 4.06 | 11.08 | 1.02 |  |  |  |
| 1.917 | 1.02                                    | 5.000 | 6.10  | 8.083 | 5.08 | 11.17 | 1.02 |  |  |  |
| 2.000 | 1.02                                    | 5.083 | 5.08  | 8.167 | 5.08 | 11.25 | 1.02 |  |  |  |
| 2.083 | 2.03                                    | 5.167 | 5.08  | 8.250 | 5.08 | 11.33 | 2.03 |  |  |  |
| 2.167 | 2.03                                    | 5.250 | 5.08  | 8.333 | 3.05 | 11.42 | 2.03 |  |  |  |
| 2.250 | 2.03                                    | 5.333 | 8.13  | 8.417 | 3.05 | 11.50 | 2.03 |  |  |  |
| 2.333 | 3.05                                    | 5.417 | 8.13  | 8.500 | 3.05 | 11.58 | 1.02 |  |  |  |
| 2.417 | 3.05                                    | 5.500 | 8.13  | 8.583 | 3.05 | 11.67 | 1.02 |  |  |  |
| 2.500 | 3.05                                    | 5.583 | 9.14  | 8.667 | 3.05 | 11.75 | 1.02 |  |  |  |
| 2.583 | 3.05                                    | 5.667 | 9.14  | 8.750 | 3.05 | 11.83 | 2.03 |  |  |  |
| 2.667 | 3.05                                    | 5.750 | 9.15  | 8.833 | 3.05 | 11.92 | 2.03 |  |  |  |
| 2.750 | 3.05                                    | 5.833 | 67.06 | 8.917 | 3.05 | 12.00 | 2.03 |  |  |  |
| 2.833 | 3.05                                    | 5.917 | 67.06 | 9.000 | 3.05 | 12.08 | 1.02 |  |  |  |
| 2.917 | 3.05                                    | 6.000 | 67.06 | 9.083 | 2.03 | 12.17 | 1.02 |  |  |  |
| 3.000 | 3.05                                    | 6.083 | 67.06 | 9.167 | 2.03 | 12.25 | 1.02 |  |  |  |
| 3.083 | 2.03                                    | 6.167 | 67.06 | 9.250 | 2.03 |       |      |  |  |  |

| Max.Eff.Inten.(r | nm/hr)= | 67.06     | 54.54      |             |
|------------------|---------|-----------|------------|-------------|
| over             | (min)   | 5.00      | 15.00      |             |
| Storage Coeff.   | (min)=  | 5.19 (ii) | 10.08 (ii) |             |
| Unit Hyd. Tpeak  | (min)=  | 5.00      | 15.00      |             |
| Unit Hyd. peak   | (cms)=  | 0.21      | 0.10       |             |
|                  |         |           |            | *TOTALS*    |
| PEAK FLOW        | (cms)=  | 0.05      | 0.02       | 0.069 (iii) |
| TIME TO PEAK     | (hrs)=  | 6.25      | 6.25       | 6.25        |
| RUNOFF VOLUME    | (mm)=   | 72.42     | 47.80      | 61.82       |
| TOTAL RAINFALL   | (mm)=   | 74.42     | 74.42      | 74.42       |
| RUNOFF COEFFICIE | NT =    | 0.97      | 0.64       | 0.83        |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 89.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0450)   |      |       |       |       |
|-------------------|------|-------|-------|-------|
| 1 + 2 = 3         | AREA | QPEAK | TPEAK | R.V.  |
|                   | (ha) | (cms) | (hrs) | (mm)  |
| ID1= 1 ( 0165):   | 0.60 | 0.080 | 6.25  | 52.77 |
| + ID2= 2 ( 0170): | 0.43 | 0.069 | 6.25  | 61.82 |

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| Max.Eff.Inten.(m | m/hr)= | 67.06 | 46.22      |          |       |
|------------------|--------|-------|------------|----------|-------|
| over             | (min)  | 5.00  | 15.00      |          |       |
| Storage Coeff.   | (min)= | 5.19  | (ii) 11.53 | (ii)     |       |
| Unit Hyd. Tpeak  | (min)= | 5.00  | 15.00      |          |       |
| Unit Hyd. peak   | (cms)= | 0.21  | 0.09       |          |       |
|                  |        |       |            | *TOTALS* |       |
| PEAK FLOW        | (cms)= | 0.04  | 0.04       | 0.080    | (iii) |
| TIME TO PEAK     | (hrs)= | 6.25  | 6.33       | 6.25     |       |
| RUNOFF VOLUME    | (mm)=  | 72.42 | 39.68      | 52.77    |       |
| TOTAL RAINFALL   | (mm)=  | 74.42 | 74.42      | 74.42    |       |
| RUNOFF COEFFICIE | NT =   | 0.97  | 0.53       | 0.71     |       |
|                  |        |       |            |          |       |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

|                   |       |          |       |         |           |       | - |
|-------------------|-------|----------|-------|---------|-----------|-------|---|
|                   |       |          |       |         |           |       |   |
| CALIB             |       |          |       |         |           |       |   |
| STANDHYD ( 0170)  | Area  | (ha)=    | 0.43  |         |           |       |   |
| ID= 1 DT= 5.0 min | Total | Imp(%)=  | 57.00 | Dir.    | Conn.(%)= | 57.00 |   |
| · ii              |       |          |       |         |           |       |   |
|                   |       | IMPERVIO | US    | PERVIOU | IS (i)    |       |   |
| Surface Area      | (ha)= | 0.25     |       | 0.18    | 3         |       |   |
| Dep. Storage      | (mm)= | 2.00     | 1     | 5.00    | )         |       |   |
| Average Slope     | (%)=  | 1.00     | 1     | 2.00    | )         |       |   |
| Length            | (m)=  | 250.00   | 1     | 20.00   | )         |       |   |
| Mannings n        | =     | 0.013    |       | 0.250   | )         |       |   |
|                   |       |          |       |         |           |       |   |

NOTE: RAINFALL WAS TRANSFORMED TO  $\,$  5.0 MIN. TIME STEP.

|       |       |       | ANCEODUE | LIVETOCE  |       |       |       |
|-------|-------|-------|----------|-----------|-------|-------|-------|
|       |       | IR    | ANSFURME | ) HYETOGR | (APH  | -     |       |
| TIME  | RAIN  | TIME  | RAIN     | ' TIME    | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs     | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250     | 67.05 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333     | 13.21 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417     | 13.21 | 9.50  | 3.05  |
| 0.333 | 1.02  | 3.417 | 3.05     | 6.500     | 13.21 | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05     | 6.583     | 13.21 | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 3.05     | 6.667     | 13.21 | 9.75  | 2.03  |
| 0.583 | 2.03  | 3.667 | 3.05     | 6.750     | 13.21 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 3.05     | 6.833     | 6.10  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 3.05     | 6.917     | 6.10  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 3.05     | 7.000     | 6.10  | 10.08 | 2.03  |
| 0.917 | 1.02  | 4.000 | 3.05     | 7.083     | 6.10  | 10.17 | 2.03  |
| 1.000 | 1.02  | 4.083 | 3.05     | 7.167     | 6.10  | 10.25 | 2.03  |
| 1.083 | 2.03  | 4.167 | 3.05     | 7.250     | 6.10  | 10.33 | 2.03  |

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|          |        | Langstaff | Rd_EA_Ex | isting_Wes | stDonWater | rshd |
|----------|--------|-----------|----------|------------|------------|------|
| ID = 3 ( | 0450): | 1.03      | 0.149    | 6.25       | 56.55      |      |
|          |        |           |          |            |            |      |

| NOTE: | PFΔK | FLOWS | DΩ | NOT | TNCLLIDE | <b>RASFELOWS</b> | TF | ΔNV |
|-------|------|-------|----|-----|----------|------------------|----|-----|

| ADD HYD ( 0450)  3 + 2 = 1            |      |       |      |       |
|---------------------------------------|------|-------|------|-------|
| ID1= 3 ( 0450): 1.03 0.149 6.25 56.55 |      |       |      |       |
|                                       | 1.03 | 0.149 | 6.25 | 56.55 |

ID = 1 ( 0450): 2.15 0.293 6.25 5

| NOTE: PEAK FLOW   | S DO NO | T INCLUDE BASEF | LOWS IF ANY.   |       |
|-------------------|---------|-----------------|----------------|-------|
| CALIB             |         |                 |                |       |
| STANDHYD ( 0190)  | Area    | (ha)= 0.86      |                |       |
| ID= 1 DT= 5.0 min | Total   | Imp(%)= 42.00   | Dir. Conn.(%)= | 42.00 |
|                   |         | IMPERVIOUS      | PERVIOUS (i)   |       |
| Surface Area      | (ha)=   | 0.36            | 0.50           |       |
| Dep. Storage      | (mm)=   | 2.00            | 5.00           |       |
| Average Slope     | (%)=    | 1.00            | 2.00           |       |
| Length            | (m)=    | 340.00          | 50.00          |       |
| Mannings n        | ` =     | 0.013           | 0.250          |       |
|                   |         |                 |                |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       | TRANSFORMED HYETOGRAPH |       |       |        |       |       |       |  |  |  |  |
|-------|------------------------|-------|-------|--------|-------|-------|-------|--|--|--|--|
| TIME  | RAIN                   | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |  |  |  |
| hrs   | mm/hr                  | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |  |  |  |
| 0.083 | 0.00                   | 3.167 | 2.03  | 6.250  | 67.05 | 9.33  | 3.05  |  |  |  |  |
| 0.167 | 0.00                   | 3.250 | 2.03  | 6.333  | 13.21 | 9.42  | 3.05  |  |  |  |  |
| 0.250 | 0.00                   | 3.333 | 3.05  | 6.417  | 13.21 | 9.50  | 3.05  |  |  |  |  |
| 0.333 | 1.02                   | 3.417 | 3.05  | 6.500  | 13.21 | 9.58  | 2.03  |  |  |  |  |
| 0.417 | 1.02                   | 3.500 | 3.05  | 6.583  | 13.21 | 9.67  | 2.03  |  |  |  |  |
| 0.500 | 1.02                   | 3.583 | 3.05  | 6.667  | 13.21 | 9.75  | 2.03  |  |  |  |  |
| 0.583 | 2.03                   | 3.667 | 3.05  | 6.750  | 13.21 | 9.83  | 2.03  |  |  |  |  |
| 0.667 | 2.03                   | 3.750 | 3.05  | 6.833  | 6.10  | 9.92  | 2.03  |  |  |  |  |
| 0.750 | 2.03                   | 3.833 | 3.05  | 6.917  | 6.10  | 10.00 | 2.03  |  |  |  |  |
| 0.833 | 1.02                   | 3.917 | 3.05  | 7.000  | 6.10  | 10.08 | 2.03  |  |  |  |  |
| 0.917 | 1.02                   | 4.000 | 3.05  | 7.083  | 6.10  | 10.17 | 2.03  |  |  |  |  |
| 1.000 | 1.02                   | 4.083 | 3.05  | 7.167  | 6.10  | 10.25 | 2.03  |  |  |  |  |
| 1.083 | 2.03                   | 4.167 | 3.05  | 7.250  | 6.10  | 10.33 | 2.03  |  |  |  |  |
| 1.167 | 2.03                   | 4.250 | 3.05  | 7.333  | 5.08  | 10.42 | 2.03  |  |  |  |  |
| 1.250 | 2.03                   | 4.333 | 5.08  | 7.417  | 5.08  | 10.50 | 2.03  |  |  |  |  |
| 1.333 | 1.02                   | 4.417 | 5.08  | 7.500  | 5.08  | 10.58 | 1.02  |  |  |  |  |
| 1.417 | 1.02                   | 4.500 | 5.08  | 7.583  | 4.06  | 10.67 | 1.02  |  |  |  |  |
| 1.500 | 1.02                   | 4.583 | 5.08  | 7.667  | 4.06  | 10.75 | 1.02  |  |  |  |  |
| 1.583 | 2.03                   | 4.667 | 5.08  | 7.750  | 4.06  | 10.83 | 2.03  |  |  |  |  |

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|       | Lange | taffRd E | Λ Evicti | ng WestD | onWaters | hd    |      |
|-------|-------|----------|----------|----------|----------|-------|------|
| 1.667 | 2.03  | 4.750    | 5.08     | 7.833    | 4.06     | 10.92 | 2.03 |
| 1.750 | 2.03  | 4.833    | 6.10     | 7.917    | 4.06     | 11.00 | 2.03 |
| 1.833 | 1.02  | 4.917    | 6.10     | 8.000    | 4.06     | 11.08 | 1.02 |
| 1.917 | 1.02  | 5.000    | 6.10     | 8.083    | 5.08     | 11.17 | 1.02 |
| 2.000 | 1.02  | 5.083    | 5.08     | 8.167    | 5.08     | 11.25 | 1.02 |
| 2.083 | 2.03  | 5.167    | 5.08     | 8.250    | 5.08     | 11.33 | 2.03 |
| 2.167 | 2.03  | 5.250    | 5.08     | 8.333    | 3.05     | 11.42 | 2.03 |
| 2.250 | 2.03  | 5.333    | 8.13     | 8.417    | 3.05     | 11.50 | 2.03 |
| 2.333 | 3.05  | 5.417    | 8.13     | 8.500    | 3.05     | 11.58 | 1.02 |
| 2.417 | 3.05  | 5.500    | 8.13     | 8.583    | 3.05     | 11.67 | 1.02 |
| 2.500 | 3.05  | 5.583    | 9.14     | 8.667    | 3.05     | 11.75 | 1.02 |
| 2.583 | 3.05  | 5.667    | 9.14     | 8.750    | 3.05     | 11.83 | 2.03 |
| 2.667 | 3.05  | 5.750    | 9.15     | 8.833    | 3.05     | 11.92 | 2.03 |
| 2.750 | 3.05  | 5.833    | 67.06    | 8.917    | 3.05     | 12.00 | 2.03 |
| 2.833 | 3.05  | 5.917    | 67.06    | 9.000    | 3.05     | 12.08 | 1.02 |
| 2.917 | 3.05  | 6.000    | 67.06    | 9.083    | 2.03     | 12.17 | 1.02 |
| 3.000 | 3.05  | 6.083    | 67.06    | 9.167    | 2.03     | 12.25 | 1.02 |
| 3.083 | 2.03  | 6.167    | 67.06    | 9.250    | 2.03     |       |      |
|       |       |          |          |          |          |       |      |

| Max.Eff.Inten.(mm/hr)= |        | 67.06     | 44.81      |             |
|------------------------|--------|-----------|------------|-------------|
| over                   | (min)  | 5.00      | 20.00      |             |
| Storage Coeff.         | (min)= | 6.25 (ii) | 17.37 (ii) |             |
| Unit Hyd. Tpeak        | (min)= | 5.00      | 20.00      |             |
| Unit Hyd. peak         | (cms)= | 0.19      | 0.06       |             |
|                        |        |           |            | *TOTALS*    |
| PEAK FLOW              | (cms)= | 0.07      | 0.04       | 0.105 (iii) |
| TIME TO PEAK           | (hrs)= | 6.25      | 6.42       | 6.25        |
| RUNOFF VOLUME          | (mm)=  | 72.42     | 39.68      | 53.42       |
| TOTAL RAINFALL         | (mm)=  | 74.42     | 74.42      | 74.42       |
| RUNOFF COEFFICIE       | ENT =  | 0.97      | 0.53       | 0.72        |
|                        |        |           |            |             |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| (111) 1 EAR 1 EOR | 5025 110 | . 11100000 | DAJE! I | 2011 21 7 |           |       |  |
|-------------------|----------|------------|---------|-----------|-----------|-------|--|
|                   |          |            |         |           |           |       |  |
| CALIB             |          |            |         |           |           |       |  |
| STANDHYD ( 0195)  | Area     | (ha)=      | 0.79    |           |           |       |  |
| ID= 1 DT= 5.0 min | Total    | Imp(%)=    | 42.00   | Dir.      | Conn.(%)= | 42.00 |  |
|                   |          |            |         |           |           |       |  |
|                   |          | IMPERVI    | OUS     | PERVIOU   | JS (i)    |       |  |
| Surface Area      | (ha)=    | 0.3        | 3       | 0.46      | 5         |       |  |
| Dep. Storage      | (mm)=    | 2.0        | 10      | 5.00      | •         |       |  |
| Average Slope     | (%)=     | 1.0        | 10      | 2.00      | •         |       |  |
| Length            | (m)=     | 340.0      | 10      | 20.00     | •         |       |  |
| Mannings n        | =        | 0.01       | .3      | 0.256     | •         |       |  |
|                   |          |            |         |           |           |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

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## ${\tt LangstaffRd\_EA\_Existing\_WestDonWatershd}$

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0455) <br>  1 + 2 = 3  <br> | AREA<br>(ha)<br>0.86<br>0.79 | QPEAK<br>(cms)<br>0.105<br>0.105 | TPEAK<br>(hrs)<br>6.25<br>6.25 | R.V.<br>(mm)<br>53.42<br>53.42 |
|---------------------------------------|------------------------------|----------------------------------|--------------------------------|--------------------------------|
| ID = 3 ( 0455):                       | 1.65                         | 0.210                            | 6.25                           | 53.42                          |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD ( 0458) <br>  1 + 2 = 3  <br> | AREA<br>(ha)<br>2.15<br>1.65 | QPEAK<br>(cms)<br>0.293<br>0.210 | TPEAK<br>(hrs)<br>6.25<br>6.25 | R.V.<br>(mm)<br>53.95<br>53.42 |
|---------------------------------------|------------------------------|----------------------------------|--------------------------------|--------------------------------|
| ID = 3 ( 0458):                       | 3.80                         | 0.503                            | 6.25                           | 53.72                          |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB             |       |         |       |                |       |
|-------------------|-------|---------|-------|----------------|-------|
| STANDHYD ( 0300)  | Area  | (ha)=   | 10.00 |                |       |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 80.00 | Dir. Conn.(%)= | 80.00 |
|                   |       |         |       |                |       |
|                   |       | IMPERVI | OUS   | PERVIOUS (i)   |       |
| Surface Area      | (ha)= | 8.0     | 0     | 2.00           |       |
| Dep. Storage      | (mm)= | 1.0     | 0     | 5.00           |       |
| Average Slope     | (%)=  | 1.0     | 0     | 2.00           |       |
| Length            | (m)=  | 258.2   | 0     | 40.00          |       |
| Mannings n        | ` ′=  | 0.01    | 3     | 0.250          |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TRANSFORMED HYETOGRAPH |       |       |       |        |         |      |       |  |  |  |  |
|------------------------|-------|-------|-------|--------|---------|------|-------|--|--|--|--|
| TIME                   | RAIN  | TIME  | RAIN  | ' TIME | RAIN    | TIME | RAIN  |  |  |  |  |
| hrs                    | mm/hr | hrs   | mm/hr | ' hrs  | mm/hr   | hrs  | mm/hr |  |  |  |  |
| 0.083                  | 0.00  | 3.167 | 2.03  | 6.250  | 67.05   | 9.33 | 3.05  |  |  |  |  |
| 0.167                  | 0.00  | 3.250 | 2.03  | 6.333  | 13.21 İ | 9.42 | 3.05  |  |  |  |  |

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#### LangstaffRd\_EA\_Existing\_WestDonWatershd

| TIME   | Edilbaca i Ma_Ex_Extactib_nesconinacei sila |         |       |          |           |       |       |       |  |
|--|---|---------|-------|----------|-----------|-------|-------|-------|--|
| hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr hrs new mm/hr h  |   |         | TRA   | ANSFORME | D HYETOGR | APH   | -     |       |  |
| 0.083 0.00   3.167   2.03   6.250   67.05   9.33   3.05   0.167 0.00   3.259   2.03   6.333   13.21   9.42   3.05   0.250   0.00   3.333   3.05   6.417   13.21   9.50   3.05   0.333   1.02   3.417   3.05   6.580   13.21   9.67   2.03   0.590   1.02   3.583   3.05   6.583   13.21   9.67   2.03   0.590   1.02   3.583   3.05   6.567   13.21   9.57   2.03   0.583   2.03   3.667   3.05   6.5750   13.21   9.58   2.03   0.667   2.03   3.353   3.05   6.667   13.21   9.83   2.03   0.667   2.03   3.353   3.05   6.691   6.19   9.02   2.03   0.633   1.02   3.1750   3.05   6.917   6.10   10.00   2.03   0.833   1.02   3.917   3.05   7.000   6.10   10.08   2.03   0.833   1.02   3.917   3.05   7.000   6.10   10.08   2.03   1.000   1.02   4.083   3.05   7.167   6.10   10.25   2.03   1.000   1.02   4.083   3.05   7.167   6.10   10.25   2.03   1.167   2.03   4.250   3.05   7.750   6.10   10.25   2.03   1.167   2.03   4.250   3.05   7.750   6.10   10.25   2.03   1.167   2.03   4.250   3.05   7.583   4.06   10.17   2.03   1.333   1.02   4.417   5.08   7.590   5.08   10.58   1.02   1.417   1.02   4.500   5.08   7.583   4.06   10.67   1.02   1.583   2.03   4.667   5.08   7.750   4.06   10.75   1.02   1.583   2.03   4.457   5.08   7.583   4.06   10.67   1.02   1.583   2.03   4.457   5.08   7.583   4.06   10.83   2.03   1.750   2.03   4.735   5.08   7.583   5.08   11.05   2.03   1.750   2.03   4.735   5.08   7.583   5.08   11.05   2.03   1.750   2.03   4.735   5.08   7.583   5.08   11.05   1.02   1.917   1.02   5.000   6.10   8.083   5.08   11.17   1.02   2.083   2.03   5.167   5.08   8.00   5.08   11.55   1.02   2.083   2.03   5.167   5.08   8.00   5.08   11.15   1.02   2.083   2.03   5.167   5.08   8.00   5.08   11.15   1.02   2.083   2.03   5.167   5.08   8.167   5.08   11.15   1.02   2.083   3.05   5.583   9.14   8.667   3.05   11.15   1.02   2.167   2.03   5.583   9.14   8.667   3.05   11.15   1.02   2.283   3.05   5.590   6.10   8.00   3.05   6.00   11.00   2.283   3.05   5.583   9.14   8.667   3.05   11.15   1.02   2.283   3.05  | TIME  | RAIN    | TIME  | RAIN     | ' TIME    | RAIN  | TIME  | RAIN  |  |
|  | hrs   | s mm/hr | hrs   | mm/hr    | ' hrs     | mm/hr | hrs   | mm/hr |  |
| 0.333 1.02   3.417   3.05   6.500   13.21   9.58   2.03   0.500   1.02   3.560   3.05   6.583   13.21   9.67   2.03   0.500   1.02   3.563   3.05   6.667   13.21   9.67   2.03   0.667   2.03   3.657   3.05   6.667   13.21   9.67   2.03   0.667   2.03   3.870   3.05   6.667   13.21   9.67   2.03   0.667   2.03   3.870   3.05   6.6750   13.21   9.83   2.03   0.667   2.03   3.870   3.05   6.697   6.10   10.00   2.03   0.833   1.02   3.917   3.05   7.000   6.10   10.00   2.03   0.917   1.02   4.000   3.05   7.000   6.10   10.08   2.03   1.000   1.02   4.083   3.05   7.167   6.10   10.25   2.03   1.000   1.02   4.083   3.05   7.157   6.10   10.25   2.03   1.107   2.03   4.167   3.05   7.250   6.10   10.33   2.03   1.167   2.03   4.250   3.65   7.333   5.08   10.42   2.03   1.150   2.03   4.433   5.08   7.417   5.08   10.50   2.03   1.150   2.03   4.450   5.08   7.500   5.08   10.50   2.03   1.417   1.02   4.500   5.08   7.500   5.08   10.58   10.50   1.583   2.03   4.667   5.08   7.567   4.06   10.67   1.02   1.583   2.03   4.667   5.08   7.750   4.06   10.83   2.03   1.750   2.03   4.750   5.08   7.750   4.06   10.83   2.03   1.750   2.03   4.750   5.08   7.83   4.06   10.05   1.02   1.917   1.02   5.000   6.10   8.083   5.08   11.17   1.02   2.03   1.1917   1.02   5.000   6.10   8.083   5.08   11.13   2.03   2.1083   2.03   5.167   5.08   8.167   5.08   11.55   1.02   2.083   2.03   5.167   5.08   8.250   5.08   11.15   2.03   2.167   2.03   5.550   5.08   8.167   5.08   11.15   1.02   2.083   2.03   5.167   5.08   8.250   5.08   11.15   2.03   2.167   2.03   5.553   5.08   8.167   5.08   11.15   2.03   2.167   2.03   5.553   9.14   8.667   3.05   11.58   2.03   2.250   2.03   5.553   9.14   8.750   3.05   11.58   2.03   2.250   2.03   5.553   9.14   8.667   3.05   11.50   2.03   2.250   3.05   5.583   9.14   8.667   3.05   11.50   2.03   2.250   3.05   5.583   9.14   8.667   3.05   11.50   2.03   2.250   3.05   5.583   9.14   8.750   3.05   11.50   2.03   2.267   3.05   5.570   9.14   8.750   3.05   11.50   2.03  | 0.08  |         |       |          |           |       | 9.33  | 3.05  |  |
| 0.333 1.02   3.417   3.05   6.500   13.21   9.58   2.03   0.500   1.02   3.560   3.05   6.583   13.21   9.67   2.03   0.500   1.02   3.563   3.05   6.667   13.21   9.67   2.03   0.667   2.03   3.657   3.05   6.667   13.21   9.67   2.03   0.667   2.03   3.870   3.05   6.667   13.21   9.67   2.03   0.667   2.03   3.870   3.05   6.6750   13.21   9.83   2.03   0.667   2.03   3.870   3.05   6.697   6.10   10.00   2.03   0.833   1.02   3.917   3.05   7.000   6.10   10.00   2.03   0.917   1.02   4.000   3.05   7.000   6.10   10.08   2.03   1.000   1.02   4.083   3.05   7.167   6.10   10.25   2.03   1.000   1.02   4.083   3.05   7.157   6.10   10.25   2.03   1.107   2.03   4.167   3.05   7.250   6.10   10.33   2.03   1.167   2.03   4.250   3.65   7.333   5.08   10.42   2.03   1.150   2.03   4.433   5.08   7.417   5.08   10.50   2.03   1.150   2.03   4.450   5.08   7.500   5.08   10.50   2.03   1.417   1.02   4.500   5.08   7.500   5.08   10.58   10.50   1.583   2.03   4.667   5.08   7.567   4.06   10.67   1.02   1.583   2.03   4.667   5.08   7.750   4.06   10.83   2.03   1.750   2.03   4.750   5.08   7.750   4.06   10.83   2.03   1.750   2.03   4.750   5.08   7.83   4.06   10.05   1.02   1.917   1.02   5.000   6.10   8.083   5.08   11.17   1.02   2.03   1.1917   1.02   5.000   6.10   8.083   5.08   11.13   2.03   2.1083   2.03   5.167   5.08   8.167   5.08   11.55   1.02   2.083   2.03   5.167   5.08   8.250   5.08   11.15   2.03   2.167   2.03   5.550   5.08   8.167   5.08   11.15   1.02   2.083   2.03   5.167   5.08   8.250   5.08   11.15   2.03   2.167   2.03   5.553   5.08   8.167   5.08   11.15   2.03   2.167   2.03   5.553   9.14   8.667   3.05   11.58   2.03   2.250   2.03   5.553   9.14   8.750   3.05   11.58   2.03   2.250   2.03   5.553   9.14   8.667   3.05   11.50   2.03   2.250   3.05   5.583   9.14   8.667   3.05   11.50   2.03   2.250   3.05   5.583   9.14   8.667   3.05   11.50   2.03   2.250   3.05   5.583   9.14   8.750   3.05   11.50   2.03   2.267   3.05   5.570   9.14   8.750   3.05   11.50   2.03  | 0.16  | 7 0.00  | 3.250 | 2.03     | 6.333     | 13.21 |       |       |  |
| 0.333 1.02   3.417   3.05   6.500   13.21   9.58   2.03   0.500   1.02   3.560   3.05   6.583   13.21   9.67   2.03   0.500   1.02   3.563   3.05   6.667   13.21   9.67   2.03   0.667   2.03   3.657   3.05   6.667   13.21   9.67   2.03   0.667   2.03   3.870   3.05   6.667   13.21   9.67   2.03   0.667   2.03   3.870   3.05   6.6750   13.21   9.83   2.03   0.667   2.03   3.870   3.05   6.697   6.10   10.00   2.03   0.833   1.02   3.917   3.05   7.000   6.10   10.00   2.03   0.917   1.02   4.000   3.05   7.000   6.10   10.08   2.03   1.000   1.02   4.083   3.05   7.167   6.10   10.25   2.03   1.000   1.02   4.083   3.05   7.157   6.10   10.25   2.03   1.107   2.03   4.167   3.05   7.250   6.10   10.33   2.03   1.167   2.03   4.250   3.65   7.333   5.08   10.42   2.03   1.150   2.03   4.433   5.08   7.417   5.08   10.50   2.03   1.150   2.03   4.450   5.08   7.500   5.08   10.50   2.03   1.417   1.02   4.500   5.08   7.500   5.08   10.58   10.50   1.583   2.03   4.667   5.08   7.567   4.06   10.67   1.02   1.583   2.03   4.667   5.08   7.750   4.06   10.83   2.03   1.750   2.03   4.750   5.08   7.750   4.06   10.83   2.03   1.750   2.03   4.750   5.08   7.83   4.06   10.05   1.02   1.917   1.02   5.000   6.10   8.083   5.08   11.17   1.02   2.03   1.1917   1.02   5.000   6.10   8.083   5.08   11.13   2.03   2.1083   2.03   5.167   5.08   8.167   5.08   11.55   1.02   2.083   2.03   5.167   5.08   8.250   5.08   11.15   2.03   2.167   2.03   5.550   5.08   8.167   5.08   11.15   1.02   2.083   2.03   5.167   5.08   8.250   5.08   11.15   2.03   2.167   2.03   5.553   5.08   8.167   5.08   11.15   2.03   2.167   2.03   5.553   9.14   8.667   3.05   11.58   2.03   2.250   2.03   5.553   9.14   8.750   3.05   11.58   2.03   2.250   2.03   5.553   9.14   8.667   3.05   11.50   2.03   2.250   3.05   5.583   9.14   8.667   3.05   11.50   2.03   2.250   3.05   5.583   9.14   8.667   3.05   11.50   2.03   2.250   3.05   5.583   9.14   8.750   3.05   11.50   2.03   2.267   3.05   5.570   9.14   8.750   3.05   11.50   2.03  | 0.25  | 0.00    | 3.333 | 3.05     | 6.417     | 13.21 |       |       |  |
| 0.583 2.03   3.667   3.05   6.750   13.21   9.83   2.03   0.667 2.03   3.750   3.05   6.833   6.10   9.92   2.03   0.750   2.03   3.833   3.05   6.917   6.10   10.00   2.03   0.917   1.02   4.000   3.05   7.000   6.10   10.08   2.03   0.917   1.02   4.000   3.05   7.083   6.10   10.17   2.03   1.080   2.03   4.167   3.05   7.250   6.10   10.33   2.03   1.167   2.03   4.250   3.05   7.333   5.08   10.42   2.03   1.250   2.03   4.333   5.08   7.417   5.08   10.58   12.03   1.250   2.03   4.333   5.08   7.417   5.08   10.58   10.58   1.250   2.03   4.333   5.08   7.417   5.08   10.58   1.02   1.417   1.02   4.560   5.08   7.583   4.06   10.67   10.2   1.500   1.02   4.583   5.08   7.667   4.06   10.675   1.02   1.583   2.03   4.667   5.08   7.750   4.06   10.67   1.02   1.667   2.03   4.450   5.08   7.750   4.06   10.67   1.02   1.667   2.03   4.450   5.08   7.750   4.06   10.075   1.02   1.833   1.02   4.917   6.10   8.000   4.06   11.09   2.03   1.833   1.02   4.917   6.10   8.000   4.06   11.08   1.02   1.917   1.02   5.000   6.10   8.000   4.06   11.08   1.02   2.083   2.03   5.167   5.08   8.167   5.08   11.15   1.02   2.083   2.03   5.167   5.08   8.167   5.08   11.15   1.02   2.083   2.03   5.167   5.08   8.167   5.08   11.15   1.02   2.083   2.03   5.167   5.08   8.150   5.08   11.15   1.02   2.083   2.03   5.167   5.00   6.10   8.083   5.08   11.15   1.02   2.167   2.03   5.550   5.08   8.167   3.05   11.58   1.02   2.167   2.03   5.550   5.08   8.167   3.05   11.58   1.02   2.167   2.03   5.550   5.08   8.800   3.05   11.58   1.02   2.167   2.03   5.550   5.00   5.00   5.00   5.00   5.00   2.167   3.05   5.500   5.00   5.00   5.00   5.00   5.00   2.170   3.05   5.500   5.00   5.00   5.00   5.00   2.183   3.05   5.667   9.14   8.750   3.05   11.58   1.02   2.170   3.05   5.500   6.03   67.06   9.083   2.03   12.17   1.02   2.183   3.05   5.667   9.14   8.750   3.05   11.58   1.02   2.183   3.05   5.660   9.08   5.00   5.00   5.00   3.000   3.05   6.083   67.06   9.083   2.03   12.17   1.02   3.000   3.05  | 0.33  |         | 3.417 | 3.05     | 6.500     | 13.21 | 9.58  | 2.03  |  |
| 0.583 2.03   3.667   3.05   6.750   13.21   9.83   2.03   0.667 2.03   3.750   3.05   6.833   6.10   9.92   2.03   0.750   2.03   3.833   3.05   6.917   6.10   10.00   2.03   0.917   1.02   4.000   3.05   7.000   6.10   10.08   2.03   0.917   1.02   4.000   3.05   7.083   6.10   10.17   2.03   1.080   2.03   4.167   3.05   7.250   6.10   10.33   2.03   1.167   2.03   4.250   3.05   7.333   5.08   10.42   2.03   1.250   2.03   4.333   5.08   7.417   5.08   10.58   12.03   1.250   2.03   4.333   5.08   7.417   5.08   10.58   10.58   1.250   2.03   4.333   5.08   7.417   5.08   10.58   1.02   1.417   1.02   4.560   5.08   7.583   4.06   10.67   10.2   1.500   1.02   4.583   5.08   7.667   4.06   10.675   1.02   1.583   2.03   4.667   5.08   7.750   4.06   10.67   1.02   1.667   2.03   4.450   5.08   7.750   4.06   10.67   1.02   1.667   2.03   4.450   5.08   7.750   4.06   10.075   1.02   1.833   1.02   4.917   6.10   8.000   4.06   11.09   2.03   1.833   1.02   4.917   6.10   8.000   4.06   11.08   1.02   1.917   1.02   5.000   6.10   8.000   4.06   11.08   1.02   2.083   2.03   5.167   5.08   8.167   5.08   11.15   1.02   2.083   2.03   5.167   5.08   8.167   5.08   11.15   1.02   2.083   2.03   5.167   5.08   8.167   5.08   11.15   1.02   2.083   2.03   5.167   5.08   8.150   5.08   11.15   1.02   2.083   2.03   5.167   5.00   6.10   8.083   5.08   11.15   1.02   2.167   2.03   5.550   5.08   8.167   3.05   11.58   1.02   2.167   2.03   5.550   5.08   8.167   3.05   11.58   1.02   2.167   2.03   5.550   5.08   8.800   3.05   11.58   1.02   2.167   2.03   5.550   5.00   5.00   5.00   5.00   5.00   2.167   3.05   5.500   5.00   5.00   5.00   5.00   5.00   2.170   3.05   5.500   5.00   5.00   5.00   5.00   2.183   3.05   5.667   9.14   8.750   3.05   11.58   1.02   2.170   3.05   5.500   6.03   67.06   9.083   2.03   12.17   1.02   2.183   3.05   5.667   9.14   8.750   3.05   11.58   1.02   2.183   3.05   5.660   9.08   5.00   5.00   5.00   3.000   3.05   6.083   67.06   9.083   2.03   12.17   1.02   3.000   3.05  | 0.41  | 7 1.02  | 3.500 | 3.05     | 6.583     | 13.21 | 9.67  | 2.03  |  |
| 0.583 2.03   3.667   3.05   6.750   13.21   9.83   2.03   0.667 2.03   3.750   3.05   6.833   6.10   9.92   2.03   0.750   2.03   3.833   3.05   6.917   6.10   10.00   2.03   0.917   1.02   4.000   3.05   7.000   6.10   10.08   2.03   0.917   1.02   4.000   3.05   7.083   6.10   10.17   2.03   1.080   2.03   4.167   3.05   7.250   6.10   10.33   2.03   1.167   2.03   4.250   3.05   7.333   5.08   10.42   2.03   1.250   2.03   4.333   5.08   7.417   5.08   10.58   12.03   1.250   2.03   4.333   5.08   7.417   5.08   10.58   10.58   1.250   2.03   4.333   5.08   7.417   5.08   10.58   1.02   1.417   1.02   4.560   5.08   7.583   4.06   10.67   10.2   1.500   1.02   4.583   5.08   7.667   4.06   10.675   1.02   1.583   2.03   4.667   5.08   7.750   4.06   10.67   1.02   1.667   2.03   4.450   5.08   7.750   4.06   10.67   1.02   1.667   2.03   4.450   5.08   7.750   4.06   10.075   1.02   1.833   1.02   4.917   6.10   8.000   4.06   11.09   2.03   1.833   1.02   4.917   6.10   8.000   4.06   11.08   1.02   1.917   1.02   5.000   6.10   8.000   4.06   11.08   1.02   2.083   2.03   5.167   5.08   8.167   5.08   11.15   1.02   2.083   2.03   5.167   5.08   8.167   5.08   11.15   1.02   2.083   2.03   5.167   5.08   8.167   5.08   11.15   1.02   2.083   2.03   5.167   5.08   8.150   5.08   11.15   1.02   2.083   2.03   5.167   5.00   6.10   8.083   5.08   11.15   1.02   2.167   2.03   5.550   5.08   8.167   3.05   11.58   1.02   2.167   2.03   5.550   5.08   8.167   3.05   11.58   1.02   2.167   2.03   5.550   5.08   8.800   3.05   11.58   1.02   2.167   2.03   5.550   5.00   5.00   5.00   5.00   5.00   2.167   3.05   5.500   5.00   5.00   5.00   5.00   5.00   2.170   3.05   5.500   5.00   5.00   5.00   5.00   2.183   3.05   5.667   9.14   8.750   3.05   11.58   1.02   2.170   3.05   5.500   6.03   67.06   9.083   2.03   12.17   1.02   2.183   3.05   5.667   9.14   8.750   3.05   11.58   1.02   2.183   3.05   5.660   9.08   5.00   5.00   5.00   3.000   3.05   6.083   67.06   9.083   2.03   12.17   1.02   3.000   3.05  | 0.500                                       | 1.02    | 3.583 | 3.05     | 6.667     | 13.21 | 9.75  | 2.03  |  |
| 0.833 1.02   3.917   3.05   7.000   6.10   10.10   2.03   0.917   1.02   4.000   3.05   7.083   6.10   10.17   2.03   1.000   1.02   4.083   3.05   7.167   6.10   10.17   2.03   1.1683   2.03   4.167   3.05   7.7.50   6.10   10.25   2.03   1.167   2.03   4.250   3.05   7.167   6.10   10.25   2.03   1.167   2.03   4.250   3.05   7.333   5.08   10.42   2.03   1.167   2.03   4.250   3.05   7.333   5.08   10.50   2.03   1.333   1.02   4.417   5.08   7.590   5.08   10.58   1.02   1.417   1.02   4.583   5.08   7.567   4.06   10.75   1.02   1.500   1.02   4.583   5.08   7.667   4.06   10.75   1.02   1.583   2.03   4.667   5.08   7.750   4.06   10.75   1.02   1.583   2.03   4.667   5.08   7.750   4.06   10.75   1.02   1.583   1.02   4.917   6.10   8.000   4.06   11.00   2.03   1.750   2.03   4.750   6.10   7.917   4.06   11.00   2.03   1.750   2.03   4.750   6.10   7.917   4.06   11.00   2.03   1.917   1.02   5.000   6.10   8.083   5.08   11.17   1.02   2.000   1.02   5.003   5.08   5.08   8.167   5.08   11.25   1.02   2.083   2.03   5.167   5.08   8.833   5.08   11.17   1.02   2.083   2.03   5.5167   5.08   8.250   5.08   11.33   2.03   2.167   2.03   5.550   5.08   8.150   5.08   11.55   1.02   2.250   2.03   5.533   8.13   8.417   3.05   11.50   2.03   2.250   2.03   5.550   5.08   8.333   3.05   11.42   2.03   2.250   3.05   5.583   9.14   8.667   3.05   11.59   2.03   2.250   3.05   5.583   9.14   8.667   3.05   11.51   2.263   3.05   5.750   9.15   8.833   3.05   11.67   1.02   2.283   3.05   5.750   9.15   8.833   3.05   11.67   1.02   2.283   3.05   5.750   9.15   8.833   3.05   11.50   2.03   2.2667   3.05   5.750   9.15   8.833   3.05   11.57   1.02   2.283   3.05   5.917   67.06   9.000   3.05   12.00   2.03   2.2607   3.05   5.600   67.06   9.000   3.05   12.05   1.02   3.000   3.05   6.003   67.06   9.000   3.05   12.05   1.02   3.000   3.05   6.000   67.06   9.000   3.05   12.05   1.02   3.000   3.05   6.000   67.06   9.000   3.05   12.05   1.02   3.000   3.05   6.000   67.06   9.000   3.05   12.05   1.02 | 0.583                                       | າ າ ຄາ  | 3.667 | 3.05     | 6.750     |       | 9.83  | 2.03  |  |
| 0.833 1.02   3.917   3.05   7.000   6.10   10.10   2.03   0.917   1.02   4.000   3.05   7.083   6.10   10.17   2.03   1.000   1.02   4.083   3.05   7.167   6.10   10.17   2.03   1.1683   2.03   4.167   3.05   7.7.50   6.10   10.25   2.03   1.167   2.03   4.250   3.05   7.167   6.10   10.25   2.03   1.167   2.03   4.250   3.05   7.333   5.08   10.42   2.03   1.167   2.03   4.250   3.05   7.333   5.08   10.50   2.03   1.333   1.02   4.417   5.08   7.590   5.08   10.58   1.02   1.417   1.02   4.583   5.08   7.567   4.06   10.75   1.02   1.500   1.02   4.583   5.08   7.667   4.06   10.75   1.02   1.583   2.03   4.667   5.08   7.750   4.06   10.75   1.02   1.583   2.03   4.667   5.08   7.750   4.06   10.75   1.02   1.583   1.02   4.917   6.10   8.000   4.06   11.00   2.03   1.750   2.03   4.750   6.10   7.917   4.06   11.00   2.03   1.750   2.03   4.750   6.10   7.917   4.06   11.00   2.03   1.917   1.02   5.000   6.10   8.083   5.08   11.17   1.02   2.000   1.02   5.003   5.08   5.08   8.167   5.08   11.25   1.02   2.083   2.03   5.167   5.08   8.833   5.08   11.17   1.02   2.083   2.03   5.5167   5.08   8.250   5.08   11.33   2.03   2.167   2.03   5.550   5.08   8.150   5.08   11.55   1.02   2.250   2.03   5.533   8.13   8.417   3.05   11.50   2.03   2.250   2.03   5.550   5.08   8.333   3.05   11.42   2.03   2.250   3.05   5.583   9.14   8.667   3.05   11.59   2.03   2.250   3.05   5.583   9.14   8.667   3.05   11.51   2.263   3.05   5.750   9.15   8.833   3.05   11.67   1.02   2.283   3.05   5.750   9.15   8.833   3.05   11.67   1.02   2.283   3.05   5.750   9.15   8.833   3.05   11.50   2.03   2.2667   3.05   5.750   9.15   8.833   3.05   11.57   1.02   2.283   3.05   5.917   67.06   9.000   3.05   12.00   2.03   2.2607   3.05   5.600   67.06   9.000   3.05   12.05   1.02   3.000   3.05   6.003   67.06   9.000   3.05   12.05   1.02   3.000   3.05   6.000   67.06   9.000   3.05   12.05   1.02   3.000   3.05   6.000   67.06   9.000   3.05   12.05   1.02   3.000   3.05   6.000   67.06   9.000   3.05   12.05   1.02 | 0.66  | 7 2.03  | 3.750 | 3.05     | 6.833     | 6.10  | 9.92  | 2.03  |  |
| 0.833 1.02   3.917   3.05   7.000   6.10   10.10   2.03   0.917   1.02   4.000   3.05   7.083   6.10   10.17   2.03   1.000   1.02   4.083   3.05   7.167   6.10   10.17   2.03   1.1683   2.03   4.167   3.05   7.7.50   6.10   10.25   2.03   1.167   2.03   4.250   3.05   7.167   6.10   10.25   2.03   1.167   2.03   4.250   3.05   7.333   5.08   10.42   2.03   1.167   2.03   4.250   3.05   7.333   5.08   10.50   2.03   1.333   1.02   4.417   5.08   7.590   5.08   10.58   1.02   1.417   1.02   4.583   5.08   7.567   4.06   10.75   1.02   1.500   1.02   4.583   5.08   7.667   4.06   10.75   1.02   1.583   2.03   4.667   5.08   7.750   4.06   10.75   1.02   1.583   2.03   4.667   5.08   7.750   4.06   10.75   1.02   1.583   1.02   4.917   6.10   8.000   4.06   11.00   2.03   1.750   2.03   4.750   6.10   7.917   4.06   11.00   2.03   1.750   2.03   4.750   6.10   7.917   4.06   11.00   2.03   1.917   1.02   5.000   6.10   8.083   5.08   11.17   1.02   2.000   1.02   5.003   5.08   5.08   8.167   5.08   11.25   1.02   2.083   2.03   5.167   5.08   8.833   5.08   11.17   1.02   2.083   2.03   5.5167   5.08   8.250   5.08   11.33   2.03   2.167   2.03   5.550   5.08   8.150   5.08   11.55   1.02   2.250   2.03   5.533   8.13   8.417   3.05   11.50   2.03   2.250   2.03   5.550   5.08   8.333   3.05   11.42   2.03   2.250   3.05   5.583   9.14   8.667   3.05   11.59   2.03   2.250   3.05   5.583   9.14   8.667   3.05   11.51   2.263   3.05   5.750   9.15   8.833   3.05   11.67   1.02   2.283   3.05   5.750   9.15   8.833   3.05   11.67   1.02   2.283   3.05   5.750   9.15   8.833   3.05   11.50   2.03   2.2667   3.05   5.750   9.15   8.833   3.05   11.57   1.02   2.283   3.05   5.917   67.06   9.000   3.05   12.00   2.03   2.2607   3.05   5.600   67.06   9.000   3.05   12.05   1.02   3.000   3.05   6.003   67.06   9.000   3.05   12.05   1.02   3.000   3.05   6.000   67.06   9.000   3.05   12.05   1.02   3.000   3.05   6.000   67.06   9.000   3.05   12.05   1.02   3.000   3.05   6.000   67.06   9.000   3.05   12.05   1.02 | 0.750                                       | 2.03    | 3.833 | 3.05     | 6.917     | 6.10  | 10.00 | 2.03  |  |
| 1.000  | 0.83  | 3 1.02  | 3.917 | 3.05     | 7.000     | 6.10  | 10.08 | 2.03  |  |
| 1.000  | 0.91  | 7 1.02  | 4.000 | 3.05     | 7.083     | 6.10  | 10.17 | 2.03  |  |
| 1.250  | 1.000                                       | 1.02    | 4.083 | 3.05     | 7.167     | 6.10  |       |       |  |
| 1.250  | 1.08  | 3 2.03  | 4.167 | 3.05     | 7.250     | 6.10  | 10.33 | 2.03  |  |
| 1.333 1.02   4.417   5.08   7.590   5.08   1.02   1.417 1.02   4.590   5.08   7.583   4.06   10.67   1.02   1.590   1.02   4.583   5.08   7.667   4.06   10.67   1.02   1.583 2.03   4.667   5.08   7.750   4.06   10.63   2.03   1.750 2.03   4.750   5.08   7.750   4.06   10.92   2.03   1.750 2.03   4.750   6.10   8.000   4.06   11.00   2.03   1.750 2.03   4.833   6.10   7.917   4.06   11.00   2.03   1.917   1.02   5.000   6.10   8.003   5.08   11.17   1.02   2.000 1.02   5.003   5.08   8.883   5.08   11.17   1.02   2.003 2.03   5.167   5.08   8.167   5.08   11.25   1.02   2.003 2.03   5.167   5.08   8.250   5.08   11.25   1.02   2.167 2.03   5.250   5.08   8.333   3.05   11.42   2.03   2.250 2.03   5.333   8.13   8.417   3.05   11.59   2.03   2.250 2.03   5.550   8.13   8.583   3.05   11.67   1.02   2.417   3.05   5.500   8.13   8.583   3.05   11.67   1.02   2.590 3.05   5.583   9.14   8.667   3.05   11.58   1.02   2.590 3.05   5.560   8.13   8.583   3.05   11.67   1.02   2.583 3.05   5.567   9.15   8.833   3.05   11.67   1.02   2.583 3.05   5.560   9.14   8.750   3.05   11.58   2.03   2.667 3.05   5.560   9.14   8.750   3.05   11.83   2.03   2.670 3.05   5.583   9.14   8.667   3.05   11.59   2.03   2.833 3.05   5.5750   9.15   8.833   3.05   11.82   2.03   2.833 3.05   5.917   67.06   9.000   3.05   12.00   2.03   2.833 3.05   5.600   67.06   9.000   3.05   12.00   2.03   2.833 3.05   5.600   67.06   9.000   3.05   12.00   2.03   2.833 3.05   5.017   67.06   9.000   3.05   12.00   2.03   2.834 3.05   5.000   15.00    Max.Eff.Inten.(mm/hr) =   | 1.16  | 7 2.03  | 4.250 |          |           | 5.08  | 10.42 | 2.03  |  |
| 1.417 1.02   4.500   5.08   7.583   4.06   10.67   1.02   1.590 1.02   4.583   5.08   7.750   4.06   10.75   1.02   1.583 2.03   4.667   5.08   7.750   4.06   10.75   1.02   1.667 2.03   4.4750   5.08   7.753   4.06   10.83   2.03   1.667 2.03   4.833   6.10   7.917   4.06   11.00   2.03   1.833 1.02   4.917   6.10   8.000   4.06   11.00   2.03   1.833 1.02   4.917   6.10   8.000   4.06   11.00   2.03   1.833 1.02   5.000   6.10   8.000   4.06   11.00   2.03   1.833 1.02   5.000   6.10   8.000   4.06   11.00   2.03   2.000 1.02   5.083   5.08   8.167   5.08   11.17   1.02   2.000 2.003   5.503   5.08   8.250   5.08   11.17   1.02   2.083 2.03   5.167   5.08   8.250   5.08   11.13   2.03   2.167   2.03   5.250   5.08   8.250   5.08   11.13   2.03   2.167   2.03   5.550   5.08   8.333   3.05   11.42   2.03   2.333 3.05   5.417   8.13   8.417   3.05   11.50   2.03   2.417   3.05   5.500   8.13   8.583   3.05   11.58   1.02   2.500 3.05   5.583   9.14   8.667   3.05   11.58   1.02   2.583 3.05   5.667   9.14   8.750   3.05   11.18   2.03   2.583 3.05   5.667   9.14   8.750   3.05   11.18   2.03   2.750 3.05   5.583   67.06   8.917   3.05   12.00   2.03   2.750 3.05   5.833   67.06   8.917   3.05   12.00   2.03   2.750 3.05   5.667   9.15   8.833   3.05   11.02   2.03   2.750 3.05   5.660   67.06   9.003   2.03   12.17   1.02   3.000 3.05   6.000   67.06   9.083   2.03   12.17   1.02   3.000 3.05   6.000   67.06   9.083   2.03   12.17   1.02   3.000 3.05   6.000   67.06   9.250   2.03    Max.Eff.Inten.(mm/hr) =  | 1.250                                       | 2.03    | 4.333 | 5.08     | 7.417     | 5.08  | 10.50 | 2.03  |  |
| 1.590 1.02   4.583   5.08   7.667   4.06   10.75   1.02   1.583 2.03   4.667   5.08   7.750   4.06   10.83 2.03   1.667 2.03   4.4750   5.08   7.750   4.06   10.83 2.03   1.750 2.03   4.4750   5.08   7.833   4.06   10.92 2.03   1.750 2.03   4.4750   5.08   7.833   4.06   11.00   2.03   1.833 1.02   4.917   6.10   8.000   4.06   11.00   2.03   1.917 1.02   5.000   6.10   8.083   5.08   11.17   1.02   2.000 1.02   5.003   5.08   5.08   8.167   5.08   11.25   1.02   2.003 2.03   5.167   5.08   8.250   5.08   11.25   1.02   2.083 2.03   5.167   5.08   8.250   5.08   11.25   1.02   2.167 2.03   5.250   5.08   8.333   3.05   11.42   2.03   2.250 2.03   5.333   8.13   8.417   3.05   11.50   2.03   2.250 2.03   5.333   8.13   8.417   3.05   11.50   2.03   2.333 3.05   5.417   8.13   8.580   3.05   11.67   1.02   2.417   3.05   5.500   8.13   8.583   3.05   11.67   1.02   2.583   3.05   5.5667   9.14   8.750   3.05   11.58   1.02   2.583   3.05   5.567   9.14   8.750   3.05   11.50   2.03   2.667   3.05   5.583   6.706   8.917   3.05   12.00   2.03   2.833   3.05   5.583   6.06   8.917   3.05   12.00   2.03   2.833   3.05   5.667   9.14   8.750   3.05   11.20   2.03   2.833   3.05   5.667   9.16   8.917   3.05   12.00   2.03   2.833   3.05   5.667   9.16   9.000   3.05   12.00   2.03   2.833   3.05   5.667   9.15   8.833   3.05   11.92   2.03   2.833   3.05   5.667   9.16   9.000   3.05   12.00   2.03   2.833   3.05   5.667   9.15   8.933   3.05   12.00   2.03   2.833   3.05   5.667   9.15   8.933   3.05   12.00   2.03   2.833   3.05   5.667   9.15   8.933   3.05   12.00   2.03   2.833   3.05   5.667   9.15   8.933   3.05   12.00   2.03   2.833   3.05   5.667   9.15   8.933   3.05   12.00   2.03   2.833   3.05   5.667   9.15   8.933   3.05   12.00   2.03   2.833   3.05   5.667   9.15   8.933   3.05   12.00   2.03   2.833   3.05   5.667   9.15   8.933   3.05   12.00   2.03   2.833   3.05   5.667   9.15   8.933   3.05   12.00   2.03   2.833   3.05   5.667   9.60   9.000   3.05   12.00   2.03   2.834   2.034   2.05   2.05  |   |         |       |          |           |       |       |       |  |
| 1.667 2.03   4.750   5.08   7.833   4.06   11.09   2.03   1.750   2.03   4.833   6.10   7.917   4.06   11.09   2.03   1.833   1.02   4.917   6.10   8.000   4.06   11.00   2.03   1.833   1.02   5.000   6.10   8.000   4.06   11.00   1.02   1.917   1.02   5.000   6.10   8.000   4.06   11.108   1.02   2.000   1.02   5.083   5.08   8.167   5.08   11.17   1.02   2.083   2.03   5.167   5.08   8.150   5.08   11.125   1.02   2.083   2.03   5.167   5.08   8.250   5.08   11.13   2.03   2.167   2.03   5.250   5.08   8.333   3.05   11.42   2.03   2.250   2.03   5.333   8.13   8.417   3.05   11.50   2.03   2.333   3.05   5.417   8.13   8.500   3.05   11.50   2.03   2.417   3.05   5.500   8.13   8.500   3.05   11.56   1.02   2.500   3.05   5.550   9.14   8.750   3.05   11.57   1.02   2.583   3.05   5.667   9.14   8.750   3.05   11.18   2.03   2.667   3.05   5.583   9.14   8.750   3.05   11.18   2.03   2.750   3.05   5.583   67.06   8.917   3.05   12.00   2.03   2.750   3.05   5.833   67.06   8.917   3.05   12.00   2.03   2.750   3.05   5.833   67.06   9.083   2.03   12.17   1.02   3.000   3.05   6.083   67.06   9.083   2.03   12.17   1.02   3.000   3.05   6.083   67.06   9.083   2.03   12.17   1.02   3.000   3.05   6.083   67.06   9.083   2.03   12.17   1.02   3.000   3.05   6.083   67.06   9.167   2.03   12.25   1.02   3.000   3.05   6.083   67.06   9.167   2.03   12.25   1.02   3.000   3.05   6.083   67.06   9.167   2.03   12.25   1.02   3.000   3.05   6.083   67.06   9.167   2.03   12.25   1.02   3.000   3.05   6.083   67.06   9.250   2.03    Max.Eff.Inten.(mm/hr) =   |   | 7 1.02  | 4.500 | 5.08     | 7.583     | 4.06  | 10.67 |       |  |
| 1.667 2.03   4.750   5.08   7.833   4.06   11.09   2.03   1.750   2.03   4.833   6.10   7.917   4.06   11.09   2.03   1.833   1.02   4.917   6.10   8.000   4.06   11.00   2.03   1.833   1.02   5.000   6.10   8.000   4.06   11.00   1.02   1.917   1.02   5.000   6.10   8.000   4.06   11.108   1.02   2.000   1.02   5.083   5.08   8.167   5.08   11.17   1.02   2.083   2.03   5.167   5.08   8.150   5.08   11.125   1.02   2.083   2.03   5.167   5.08   8.250   5.08   11.13   2.03   2.167   2.03   5.250   5.08   8.333   3.05   11.42   2.03   2.250   2.03   5.333   8.13   8.417   3.05   11.50   2.03   2.333   3.05   5.417   8.13   8.500   3.05   11.50   2.03   2.417   3.05   5.500   8.13   8.500   3.05   11.56   1.02   2.500   3.05   5.550   9.14   8.750   3.05   11.57   1.02   2.583   3.05   5.667   9.14   8.750   3.05   11.18   2.03   2.667   3.05   5.583   9.14   8.750   3.05   11.18   2.03   2.750   3.05   5.583   67.06   8.917   3.05   12.00   2.03   2.750   3.05   5.833   67.06   8.917   3.05   12.00   2.03   2.750   3.05   5.833   67.06   9.083   2.03   12.17   1.02   3.000   3.05   6.083   67.06   9.083   2.03   12.17   1.02   3.000   3.05   6.083   67.06   9.083   2.03   12.17   1.02   3.000   3.05   6.083   67.06   9.083   2.03   12.17   1.02   3.000   3.05   6.083   67.06   9.167   2.03   12.25   1.02   3.000   3.05   6.083   67.06   9.167   2.03   12.25   1.02   3.000   3.05   6.083   67.06   9.167   2.03   12.25   1.02   3.000   3.05   6.083   67.06   9.167   2.03   12.25   1.02   3.000   3.05   6.083   67.06   9.250   2.03    Max.Eff.Inten.(mm/hr) =   |   | 1.02    | 4.583 | 5.08     | 7.667     | 4.06  | 10.75 | 1.02  |  |
| 1.756 2.83 4.83 6.10 7.917 4.06 11.00 2.03 1.833 1.02 4.917 6.10 8.000 4.06 11.00 2.03 1.833 1.02 4.917 6.10 8.000 4.06 11.00 2.03 1.833 1.02 5.000 6.10 8.000 4.06 11.00 2.03 1.833 1.02 5.000 6.10 8.000 4.06 11.00 1.00 2.000 1.02 5.003 5.003 6.00 8.00 5.00 8.01 11.7 1.02 2.003 2.003 5.167 5.00 8.8 8.167 5.00 8.11.125 1.02 2.083 2.03 5.167 5.00 8.8 8.250 5.00 8.11.13 2.03 2.167 2.03 5.250 5.00 8.00 8.333 3.05 11.42 2.03 2.250 2.03 5.333 8.13 8.43 8.407 3.05 11.50 2.03 2.250 2.03 5.333 8.13 8.407 3.05 11.50 2.03 2.333 3.05 5.417 8.13 8.500 3.05 11.58 1.02 2.417 3.05 5.500 8.13 8.503 3.05 11.57 1.02 2.500 3.05 5.500 8.13 8.503 3.05 11.57 1.02 2.503 3.05 5.667 9.14 8.750 3.05 11.57 1.02 2.503 3.05 5.667 9.14 8.750 3.05 11.75 1.02 2.503 3.05 5.533 67.06 8.917 3.05 12.00 2.03 2.750 3.05 5.833 67.06 8.917 3.05 12.00 2.03 2.833 3.05 5.000 67.06 9.000 3.05 12.08 1.02 2.917 3.05 6.000 67.06 9.003 2.03 12.17 1.02 3.000 3.05 6.000 67.06 9.003 2.03 12.17 1.02 3.000 3.05 6.000 67.06 9.250 2.03   |   |         |       |          |           |       |       | 2.03  |  |
| 1.833 1.02   4.917   6.10   8.000   4.06   11.08   1.02   1.917   1.02   5.000   6.10   8.083   5.08   11.17   1.02   2.000   1.02   5.083   6.08   8.167   5.08   11.17   1.02   2.083   2.03   5.167   5.08   8.250   5.08   11.13   2.03   2.167   2.03   5.250   5.08   8.333   3.05   11.42   2.03   2.250   2.03   5.333   8.13   8.417   3.05   11.50   2.03   2.333   3.05   5.417   8.13   8.500   3.05   11.59   2.03   2.417   3.05   5.500   8.13   8.583   3.05   11.59   1.02   2.417   3.05   5.560   9.14   8.750   3.05   11.57   1.02   2.500   3.05   5.560   9.14   8.750   3.05   11.75   1.02   2.583   3.05   5.667   9.14   8.750   3.05   11.75   1.02   2.583   3.05   5.560   9.15   8.833   3.05   11.20   2.03   2.750   3.05   5.583   67.06   8.917   3.05   12.08   1.02   2.750   3.05   6.833   67.06   8.917   3.05   12.08   1.02   2.917   3.05   6.000   67.06   9.883   2.03   12.17   1.02   3.000   3.05   6.000   67.06   9.250   2.03    Max.Eff.Inten.(mm/hr) =  |   | 7 2.03  | 4.750 | 5.08     | 7.833     | 4.06  |       |       |  |
| 1.917   1.02   5.000   6.10   8.083   5.08   11.17   1.02   2.003   5.00   5.00   6.10   8.083   5.08   11.25   1.02   2.003   5.00     |   | 2.03    | 4.833 | 6.10     | 7.917     | 4.06  | 11.00 | 2.03  |  |
| 2.083   2.03   5.167   5.08   8.250   5.08   8.120   2.03   2.167   2.03   5.250   5.08   8.333   3.05   11.42   2.03   2.250   2.03   5.333   8.13   8.417   3.05   11.45   2.03   2.250   2.03   5.333   8.13   8.417   3.05   11.50   2.03   2.333   3.05   5.530   8.13   8.500   3.05   11.58   1.02   2.150   2.03   2.500   3.05   5.583   9.14   8.667   3.05   11.57   1.02   2.583   3.05   5.583   9.14   8.667   3.05   11.57   1.02   2.263   3.05   5.750   9.15   8.833   3.05   11.75   1.02   2.263   3.05   5.750   9.15   8.833   3.05   11.92   2.03   2.667   3.05   5.833   6.766   8.917   3.05   11.83   2.03   2.150   2.03   2.150   3.05   6.083   67.06   8.917   3.05   12.00   2.03   2.103      |   |         |       |          |           |       | 11.08 | 1.02  |  |
| 2.083   2.03   5.167   5.08   8.250   5.08   8.120   2.03   2.167   2.03   5.250   5.08   8.333   3.05   11.42   2.03   2.250   2.03   5.333   8.13   8.417   3.05   11.45   2.03   2.250   2.03   5.333   8.13   8.417   3.05   11.50   2.03   2.333   3.05   5.530   8.13   8.500   3.05   11.58   1.02   2.150   2.03   2.500   3.05   5.583   9.14   8.667   3.05   11.57   1.02   2.583   3.05   5.583   9.14   8.667   3.05   11.57   1.02   2.263   3.05   5.750   9.15   8.833   3.05   11.75   1.02   2.263   3.05   5.750   9.15   8.833   3.05   11.92   2.03   2.667   3.05   5.833   6.766   8.917   3.05   11.83   2.03   2.150   2.03   2.150   3.05   6.083   67.06   8.917   3.05   12.00   2.03   2.103      |   | 7 1.02  | 5.000 | 6.10     | 8.083     | 5.08  | 11.17 | 1.02  |  |
| 2.167   2.03   5.250   5.08   8.333   3.05   11.42   2.03     2.250   2.03   5.333   8.13   8.417   3.05   11.50   2.03     2.333   3.05   5.417   8.13   8.500   3.05   11.58   1.02     2.417   3.05   5.500   8.13   8.583   3.05   11.58   1.02     2.500   3.05   5.583   9.14   8.667   3.05   11.75   1.02     2.583   3.05   5.667   9.14   8.750   3.05   11.75   1.02     2.583   3.05   5.550   9.15   8.833   3.05   11.92     2.750   3.05   5.533   67.06   8.917   3.05   12.00   2.03     2.833   3.05   5.833   67.06   8.917   3.05   12.00   2.03     2.833   3.05   5.067   0.76   9.000   3.05   12.08   1.02     2.917   3.05   6.000   67.06   9.083   2.03   12.17   1.02     3.080   3.05   6.083   67.06   9.157   2.03   12.25   1.02     3.083   2.03   6.167   67.06   9.250   2.03    Max.Eff.Inten.(mm/hr)  |   |         |       |          |           |       |       |       |  |
| 2.256   2.63   5.333   8.417   3.65   11.50   2.63   | 2.083                                       | 3 2.03  | 5.167 | 5.08     | 8.250     | 5.08  |       |       |  |
| 2.256   2.63   5.333   8.417   3.65   11.50   2.63   | 2.16  | 7 2.03  | 5.250 | 5.08     | 8.333     | 3.05  | 11.42 | 2.03  |  |
| 2.590   3.05   5.583   9.14   8.667   3.05   11.83   2.03     2.583   3.05   5.667   9.14   8.750   3.05   11.83   2.03     2.667   3.05   5.5750   9.15   8.833   3.05   11.83   2.03     2.750   3.05   5.750   9.15   8.833   3.05   11.92   2.03     2.833   3.05   5.917   67.06   9.000   3.05   12.08   1.02     2.917   3.05   6.000   67.06   9.000   3.05   12.08   1.02     3.000   3.05   6.083   67.06   9.167   2.03   12.17   1.02     3.083   2.03   6.167   67.06   9.250   2.03   12.25   1.02    Max.Eff.Inten.(mm/hr) =  | 2.250                                       | 0 2.03  | 5.333 | 8.13     | 8.417     | 3.05  | 11.50 | 2.03  |  |
| 2.590   3.05   5.583   9.14   8.667   3.05   11.83   2.03     2.583   3.05   5.667   9.14   8.750   3.05   11.83   2.03     2.667   3.05   5.5750   9.15   8.833   3.05   11.83   2.03     2.750   3.05   5.750   9.15   8.833   3.05   11.92   2.03     2.833   3.05   5.917   67.06   9.000   3.05   12.08   1.02     2.917   3.05   6.000   67.06   9.000   3.05   12.08   1.02     3.000   3.05   6.083   67.06   9.167   2.03   12.17   1.02     3.083   2.03   6.167   67.06   9.250   2.03   12.25   1.02    Max.Eff.Inten.(mm/hr) =  | 2.33  | 3.05    | 5.417 | 8.13     | 8.500     | 3.05  | 11.58 | 1.02  |  |
| 2.583   3.05   5.667   9.14   8.750   3.05   11.93   2.03     2.667   3.05   5.750   9.15   8.833   3.05   11.92   2.03     2.750   3.05   5.833   67.06   8.917   3.05   11.90   2.03     2.833   3.05   5.917   67.06   9.000   3.05   12.00   2.03     2.833   3.05   5.917   67.06   9.000   3.05   12.08   1.02     2.917   3.05   6.000   67.06   9.000   3.05   12.108   1.02     3.000   3.05   6.083   67.06   9.167   2.03   12.15   1.02     3.083   2.03   6.167   67.06   9.250   2.03   12.25   1.02     3.083   2.03   6.167   67.06   9.250   2.03   12.25   1.02     3.083   2.08   15.00   15.00     Storage Coeff. (min) =  |   | 7 3.05  | 5.500 | 8.13     | 8.583     | 3.05  |       |       |  |
| 2.756    3.05    5.833    67.06    8.917    3.05    12.08    1.02  |   | 3.05    | 5.583 | 9.14     | 8.667     |       |       |       |  |
| 2.756    3.05    5.833    67.06    8.917    3.05    12.08    1.02  |   | 3.05    | 5.667 | 9.14     | 8.750     | 3.05  | 11.83 | 2.03  |  |
| 3.000 3.05   0.003   0.105   9.167   2.03   12.25   1.02   3.0083 2.03   6.167   67.06   9.250   2.03   12.25   1.02    Max.Eff.Inten.(mm/hr) = 67.06   46.22   0.00   0.00    Storage Coeff. (min) = 6.25 (ii) 12.59 (ii)    Unit Hyd. Tpeak (min) = 5.00   15.00    Unit Hyd. Tpeak (cms) = 0.19   0.08    PEAK FLOW (cms) = 0.06   0.04   0.105 (iii)    TIME TO PEAK (hrs) = 6.25   6.33   6.25    RUNOFF VOLUME (mm) = 72.42   39.68   53.42    TOTAL RAINFALL (mm) = 74.42   74.42   74.42   |   | 7 3.05  | 5.750 | 9.15     | 8.833     | 3.05  | 11.92 |       |  |
| 3.000 3.05   0.003   0.105   9.167   2.03   12.25   1.02   3.0083 2.03   6.167   67.06   9.250   2.03   12.25   1.02    Max.Eff.Inten.(mm/hr) = 67.06   46.22   0.00   0.00    Storage Coeff. (min) = 6.25 (ii) 12.59 (ii)    Unit Hyd. Tpeak (min) = 5.00   15.00    Unit Hyd. Tpeak (cms) = 0.19   0.08    PEAK FLOW (cms) = 0.06   0.04   0.105 (iii)    TIME TO PEAK (hrs) = 6.25   6.33   6.25    RUNOFF VOLUME (mm) = 72.42   39.68   53.42    TOTAL RAINFALL (mm) = 74.42   74.42   74.42   | 2.750                                       | 3.05    | 5.833 | 67.06    | 8.917     | 3.05  | 12.00 |       |  |
| 3.000 3.05   0.003   0.105   9.167   2.03   12.25   1.02   3.0083 2.03   6.167   67.06   9.250   2.03   12.25   1.02    Max.Eff.Inten.(mm/hr) = 67.06   46.22   0.00   0.00    Storage Coeff. (min) = 6.25 (ii) 12.59 (ii)    Unit Hyd. Tpeak (min) = 5.00   15.00    Unit Hyd. Tpeak (cms) = 0.19   0.08    PEAK FLOW (cms) = 0.06   0.04   0.105 (iii)    TIME TO PEAK (hrs) = 6.25   6.33   6.25    RUNOFF VOLUME (mm) = 72.42   39.68   53.42    TOTAL RAINFALL (mm) = 74.42   74.42   74.42   | 2.83  | 3.05    | 5.917 | 67.06    | 9.000     | 3.05  | 12.08 | 1.02  |  |
| 3.000 3.05   0.003   0.105   9.167   2.03   12.25   1.02   3.0083 2.03   6.167   67.06   9.250   2.03   12.25   1.02    Max.Eff.Inten.(mm/hr) = 67.06   46.22   0.00   0.00    Storage Coeff. (min) = 6.25 (ii) 12.59 (ii)    Unit Hyd. Tpeak (min) = 5.00   15.00    Unit Hyd. Tpeak (cms) = 0.19   0.08    PEAK FLOW (cms) = 0.06   0.04   0.105 (iii)    TIME TO PEAK (hrs) = 6.25   6.33   6.25    RUNOFF VOLUME (mm) = 72.42   39.68   53.42    TOTAL RAINFALL (mm) = 74.42   74.42   74.42   | 2.91  | 7 3.05  | 6.000 | 67.06    | 9.083     | 2.03  | 12.17 |       |  |
| Max.Eff.Inten.(mm/hr)=   |   | 3.05    | 6.083 | 6/.06    | 1 9.16/   | 2.03  | 12.25 | 1.02  |  |
| over (min)         5.00         15.00           Storage Coeff. (min)=         6.25 (ii)         12.59 (ii)           Unit Hyd. Tpeak (min)=         5.00         15.00           Unit Hyd. peak (cms)=         0.19         0.08           *TOTALS*           PEAK FLOW         (cms)=         0.06         0.04         0.105 (iii)           TIME TO PEAK         (hrs)=         6.25         6.33         6.25           RUNOFF VOLUME         (mm)=         72.42         39.68         53.42           TOTAL RAINFALL         (mm)=         74.42         74.42         74.42   | 3.083                                       | 3 2.03  | 6.167 | 67.06    | 9.250     | 2.03  | l     |       |  |
| over (min)         5.00         15.00           Storage Coeff. (min)=         6.25 (ii)         12.59 (ii)           Unit Hyd. Tpeak (min)=         5.00         15.00           Unit Hyd. peak (cms)=         0.19         0.08           *TOTALS*           PEAK FLOW         (cms)=         0.06         0.04         0.105 (iii)           TIME TO PEAK         (hrs)=         6.25         6.33         6.25           RUNOFF VOLUME         (mm)=         72.42         39.68         53.42           TOTAL RAINFALL         (mm)=         74.42         74.42         74.42   | /   |         |       |          |           |       |       |       |  |
| Storage Coeff. (min) = 6.25 (ii) 12.59 (ii)   Unit Hyd. Tpeak (min) = 5.00   15.00     15.00     Unit Hyd. peak (cms) = 0.19   0.08   *TOTALS*   |   |         |       |          |           |       |       |       |  |
| Unit Hyd. peak (cms)= 0.19 0.08 *TOTALS*  PEAK FLOW (cms)= 0.06 0.04 0.105 (iii)  TIME TO PEAK (hrs)= 6.25 6.33 6.25  RUNOFF VOLUME (mm)= 72.42 39.68 53.42  TOTAL RAINFALL (mm)= 74.42 74.42 74.42  |   |         |       |          |           | ,     |       |       |  |
| Unit Hyd. peak (cms)= 0.19 0.08 *TOTALS*  PEAK FLOW (cms)= 0.06 0.04 0.105 (iii)  TIME TO PEAK (hrs)= 6.25 6.33 6.25  RUNOFF VOLUME (mm)= 72.42 39.68 53.42  TOTAL RAINFALL (mm)= 74.42 74.42 74.42  | Storage Coeff.                              | (min)=  |       |          |           | .)    |       |       |  |
| PEAK FLOW (cms)= 0.06 0.04 0.105 (iii) TIME TO PEAK (hrs)= 6.25 6.33 6.25 RUNOFF VOLUME (mm)= 72.42 39.68 53.42 TOTAL RAINFALL (mm)= 74.42 74.42 74.42   |   |         |       |          |           |       |       |       |  |
| PEAK FLOW (cms)= 0.06 0.04 0.105 (iii) TIME TO PEAK (hrs)= 6.25 6.33 6.25 RUNOFF VOLUME (mm)= 72.42 39.68 53.42 TOTAL RAINFALL (mm)= 74.42 74.42 74.42   | ипіт нуб. реак                              | (cms)=  | 0.19  |          | 0.08      | ****  | TALC* |       |  |
| TIME TO PEAK (hrs)= 6.25 6.33 6.25 RUNOFF VOLUME (mm)= 72.42 39.68 53.42 TOTAL RAINFALL (mm)= 74.42 74.42 74.42  | DEAK FLOW                                   | ()      | 0.00  |          | 0.04      |       |       | `     |  |
| RUNOFF VOLUME (mm) = 72.42 39.68 53.42<br>TOTAL RAINFALL (mm) = 74.42 74.42 74.42  |   |         |       |          |           |       |       | ,     |  |
| TOTAL RAINFALL (mm)= 74.42 74.42 74.42   |   |         |       |          |           |       |       |       |  |
|  |   |         |       |          |           |       |       |       |  |
| NONOFF COEFFECIEN( = 0.9/ 0.33 0./2  |   |         |       |          |           |       |       |       |  |
|  | NUMOFF CUEFFICI                             | -IVI =  | 0.97  |          | 0.33      | ,     | 0.72  |       |  |

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|                      | Langs  | taffRd E | A Exist | ing WestDo | nWaters | hd         |      |  |
|----------------------|--------|----------|---------|------------|---------|------------|------|--|
| 0.250                |        | 3.333    |         | 6.417      | 13.21   |            | 3.05 |  |
|                      |        | 3.417    | 3.05    |            | 13.21   |            | 2.03 |  |
|                      | 1.02 İ | 3.500    | 3.05    |            | 13.21   | 9.67       | 2.03 |  |
|                      | 1.02 İ | 3.583    | 3.05    |            | 13.21   |            | 2.03 |  |
| 0.583                | 2.03 İ | 3.667    | 3.05    | 6.750      | 13.21   | 9.83       | 2.03 |  |
|                      |        | 3.750    | 3.05    |            | 6.10    |            | 2.03 |  |
|                      |        | 3.833    |         | 6.917      | 6.10    |            | 2.03 |  |
|                      |        | 3.917    | 3.05    |            | 6.10    |            | 2.03 |  |
| 0.917                | 1.02 İ | 4.000    | 3.05    | 7.083      | 6.10    | 10.17      | 2.03 |  |
|                      |        | 4.083    | 3.05    | 7.167      | 6.10    | 10.25      | 2.03 |  |
|                      |        | 4.167    | 3.05    |            | 6.10    |            | 2.03 |  |
|                      |        | 4.250    | 3.05    |            | 5.08    |            | 2.03 |  |
|                      |        | 4.333    | 5.08    | 7.417      | 5.08    | 10.50      | 2.03 |  |
| 1.333                | 1.02 İ | 4.417    | 5.08    | 7.500      | 5.08    | 10.58      | 1.02 |  |
|                      |        | 4.500    | 5.08    |            | 4.06    | 10.67      | 1.02 |  |
|                      |        | 4.583    |         | 7.667      | 4.06    |            | 1.02 |  |
|                      |        | 4.667    | 5.08    |            | 4.06    | 10.83      | 2.03 |  |
|                      |        | 4.750    | 5.08    | 7.833      | 4.06    |            | 2.03 |  |
|                      |        | 4.833    | 6.10    |            | 4.06    |            | 2.03 |  |
|                      |        | 4.917    |         | 8.000      | 4.06    |            | 1.02 |  |
| 1.917                | 1.02 İ | 5.000    | 6.10    | 8.083      | 5.08    | 11.17      | 1.02 |  |
|                      |        | 5.083    | 5.08    |            | 5.08    | 11.25      | 1.02 |  |
|                      | 2.03   |          | 5.08    |            | 5.08    |            | 2.03 |  |
|                      |        | 5.250    | 5.08    |            | 3.05    |            | 2.03 |  |
|                      | 2.03 İ | 5.333    | 8.13    | 8.417      | 3.05    | 11.50      | 2.03 |  |
|                      |        | 5.417    | 8.13    |            | 3.05    | 11.58      | 1.02 |  |
|                      |        | 5.500    |         | 8.583      | 3.05    |            | 1.02 |  |
| 2.500                | 3.05 j | 5.583    | 9.14    | 8.667      | 3.05    | 11.75      | 1.02 |  |
| 2.583                | 3.05 j | 5.667    | 9.14    | 8.750      | 3.05    | 11.83      | 2.03 |  |
| 2.667                | 3.05   | 5.750    | 9.15    | 8.833      | 3.05    | 11.92      | 2.03 |  |
| 2.750                | 3.05   | 5.833    | 67.06   | 8.917      | 3.05    | 12.00      | 2.03 |  |
| 2.833                | 3.05   | 5.917    | 67.06   | 9.000      | 3.05    | 12.08      | 1.02 |  |
| 2.917                | 3.05   | 6.000    | 67.06   | 9.083      | 2.03    | 12.17      | 1.02 |  |
| 3.000                | 3.05   | 6.083    | 67.06   | 9.167      | 2.03    | 12.25      | 1.02 |  |
| 3.083                | 2.03   | 6.167    | 67.06   | 9.250      | 2.03    |            |      |  |
| Max.Eff.Inten.(mm/hr | )=     | 67.06    |         | 41.26      |         |            |      |  |
| over (min            |        | 5.00     |         | 15.00      |         |            |      |  |
| Storage Coeff. (min  |        | 5.30     | (ii)    | 10.05 (ii) |         |            |      |  |
| Unit Hyd. Tpeak (min |        | 5.00     | ()      | 15.00      | '       |            |      |  |
| Unit Hyd. peak (cms  |        | 0.21     |         | 0.10       |         |            |      |  |
| (                    | ,      |          |         |            | *T01    | TALS*      |      |  |
| PEAK FLOW (cms       |        | 1.49     |         | 0.18       |         | .665 (iii) |      |  |
| TIME TO PEAK (hrs    |        | 6.25     |         | 6.33       |         | 5.25       |      |  |
| RUNOFF VOLUME (mm    |        | 73.42    |         | 35.19      |         | .78        |      |  |
| TOTAL RAINFALL (mm   |        | 74.42    |         | 74.42      |         | 74.42      |      |  |
| RUNOFF COEFFICIENT   | =      | 0.99     |         | 0.47       | 6       | 88.6       |      |  |
|                      |        |          |         |            |         |            |      |  |

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: CN\* = 79.0 Ta = Dep. Storage (Above) (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

# $\label{langstaffRd_EA_Existing_WestDonWatershd} \mbox{(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.}$

| CALIB             |            |          |       |         |           |       |  |
|-------------------|------------|----------|-------|---------|-----------|-------|--|
| STANDHYD ( 0350)  | Area       | (ha)=    | 0.90  |         |           |       |  |
| ID= 1 DT= 5.0 min | Total      | Imp(%)=  | 70.00 | Dir.    | Conn.(%)= | 70.00 |  |
|                   |            |          |       |         |           |       |  |
|                   |            | IMPERVIO | OUS   | PERVIOL | JS (i)    |       |  |
| Surface Area      | (ha)=      | 0.63     | 3     | 0.27    | ,         |       |  |
| Dep. Storage      | ( mm ) =   | 1.00     | 9     | 5.00    | )         |       |  |
| Average Slope     | (%)=       | 1.00     | )     | 2.00    | )         |       |  |
| Length            | (m)=       | 77.46    | 5     | 40.00   | )         |       |  |
| Mannings n        | ` <i>=</i> | 0.013    | 3     | 0.250   | )         |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250   | 67.05 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333   | 13.21 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417   | 13.21 | 9.50  | 3.05  |
| 0.333 | 1.02  | 3.417 | 3.05     | 6.500   | 13.21 | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05     | 6.583   | 13.21 | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 3.05     | 6.667   | 13.21 | 9.75  | 2.03  |
| 0.583 | 2.03  | 3.667 | 3.05     | 6.750   | 13.21 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 3.05     | 6.833   | 6.10  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 3.05     | 6.917   | 6.10  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 3.05     | 7.000   | 6.10  | 10.08 | 2.03  |
| 0.917 | 1.02  | 4.000 | 3.05     | 7.083   | 6.10  | 10.17 | 2.03  |
| 1.000 | 1.02  | 4.083 | 3.05     | 7.167   | 6.10  | 10.25 | 2.03  |
| 1.083 | 2.03  | 4.167 | 3.05     | 7.250   | 6.10  | 10.33 | 2.03  |
| 1.167 | 2.03  | 4.250 | 3.05     | 7.333   | 5.08  | 10.42 | 2.03  |
| 1.250 | 2.03  | 4.333 | 5.08     | 7.417   | 5.08  | 10.50 | 2.03  |
| 1.333 | 1.02  | 4.417 | 5.08     | 7.500   | 5.08  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 5.08     | 7.583   | 4.06  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 5.08     |         | 4.06  | 10.75 | 1.02  |
| 1.583 | 2.03  |       | 5.08     |         | 4.06  |       | 2.03  |
| 1.667 | 2.03  | 4.750 | 5.08     |         | 4.06  |       | 2.03  |
| 1.750 | 2.03  | 4.833 | 6.10     |         | 4.06  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 6.10     |         | 4.06  | 11.08 | 1.02  |
| 1.917 | 1.02  | 5.000 | 6.10     |         | 5.08  | 11.17 | 1.02  |
| 2.000 | 1.02  | 5.083 | 5.08     | 8.167   | 5.08  | 11.25 | 1.02  |
| 2.083 | 2.03  | 5.167 | 5.08     | 8.250   | 5.08  | 11.33 | 2.03  |
| 2.167 | 2.03  | 5.250 | 5.08     | 8.333   | 3.05  | 11.42 | 2.03  |
| 2.250 | 2.03  | 5.333 | 8.13     | 8.417   | 3.05  | 11.50 | 2.03  |
| 2.333 | 3.05  | 5.417 | 8.13     | 8.500   | 3.05  | 11.58 | 1.02  |
| 2.417 | 3.05  | 5.500 | 8.13     | 8.583   | 3.05  | 11.67 | 1.02  |
| 2.500 | 3.05  | 5.583 | 9.14     | 8.667   | 3.05  | 11.75 | 1.02  |
| 2.583 | 3.05  | 5.667 | 9.14     | 8.750   | 3.05  | 11.83 | 2.03  |
| 2.667 | 3.05  | 5.750 | 9.15     | 8.833   | 3.05  | 11.92 | 2.03  |

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|      | LangstaffRd_EA_Existing_WestDonWatershd |      |       |      |      |       |      |  |  |  |  |  |
|------|---|------|-------|------|------|-------|------|--|--|--|--|--|
| 0.75 | 1.02                                    | 4.00 | 4.06  | 7.25 | 6.10 | 10.50 | 2.03 |  |  |  |  |  |
| 1.00 | 2.03                                    | 4.25 | 3.05  | 7.50 | 5.08 | 10.75 | 1.02 |  |  |  |  |  |
| 1.25 | 1.02                                    | 4.50 | 5.08  | 7.75 | 5.08 | 11.00 | 2.03 |  |  |  |  |  |
| 1.50 | 2.03                                    | 4.75 | 6.10  | 8.00 | 5.08 | 11.25 | 2.03 |  |  |  |  |  |
| 1.75 | 2.03                                    | 5.00 | 6.10  | 8.25 | 4.06 | 11.50 | 1.02 |  |  |  |  |  |
| 2.00 | 1.02                                    | 5.25 | 5.08  | 8.50 | 4.06 | 11.75 | 2.03 |  |  |  |  |  |
| 2.25 | 2.03                                    | 5.50 | 10.16 | 8.75 | 3.05 | 12.00 | 1.02 |  |  |  |  |  |
| 2.50 | 3.05                                    | 5.75 | 10.16 | 9.00 | 3.05 | 12.25 | 2.03 |  |  |  |  |  |
| 2.75 | 3.05                                    | 6.00 | 73.15 | 9.25 | 3.05 | l     |      |  |  |  |  |  |
| 3.00 | 4.06                                    | 6.25 | 74.17 | 9.50 | 3.05 | l     |      |  |  |  |  |  |
| 3.25 | 3.05                                    | 6.50 | 15.24 | 9.75 | 2.03 |       |      |  |  |  |  |  |
|      |   |      |       |      |      |       |      |  |  |  |  |  |

| CALIB         | Area<br>Total | (ha)=<br>Imp(%)= | 3.05<br>62.00 | Dir. Conn.(%)= | 62.00 |
|---------------|---------------|------------------|---------------|----------------|-------|
|               |               | IMPERVI          | ous           | PERVIOUS (i)   |       |
| Surface Area  | (ha)=         | 1.8              | 9             | 1.16           |       |
| Dep. Storage  | (mm)=         | 2.0              | 0             | 5.00           |       |
| Average Slope | (%)=          | 1.0              | 0             | 2.00           |       |
| Length        | (m)=          | 531.0            | 0             | 40.00          |       |
| Mannings n    | =             | 0.01             | 3             | 0.250          |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    |       | D HYETOGR | APH   |       |       |
|-------|-------|-------|-------|-----------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN  | ' TIME    | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr | ' hrs     | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05  | 6.250     | 74.17 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05  | 6.333     | 15.24 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 3.05  | 6.417     | 15.24 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 3.05  | 6.500     | 15.24 | 9.58  | 2.03  |
| 0.417 | 2.03  | 3.500 | 3.05  | 6.583     | 14.22 | 9.67  | 2.03  |
| 0.500 | 2.03  | 3.583 | 3.05  | 6.667     | 14.22 | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 3.05  | 6.750     | 14.22 | 9.83  | 3.05  |
| 0.667 | 1.02  | 3.750 | 3.05  | 6.833     | 7.11  | 9.92  | 3.05  |
| 0.750 | 1.02  | 3.833 | 4.06  | 6.917     | 7.11  | 10.00 | 3.05  |
| 0.833 | 2.03  | 3.917 | 4.06  | 7.000     | 7.11  | 10.08 | 2.03  |
| 0.917 | 2.03  | 4.000 | 4.06  | 7.083     | 6.10  | 10.17 | 2.03  |
| 1.000 | 2.03  | 4.083 | 3.05  | 7.167     | 6.10  | 10.25 | 2.03  |
| 1.083 | 1.02  | 4.167 | 3.05  | 7.250     | 6.10  | 10.33 | 2.03  |
| 1.167 | 1.02  | 4.250 | 3.05  | 7.333     | 5.08  | 10.42 | 2.03  |
| 1.250 | 1.02  | 4.333 | 5.08  | 7.417     | 5.08  | 10.50 | 2.03  |
| 1.333 | 2.03  | 4.417 | 5.08  | 7.500     | 5.08  | 10.58 | 1.02  |
| 1.417 | 2.03  | 4.500 | 5.08  | 7.583     | 5.08  | 10.67 | 1.02  |
| 1.500 | 2.03  | 4.583 | 6.10  | 7.667     | 5.08  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 6.10  | 7.750     | 5.08  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 6.10  | 7.833     | 5.08  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 6.10  | 7.917     | 5.08  | 11.00 | 2.03  |
|       |       |       | D     | 424       |       |       |       |
|       |       |       | Page  | 131       |       |       |       |
|       |       |       |       |           |       |       |       |

|  | Langst                   | affRd F       | Δ Fyist            | ing West                       | DonWaters    | :hd       |          |
|--|--------------------------|---------------|--------------------|--------------------------------|--------------|-----------|----------|
| 2.750  |                          |               |                    |                                |              |           | 2.03     |
| 2.833  | 3.05                     | 5.917         | 67.06              | 9.000                          | 3.05         | 12.08     | 1.02     |
| 2.917  | 3.05                     | 6.000         | 67.06              | 9.083                          | 2.03         | 12.17     | 1.02     |
| 3.000  | 3.05  <br>3.05  <br>2.03 | 6.083         | 67.06              | 9.167                          | 2.03         | 12.25     | 1.02     |
| 3.083  | 2.03                     | 6.167         | 67.06              | 9.250                          | 2.03         | l         |          |
| Max.Eff.Inten.(mm<br>over (<br>Storage Coeff. (<br>Unit Hyd. Tpeak (<br>Unit Hyd. peak ( | /hr)=                    | 67.06         |                    | 39.79                          |              |           |          |
| over (   | min)                     | 5.00          |                    | 15.00                          |              |           |          |
| Storage Coeff. (   | min)=                    | 2.57          | (ii)               | 12.78 (                        | ii)          |           |          |
| Unit Hyd. Ipeak (  | min)=                    | 5.00          |                    | 15.00                          |              |           |          |
| unit nyu. peak (   | CIIIS)=                  | 0.29          |                    | 0.00                           | ****         | TALS*     |          |
| PFAK FLOW (  | cms)=                    | 0.12          |                    | 0.02                           |              | .140 (iii | )        |
| TIME TO PEAK (   | hrs)=                    | 6.25          |                    | 6.33                           | _            | 6.25      | ,        |
| RUNOFF VOLUME  | (mm)=                    | 73.42         |                    | 35.19                          | 6            | 1.95      |          |
| TOTAL RAINFALL   | (mm)=                    | 74.42         |                    | 74.42                          | 7            | 4.42      |          |
| PEAK FLOW ( TIME TO PEAK ( RUNOFF VOLUME TOTAL RAINFALL RUNOFF COEFFICIEN                | Ť =                      | 0.99          |                    | 6.33<br>35.19<br>74.42<br>0.47 |              | 0.83      |          |
| **** WARNING: STORAGE  | COEFF. IS                | S SMALL       | ER THAN            | TIME ST                        | EP!          |           |          |
| (i) CN PROCEDUR  | E SELECTEI               | D FOR P       | ERVIOUS            | LOSSES:                        |              |           |          |
| CN* = 79   |                          |               |                    |                                |              |           |          |
| (ii) TIME STEP (   |                          |               |                    | R ÈQUAL                        | •            |           |          |
| THAN THE ST  |                          |               |                    |                                |              |           |          |
| (iii) PEAK FLOW D  | OES NOT IN               | NCLUDE I      | BASEFLO            | W IF ANY                       |              |           |          |
| ADD HYD ( 0375)  <br>1 + 2 = 3  <br>ID1= 1 ( 0300<br>+ ID2= 2 ( 0350                     | ARI<br>(h:               | EA QI<br>a) ( | PEAK<br>cms)       | TPEAK<br>(hrs)                 | R.V.<br>(mm) |           |          |
| + ID2= 2 ( 0350  | ): 10.0                  | 90 0.         | 140                | 6.25                           | 61.95        |           |          |
| ID = 3 ( 0375  |                          |               |                    |                                | 65.46        |           |          |
| NOTE: PEAK FLOWS   |                          |               |                    |                                |              |           |          |
| ************   |                          |               |                    |                                |              |           |          |
| ** SIMULATION:Run 06   | **                       |               |                    |                                |              |           |          |
| *************  | *******                  | *             |                    |                                |              |           |          |
| DEAD STORM   | E43                      |               |                    | ! \ •                          |              |           |          |
| READ STORM   | Filename                 |               | sers∖ra<br>Local∖T |                                | ррυ          |           |          |
| i  |                          |               |                    |                                | 9819-1b44    | 900a1c25\ | d7466973 |
| Ptotal= 82.04 mm   | Comments                 |               |                    |                                |              |           |          |
|  | RAIN                     |               |                    |                                |              |           |          |
| hrs  | mm/hr                    | hrs           | mm/hr              | ' hr                           | s mm/hr      | hrs       | mm/hr    |
| 0.25   | 0.00                     | 3.50          | 3.05               | 6.75                           | 14.22        | 10.00     | 3.05     |
| 0.50   | 2.03                     | 3.75          | 3.05               | 7.00                           | 7.11         | 10.25     | 2.03     |
|  |                          |               | Page               | 130                            |              |           |          |
|  |                          |               |                    |                                |              |           |          |

|                     | Langs | taffRd_E | A_Exist | ing_WestDon | Waters | hd         |      |
|---------------------|-------|----------|---------|-------------|--------|------------|------|
| 1.833               | 1.02  | 4.917    | 6.10    | 8.000       | 5.08   | 11.08      | 2.03 |
| 1.917               | 1.02  | 5.000    | 6.10    | 8.083       | 4.06   | 11.17      | 2.03 |
| 2.000               | 1.02  | 5.083    | 5.08    | 8.167       | 4.06   | 11.25      | 2.03 |
| 2.083               | 2.03  | 5.167    | 5.08    | 8.250       | 4.06   | 11.33      | 1.02 |
| 2.167               | 2.03  |          | 5.08    |             | 4.06   |            | 1.02 |
| 2.250               | 2.03  | 5.333    | 10.16   |             | 4.06   |            | 1.02 |
| 2.333               | 3.05  | 5.417    | 10.16   | 8.500       | 4.06   | 11.58      | 2.03 |
| 2.417               | 3.05  | 5.500    | 10.16   | 8.583       | 3.05   | 11.67      | 2.03 |
| 2.500               | 3.05  | 5.583    | 10.16   | 8.667       | 3.05   | 11.75      | 2.03 |
| 2.583               | 3.05  | 5.667    | 10.16   | 8.750       | 3.05   | 11.83      | 1.02 |
| 2.667               | 3.05  | 5.750    | 10.16   | 8.833       | 3.05   | 11.92      | 1.02 |
| 2.750               | 3.05  | 5.833    | 73.15   | 8.917       | 3.05   | 12.00      | 1.02 |
| 2.833               | 4.06  | 5.917    | 73.15   | 9.000       | 3.05   | 12.08      | 2.03 |
| 2.917               | 4.06  | 6.000    | 73.15   | 9.083       | 3.05   | 12.17      | 2.03 |
| 3.000               | 4.06  | 6.083    | 74.17   | 9.167       | 3.05   | 12.25      | 2.03 |
| 3.083               | 3.05  | 6.167    | 74.17   | 9.250       | 3.05   |            |      |
| Max.Eff.Inten.(mm/h | nr)=  | 74.17    |         | 57.55       |        |            |      |
| over (mi            |       | 10.00    |         | 20.00       |        |            |      |
|                     | in)=  |          | (ii)    | 16.64 (ii)  |        |            |      |
| Unit Hyd. Tpeak (mi |       | 10.00    | (/      | 20.00       |        |            |      |
|                     | ns)=  | 0.13     |         | 0.06        |        |            |      |
|                     | ,     |          |         |             | *T0    | TALS*      |      |
| PEAK FLOW (cr       | ns)=  | 0.38     |         | 0.13        | 0      | .493 (iii) |      |
|                     | -s)=  | 6.25     |         | 6.42        |        | 5.25       |      |
| RUNOFF VOLUME (r    | nm)=  | 80.04    |         | 50.13       | 68     | 3.67       |      |
| TOTAL RAINFALL (r   | nm)=  | 82.04    |         | 82.04       |        | 2.04       |      |
| RUNOFF COEFFICIENT  | =     | 0.98     |         | 0.61        |        | 0.84       |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 86.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB         | Area<br>Total | (ha)= 1.2<br>Imp(%)= 52.0 | 7<br>0 Dir. Conn.(%)= | 52.00 |
|---------------|---------------|---------------------------|-----------------------|-------|
|               |               |                           |                       |       |
|               |               | IMPERVIOUS                | PERVIOUS (i)          |       |
| Surface Area  | (ha)=         | 0.66                      | 0.61                  |       |
| Dep. Storage  | ( mm ) =      | 2.00                      | 5.00                  |       |
| Average Slope | (%)=          | 1.00                      | 2.00                  |       |
| Length        | (m)=          | 503.00                    | 25.00                 |       |
| Mannings n    | =             | 0.013                     | 0.250                 |       |
|               |               |                           |                       |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

|                 | Lange  | taffRd F | A Evict | ing WestDo | nWatere | hd        |      |
|-----------------|--------|----------|---------|------------|---------|-----------|------|
| TIMI            |        |          | RAIN    |            | RAIN    |           | RAI  |
| hr              |        | l hrs    | mm/hr   | l' hrs     | mm/hr   |           | mm/h |
| 0.08            |        |          | 3.05    |            | 74.17   |           | 3.05 |
| 0.16            |        |          | 3.05    |            | 15.24   |           | 3.05 |
| 0.250           |        |          | 3.05    |            | 15.24   | 9.50      | 3.05 |
| 0.33            |        |          | 3.05    |            | 15.24   |           | 2.03 |
| 0.41            |        | 3.500    |         | 6.583      | 14.22   |           | 2.03 |
| 0.50            |        |          | 3.05    |            | 14.22   |           | 2.03 |
| 0.58            |        |          |         | 6.750      | 14.22   |           | 3.05 |
| 0.66            |        |          |         | 6.833      | 7.11    |           | 3.05 |
| 0.75            |        |          | 4.06    |            | 7.11    |           | 3.05 |
| 0.83            |        |          |         | 7.000      | 7.11    |           | 2.03 |
| 0.91            |        |          | 4.06    |            | 6.10    |           | 2.03 |
| 1.000           |        |          | 3.05    |            | 6.10    |           | 2.03 |
| 1.08            |        |          | 3.05    |            | 6.10    |           | 2.03 |
| 1.16            |        |          | 3.05    |            | 5.08    |           | 2.03 |
| 1.25            |        | 4.230    | 5.08    |            | 5.08    |           | 2.03 |
|                 |        |          |         |            |         |           |      |
| 1.33            |        | 4.417    | 5.08    |            | 5.08    |           | 1.02 |
| 1.41            |        |          | 5.08    |            | 5.08    |           | 1.02 |
| 1.500           |        | 4.583    | 6.10    |            | 5.08    |           | 1.02 |
| 1.58            |        |          | 6.10    |            | 5.08    |           | 2.03 |
| 1.66            |        | 4.750    | 6.10    |            | 5.08    |           | 2.03 |
| 1.750           |        | 4.833    | 6.10    |            | 5.08    |           | 2.03 |
| 1.83            |        |          | 6.10    |            | 5.08    |           | 2.03 |
| 1.91            |        |          |         | 8.083      | 4.06    |           | 2.03 |
| 2.000           |        | 5.083    |         | 8.167      | 4.06    |           | 2.03 |
| 2.08            |        |          | 5.08    |            | 4.06    |           | 1.02 |
| 2.16            |        |          |         | 8.333      | 4.06    |           | 1.02 |
| 2.250           |        |          |         | 8.417      | 4.06    |           | 1.02 |
| 2.33            |        |          |         | 8.500      | 4.06    |           | 2.03 |
| 2.41            |        |          |         | 8.583      | 3.05    |           | 2.03 |
| 2.500           |        |          | 10.16   |            | 3.05    |           | 2.03 |
| 2.58            |        |          |         | 8.750      | 3.05    |           | 1.02 |
| 2.66            |        |          |         | 8.833      | 3.05    |           | 1.02 |
| 2.750           |        |          | 73.15   |            | 3.05    |           | 1.02 |
| 2.83            |        |          | 73.15   |            | 3.05    | 12.08     | 2.03 |
| 2.91            |        |          | 73.15   |            | 3.05    |           | 2.03 |
| 3.000           |        |          | 74.17   |            | 3.05    |           | 2.03 |
| 3.08            | 3 3.05 | 6.167    | /4.1/   | 9.250      | 3.05    |           |      |
| Max.Eff.Inten.( |        | 74.17    |         | 53.29      |         |           |      |
|                 | (min)  | 10.00    |         | 15.00      |         |           |      |
| Storage Coeff.  | (min)= | 7.59     | (ii)    | 14.44 (ii  | )       |           |      |
| Unit Hyd. Tpeak |        | 10.00    |         | 15.00      |         |           |      |
| Unit Hyd. peak  | (cms)= | 0.13     |         | 0.08       | ******  | ALS*      |      |
| PEAK FLOW       | (cms)= | 0.13     |         | 0.07       |         | 196 (iii) |      |
| TIME TO PEAK    | (hrs)= | 6.25     |         | 6.33       |         | 5.25      |      |
| RUNOFF VOLUME   | (mm)=  | 80.04    |         | 45.99      |         | 3.69      |      |
| TOTAL RAINFALL  | (mm)=  | 82.04    |         | 82.04      |         | 2.04      |      |
| RUNOFF COEFFICI |        | 0.98     |         | 0.56       |         | 3.78      |      |
|                 |        |          |         |            |         | -         |      |
|                 |        |          |         |            |         |           |      |

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| Lar  | ngstaffRd_EA_E                 | xisting_West | DonWaters | hd        |      |
|--|--------------------------------|--------------|-----------|-----------|------|
| 2.41/ 3.0  | 5   5.500 16                   | 0.16   8.583 | 3.05      | 11.6/     | 2.03 |
| 2.500 3.0  | 5   5.583 16                   | 0.16   8.66/ | 3.05      | 11.75     | 2.03 |
| 2.583 3.0  | 5   5.66/ 16                   | 1.16   8.750 | 3.05      | 11.83     | 1.02 |
| 2.00/ 3.0  | 5   5./50 10                   | 1.10   0.033 | 3.05      | 11.92     | 1.02 |
| 2.750 5.0  | 5   5.033 /3<br>6   5.017 73   | 15   0.917   | 3.05      | 12.00     | 2.02 |
| 2.655 4.0  | 6   5.917 73<br>6   6 000 73   | 15   9.000   | 3.05      | 12.00     | 2.03 |
| 2.917 4.0  | 6   6.000 7.                   | 17   0 167   | 2.05      | 12.1/     | 2.03 |
| 3.083 3.0  | ngstaffRd_EA_E<br>5     5.500  | .17   9.250  | 3.05      | 12.23     | 2.03 |
| Max.Eff.Inten.(mm/hr)= over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)=                     | 7/ 17                          | 54 69        |           |           |      |
| over (min)   | 10 00                          | 20 00        |           |           |      |
| Storage Coeff. (min)=  | 7.59 (ii                       | ) 15.15 (i   | i)        |           |      |
| Unit Hvd. Tneak (min)=   | 10.00                          | 20.00        | /         |           |      |
| Unit Hyd. peak (cms)=  | 0.13                           | 0.07         |           |           |      |
| , , , ,  |                                |              | *T0       | TALS*     |      |
| PEAK FLOW (cms)=   | 0.11                           | 0.09         | 0         | .198 (iii | )    |
| TIME TO PEAK (hrs)=  | 6.25                           | 6.33         |           | 5.25      | •    |
| RUNOFF VOLUME (mm)=  | 80.04                          | 47.32        | 66        | 3.40      |      |
| TOTAL RAINFALL (mm)=   | 82.04                          | 82.04        | 82        | 2.04      |      |
| PEAK FLOW (cms)= TIME TO PEAK (hrs)= RUNOFF VOLUME (mm)= TOTAL RAINFALL (mm)= RUNOFF COEFFICIENT = | 0.98                           | 0.58         | 82        | 3.74      |      |
| CN* = 84.0<br>(ii) TIME STEP (DT) SH<br>THAN THE STORAGE<br>(iii) PEAK FLOW DOES NO                | OULD BE SMALLE<br>COEFFICIENT. | R OR EQUAL   |           |           |      |
| ADD HYD ( 0420) <br>1 + 2 = 3  <br>ID1= 1 ( 0135):<br>+ ID2= 2 ( 0140):                            | AREA QPEAK                     | TPEAK        | R.V.      |           |      |
| ID1= 1 ( 0135):  | 1.43 0.198                     | 6.25         | 60.40     |           |      |
| + ID2= 2 ( 0140):  | 1.27 0.196                     | 6.25         | 63.69     |           |      |
| ID = 3 ( 0420):  |                                |              |           |           |      |
| NOTE: PEAK FLOWS DO NO   | T INCLUDE BASE                 | FLOWS IF ANY | ·.        |           |      |
| ADD HYD ( 0425) <br>1 + 2 = 3  <br>ID1= 1 ( 0145):   | AREA OPEAK                     | TPEAK        | R.V.      |           |      |
| 1 + 2 = 3  | (ha) (cms)                     | (hrs)        | (mm)      |           |      |
| ID1= 1 ( 0145):  | 3.05 0.493                     | 6.25         | 68.67     |           |      |
| + ID2= 2 ( 0420):  | 2.70 0.394                     | 6.25         | 61.95     |           |      |
|  |                                |              |           |           |      |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY. Page 135

ID = 3 ( 0425): 5.75 0.887 6.25 65.52

- Langstaffrd\_EA\_Existing\_WestDonWatershd
  (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)
  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
  THAN THE STORAGE COEFFICIENT.
  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

IMPERVIOUS (i) 0.57 0.86 2.00 5.00 1.00 2.00 503.00 30.00 0.013 0.250 Surface Area Dep. Storage Average Slope Length Mannings n (ha)= (mm)= (%)= (m)=

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TRA   | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05     | 6.250   | 74.17 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05     | 6.333   | 15.24 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417   | 15.24 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 3.05     | 6.500   | 15.24 | 9.58  | 2.03  |
| 0.417 | 2.03  | 3.500 | 3.05     | 6.583   | 14.22 | 9.67  | 2.03  |
| 0.500 | 2.03  | 3.583 | 3.05     | 6.667   | 14.22 | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 3.05     | 6.750   | 14.22 |       | 3.05  |
| 0.667 | 1.02  | 3.750 | 3.05     | 6.833   | 7.11  | 9.92  | 3.05  |
| 0.750 | 1.02  | 3.833 | 4.06     | 6.917   | 7.11  | 10.00 | 3.05  |
| 0.833 | 2.03  |       | 4.06     | 7.000   | 7.11  |       | 2.03  |
| 0.917 | 2.03  | 4.000 | 4.06     | 7.083   | 6.10  | 10.17 | 2.03  |
| 1.000 | 2.03  | 4.083 | 3.05     | 7.167   | 6.10  | 10.25 | 2.03  |
| 1.083 | 1.02  | 4.167 | 3.05     | 7.250   | 6.10  |       | 2.03  |
| 1.167 | 1.02  | 4.250 | 3.05     | 7.333   | 5.08  | 10.42 | 2.03  |
| 1.250 | 1.02  | 4.333 | 5.08     | 7.417   | 5.08  | 10.50 | 2.03  |
| 1.333 | 2.03  |       | 5.08     | 7.500   | 5.08  | 10.58 | 1.02  |
| 1.417 | 2.03  | 4.500 | 5.08     | 7.583   | 5.08  | 10.67 | 1.02  |
| 1.500 | 2.03  | 4.583 | 6.10     | 7.667   | 5.08  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 6.10     | 7.750   | 5.08  |       | 2.03  |
| 1.667 | 2.03  | 4.750 | 6.10     | 7.833   | 5.08  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 6.10     | 7.917   | 5.08  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 6.10     | 8.000   | 5.08  | 11.08 | 2.03  |
| 1.917 | 1.02  | 5.000 | 6.10     | 8.083   | 4.06  | 11.17 | 2.03  |
| 2.000 | 1.02  | 5.083 | 5.08     | 8.167   | 4.06  | 11.25 | 2.03  |
| 2.083 | 2.03  | 5.167 | 5.08     | 8.250   | 4.06  | 11.33 | 1.02  |
| 2.167 | 2.03  | 5.250 | 5.08     | 8.333   | 4.06  | 11.42 | 1.02  |
| 2.250 | 2.03  | 5.333 | 10.16    | 8.417   | 4.06  | 11.50 | 1.02  |
| 2.333 | 3.05  | 5.417 | 10.16    | 8.500   | 4.06  | 11.58 | 2.03  |

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| LangstaffRd | EA | Existing | _WestDonWatershd |
|-------------|----|----------|------------------|

| CALIB             |       |         |       |        |           |       |  |
|-------------------|-------|---------|-------|--------|-----------|-------|--|
| STANDHYD ( 0210)  | Area  | (ha)=   | 0.96  |        |           |       |  |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 44.00 | Dir.   | Conn.(%)= | 44.00 |  |
|                   |       |         |       |        |           |       |  |
|                   |       | IMPERVI | OUS   | PERVIO | JS (i)    |       |  |
| Surface Area      | (ha)= | 0.4     | 2     | 0.5    | 4         |       |  |
| Dep. Storage      | (mm)= | 2.0     | 0     | 5.00   |           |       |  |
| Average Slope     | (%)=  | 1.0     | 0     | 2.0    | 9         |       |  |
| Length            | (m)=  | 470.0   | 0     | 20.0   | 9         |       |  |
| Mannings n        | ` =   | 0.01    | 3     | 0.25   | 9         |       |  |
|                   |       |         |       |        |           |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| • | KAINFAL | L WAS I | KANSFORM |         | J.O MIN.  | IIME SIE | .г.   |       |
|---|---------|---------|----------|---------|-----------|----------|-------|-------|
|   |         |         | TR/      | NSFORME | D HYETOGR | ΔΡΗ      |       |       |
|   | TIME    | RAIN    |          | RAIN    | l' TIME   | RAIN     |       | RAIN  |
|   | hrs     | mm/hr   | hrs      | mm/hr   |           | mm/hr    | hrs   | mm/hr |
|   | 0.083   | 0.00    | 3.167    | 2 05    | 6 250     | 74.17    | 9.33  | 3.05  |
|   | 0.167   |         | 3.250    | 3.05    | 6.333     | 15.24    |       | 3.05  |
|   | 0.250   |         | 3.333    | 3.05    | 6.417     |          |       | 3.05  |
|   | 0.333   |         | 3.417    |         |           | 15.24    |       | 2.03  |
|   | 0.417   | 2.03    | 3.500    | 3.05    | 6.583     | 14.22    | 9.67  | 2.03  |
|   | 0.500   |         | 3.583    | 3.05    |           | 14.22    |       | 2.03  |
|   | 0.583   |         | 3.667    | 3.05    | 6.750     | 14.22    | 9.83  | 3.05  |
|   | 0.667   | 1.02    | 3.750    | 3.05    | 6.833     | 7.11     | 9.92  | 3.05  |
|   | 0.750   | 1.02    | 3.833    | 4.06    | 6.917     | 7.11     | 10.00 | 3.05  |
|   | 0.833   | 2.03    | 3.917    | 4.06    | 7.000     | 7.11     | 10.08 | 2.03  |
|   | 0.917   | 2.03    | 4.000    | 4.06    | 7.083     | 6.10     | 10.17 | 2.03  |
|   | 1.000   | 2.03    | 4.083    | 3.05    | 7.167     | 6.10     | 10.25 | 2.03  |
|   | 1.083   | 1.02    | 4.167    | 3.05    | 7.250     | 6.10     | 10.33 | 2.03  |
|   | 1.167   | 1.02    | 4.250    | 3.05    | 7.333     | 5.08     | 10.42 | 2.03  |
|   | 1.250   | 1.02    | 4.333    | 5.08    |           | 5.08     | 10.50 | 2.03  |
|   | 1.333   | 2.03    | 4.417    | 5.08    | 7.500     | 5.08     | 10.58 | 1.02  |
|   | 1.417   | 2.03    | 4.500    | 5.08    |           | 5.08     | 10.67 | 1.02  |
|   | 1.500   | 2.03    | 4.583    | 6.10    | 7.667     | 5.08     | 10.75 | 1.02  |
|   | 1.583   |         | 4.667    |         | 7.750     | 5.08     |       | 2.03  |
|   | 1.667   |         | 4.750    | 6.10    |           | 5.08     |       | 2.03  |
|   | 1.750   |         | 4.833    | 6.10    |           | 5.08     |       | 2.03  |
|   | 1.833   |         | 4.917    | 6.10    |           | 5.08     |       | 2.03  |
|   | 1.917   |         | 5.000    | 6.10    |           |          |       |       |
|   | 2.000   |         | 5.083    | 5.08    |           |          |       | 2.03  |
|   | 2.083   | 2.03    |          | 5.08    |           | 4.06     |       | 1.02  |
|   | 2.167   | 2.03    |          | 5.08    |           | 4.06     |       | 1.02  |
|   | 2.250   |         | 5.333    | 10.16   |           | 4.06     |       | 1.02  |
|   | 2.333   | 3.05    |          | 10.16   |           | 4.06     |       | 2.03  |
|   | 2.417   |         | 5.500    | 10.16   |           | 3.05     |       | 2.03  |
|   | 2.500   |         | 5.583    |         |           |          |       | 2.03  |
|   | 2.583   |         | 5.667    |         |           | 3.05     |       | 1.02  |
|   | 2.667   |         | 5.750    | 10.16   |           | 3.05     |       | 1.02  |
|   | 2.750   |         | 5.833    |         | 8.917     | 3.05     |       | 1.02  |
|   | 2.833   | 4.06    | 5.917    | 73.15   | 9.000     | 3.05     | 12.08 | 2.03  |
|   |         |         |          |         |           |          |       |       |

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#### LangstaffRd\_EA\_Existing\_WestDonWatershd 4.06 | 6.000 73.15 | 9.083 3.05 | 12.17 4.06 | 6.083 74.17 | 9.167 3.05 | 12.25 3.05 | 6.167 74.17 | 9.250 3.05 | 2.917 3.083 Max.Eff.Inten.(mm/hr)= over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)= 74.17 5.00 7.29 (ii) 5.00 0.17 53.29 15.00 13.28 (ii) 15.00 0.08 \*TOTALS\* 0.09 6.25 80.04 82.04 0.98 PEAK FLOW (cms)= TIME TO PEAK (hrs)= RUNOFF VOLUME (mm)= TOTAL RAINFALL (mm)= RUNOFF COEFFICIENT = TOTALS\* 0.144 (iii) 6.25 60.96 82.04 0.74 0.06 6.33 45.99 82.04 0.56

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
- (1) CN\* PROCEDURE SELECTED FOR FEATURES LOSSES.

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COEFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |         |       |         |           |       |
|-------------------|-------|---------|-------|---------|-----------|-------|
| STANDHYD ( 0205)  | Area  | (ha)=   | 1.11  |         |           |       |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 38.00 | Dir.    | Conn.(%)= | 38.00 |
|                   |       |         |       |         |           |       |
|                   |       | IMPERVI | OUS   | PERVIOL | JS (i)    |       |
| Surface Area      | (ha)= | 0.4     | 2     | 0.69    | 9         |       |
| Dep. Storage      | (mm)= | 2.0     | а     | 5.00    | •         |       |
| Average Slope     | (%)=  | 1.0     | а     | 2.00    | •         |       |
| Length            | (m)=  | 470.0   | а     | 20.00   | •         |       |
| Mannings n        | ` '=  | 0.01    | 3     | 0.250   | 9         |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   | -     |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05     | 6.250   | 74.17 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05     | 6.333   | 15.24 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417   | 15.24 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 3.05     | 6.500   | 15.24 | 9.58  | 2.03  |
| 0.417 | 2.03  | 3.500 | 3.05     | 6.583   | 14.22 | 9.67  | 2.03  |
| 0.500 | 2.03  | 3.583 | 3.05     | 6.667   | 14.22 | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 3.05     | 6.750   | 14.22 | 9.83  | 3.05  |
| 0.667 | 1.02  | 3.750 | 3.05     | 6.833   | 7.11  | 9.92  | 3.05  |
| 0.750 | 1.02  | 3.833 | 4.06     | 6.917   | 7.11  | 10.00 | 3.05  |
| 0.833 | 2.03  | 3.917 | 4.06     | 7.000   | 7.11  | 10.08 | 2.03  |
| 0.917 | 2.03  | 4.000 | 4.06     | 7.083   | 6.10  | 10.17 | 2.03  |

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|            |        | Langstaff | Rd_EA_Ex | isting_West | DonWater | shd |
|------------|--------|-----------|----------|-------------|----------|-----|
| + ID2= 2 ( | 0210): | 0.96      | 0.144    | 6.25        | 60.96    |     |
|            |        |           |          |             |          |     |
| TD = 3 (   | 0460): | 2.07      | 0.305    | 6.25        | 59.87    |     |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS TE ANY.

| CALIB             |       |         |       |                |       |
|-------------------|-------|---------|-------|----------------|-------|
| STANDHYD ( 0230)  | Area  | (ha)=   | 0.70  |                |       |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 57.00 | Dir. Conn.(%)= | 57.00 |
|                   |       |         |       |                |       |
|                   |       | IMPERVI | 0US   | PERVIOUS (i)   |       |
| Surface Area      | (ha)= | 0.4     | 0     | 0.30           |       |
| Dep. Storage      | (mm)= | 2.0     | 0     | 5.00           |       |
| Average Slope     | (%)=  | 1.0     | 0     | 2.00           |       |
| Length            | (m)=  | 320.0   | 0     | 25.00          |       |
| Mannings n        | ` =   | 0.01    | 3     | 0.290          |       |
|                   |       |         |       |                |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR      | ANSFORME | HYETOGR | ΔРН   |       |       |
|-------|-------|---------|----------|---------|-------|-------|-------|
| TIME  | RAIN  |         |          |         | RAIN  |       | RAIN  |
| hrs   | mm/hr | hrs     | mm/hr    | ' hrs   | mm/hr | i hrs | mm/hr |
| 0.083 | 0.00  | 3.167   | 3.05     | 6.250   | 74.17 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250   | 3.05     | 6.333   | 15.24 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333   | 3.05     | 6.417   | 15.24 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417   | 3.05     | 6.500   | 15.24 | 9.58  | 2.03  |
| 0.417 | 2.03  | 3.500   | 3.05     | 6.583   | 14.22 | 9.67  | 2.03  |
| 0.500 | 2.03  | 3.583   | 3.05     | 6.667   | 14.22 | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667   | 3.05     | 6.750   | 14.22 | 9.83  | 3.05  |
| 0.667 | 1.02  | 3.750   | 3.05     | 6.833   | 7.11  | 9.92  | 3.05  |
| 0.750 | 1.02  | 3.833   | 4.06     | 6.917   | 7.11  | 10.00 | 3.05  |
| 0.833 | 2.03  | 3.917   | 4.06     | 7.000   | 7.11  | 10.08 | 2.03  |
| 0.917 | 2.03  | 4.000   | 4.06     | 7.083   | 6.10  | 10.17 | 2.03  |
| 1.000 | 2.03  | 4.083   | 3.05     | 7.167   | 6.10  | 10.25 | 2.03  |
| 1.083 | 1.02  | 4.167   | 3.05     | 7.250   | 6.10  | 10.33 | 2.03  |
| 1.167 | 1.02  | 4.250   |          |         |       |       | 2.03  |
| 1.250 | 1.02  | 4.333   | 5.08     | 7.417   | 5.08  | 10.50 | 2.03  |
| 1.333 | 2.03  | 4.417   | 5.08     | 7.500   | 5.08  | 10.58 | 1.02  |
| 1.417 | 2.03  | 4.500   | 5.08     | 7.583   |       |       |       |
| 1.500 | 2.03  |         | 6.10     |         | 5.08  |       | 1.02  |
| 1.583 | 2.03  |         | 6.10     |         | 5.08  |       | 2.03  |
| 1.667 | 2.03  |         | 6.10     |         |       |       | 2.03  |
| 1.750 | 2.03  | 4.833   |          |         |       | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917   | 6.10     |         | 5.08  | 11.08 | 2.03  |
| 1.917 | 1.02  | 5.000   | 6.10     | 8.083   | 4.06  | 11.17 | 2.03  |
| 2.000 | 1.02  | 5.083   | 5.08     | 8.167   | 4.06  | 11.25 | 2.03  |
| 2.083 | 2.03  | 5.167   | 5.08     | 8.250   | 4.06  | 11.33 | 1.02  |
| 2.167 | 2.03  | 5.250   | 5.08     |         |       | 11.42 | 1.02  |
| 2.250 | 2.03  | 5.333   | 10.16    |         |       |       | 1.02  |
| 2.333 |       | 5.417   | 10.16    |         | 4.06  | 11.58 | 2.03  |
| 2.417 | 3.05  | 1 5.500 | 10.16    | 8.583   | 3.05  | 11.67 | 2.03  |

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LangstaffRd_EA_Existing_WestDonWatershd
2.03 | 4.083 | 3.05 | 7.167 | 6.10 | 16
1.02 | 4.167 | 3.05 | 7.259 | 6.10 | 16
1.02 | 4.250 | 3.05 | 7.333 | 5.08 | 16
1.02 | 4.250 | 3.05 | 7.333 | 5.08 | 16
1.02 | 4.333 | 5.08 | 7.6417 | 5.08 | 16
2.03 | 4.500 | 5.08 | 7.583 | 5.08 | 16
2.03 | 4.500 | 5.08 | 7.583 | 5.08 | 16
2.03 | 4.500 | 5.08 | 7.583 | 5.08 | 16
2.03 | 4.567 | 6.10 | 7.657 | 5.08 | 16
2.03 | 4.667 | 6.10 | 7.759 | 5.08 | 16
2.03 | 4.759 | 6.10 | 7.759 | 5.08 | 16
2.03 | 4.759 | 6.10 | 7.833 | 5.08 | 17
1.02 | 5.000 | 6.10 | 8.000 | 5.08 | 11
1.02 | 5.000 | 6.10 | 8.000 | 5.08 | 12
1.02 | 5.000 | 6.10 | 8.000 | 5.08 | 12
1.02 | 5.000 | 6.10 | 8.000 | 5.08 | 12
1.02 | 5.500 | 6.10 | 8.000 | 5.08 | 12
1.02 | 5.500 | 6.10 | 8.000 | 5.08 | 12
1.02 | 5.500 | 6.10 | 8.000 | 6.00 | 6.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 | 7.
                                                                                                         1.000
                                                                                                                                                                                                                                                                                                                                                                                                6.10 | 10.25
6.10 | 10.33
                                                                                                           1.083
                                                                                                         1.083
1.167
1.250
1.333
1.417
1.500
1.583
                                                                                                                                                                                                                                                                                                                                                                                                                                            10.33
10.42
10.50
10.58
10.67
10.75
10.83
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           2.03
2.03
1.02
1.02
1.02
                                                                                                         1.667
                                                                                                                                                                                                                                                                                                                                                                                                                                              10.92
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               2.03
                                                                                                           1.750
                                                                                                                                                                                                                                                                                                                                                                                                                                              11.00
11.08
11.17
11.25
11.33
11.42
                                                                                                         1.833
1.917
2.000
2.083
2.167
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           2.03
2.03
2.03
1.02
1.02
                                                                                                         2,250
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               1.02
                                                                                                                                                                                                                                                                                                                                                                                            4.06 | 11.50

4.06 | 11.58

3.05 | 11.67

3.05 | 11.75

3.05 | 11.83

3.05 | 11.92

3.05 | 12.00

3.05 | 12.00

3.05 | 12.02

3.05 | 12.17

3.05 | 12.25

3.05 |
                                                                                                         2.333
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             2.03
                                                                                                           2.417
                                                                                                         2.417
2.500
2.583
2.667
2.750
2.833
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           2.03
1.02
1.02
1.02
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             2.03
                                                                                                           2.917
                                                                                                           3.000
                            Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                                                                                                                                                                                            74.17
5.00
7.29 (ii)
                                                                                                                                                                                                                                                                                                                53.29
15.00
13.28 (ii)
                                                                                                                                                                                                                                   5.00
0.17
                                                                                                                                                                                                                                                                                                                        15.00
                                                                                                                                                                                                                                                                                                                             0.08
                                                                                                                                                                                                                                                                                                                                                                                                                  *TOTALS*
                            PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                                                                                                                                                                                              0.09
6.25
80.04
82.04
0.98
                                                                                                                                                                                                                                                                                                                                                                                                                         TOTALS*
0.160 (iii)
6.25
58.92
82.04
0.72
                                                                                                                                                                                                                                                                                                                      0.08
6.33
45.99
82.04
0.56
                                          (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
                              (1) CN* PROCEDURE SELECTED FOR FEXTURES USED SELECTED FOR FEXTURE STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
| ADD HYD ( 0460)|
| 1 + 2 = 3 |
                                                                                                                                                                                               AREA QPEAK
(ha) (cms)
1.11 0.160
                                                                                                                                                                                                                                                                                                        (hrs)
6.25
                                                   ID1= 1 ( 0205):
```

|                 | Langs   | taffRd E | A Exist | ing WestDon | Watershd |         |      |
|-----------------|---------|----------|---------|-------------|----------|---------|------|
| 2.50            | 0 3.05  | 5.583    | 10.16   | 8.667       | 3.05   1 | 1.75    | 2.03 |
| 2.58            | 3 3.05  | 5.667    | 10.16   | 8.750       | 3.05   1 | 1.83    | 1.02 |
| 2.66            | 7 3.05  | 5.750    | 10.16   | 8.833       | 3.05   1 | 1.92    | 1.02 |
| 2.75            | 0 3.05  | 5.833    | 73.15   | 8.917       | 3.05   1 | 2.00    | 1.02 |
| 2.83            | 3 4.06  | 5.917    | 73.15   | 9.000       | 3.05   1 | 2.08    | 2.03 |
| 2.91            | 7 4.06  | 6.000    | 73.15   | 9.083       | 3.05   1 | 2.17    | 2.03 |
| 3.00            | 0 4.06  | 6.083    | 74.17   | 9.167       | 3.05   1 | 2.25    | 2.03 |
| 3.08            | 3 3.05  | 6.167    | 74.17   | 9.250       | 3.05     |         |      |
|                 |         |          |         |             |          |         |      |
| Max.Eff.Inten.( | mm/hr)= | 74.17    |         | 50.57       |          |         |      |
| over            | (min)   | 5.00     |         | 15.00       |          |         |      |
| Storage Coeff.  | (min)=  | 5.79     | (ii)    | 13.43 (ii)  |          |         |      |
| Unit Hyd. Tpeak | (min)=  | 5.00     |         | 15.00       |          |         |      |
| Unit Hyd. peak  | (cms)=  | 0.20     |         | 0.08        |          |         |      |
|                 |         |          |         |             | *TOTAL   | S*      |      |
| PEAK FLOW       | (cms)=  | 0.08     |         | 0.03        | 0.11     | 2 (iii) |      |
| TIME TO PEAK    | (hrs)=  | 6.25     |         | 6.33        | 6.2      | 5       |      |
| RUNOFF VOLUME   | (mm)=   | 80.04    |         | 43.44       | 64.3     | 0       |      |
| TOTAL RAINFALL  | (mm)=   | 82.04    |         | 82.04       | 82.0     | 4       |      |
| RUNOFF COEFFICI | ENT =   | 0.98     |         | 0.53        | 0.7      | 8       |      |
|                 |         |          |         |             |          |         |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 81.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB                                   |          |                  |       |        |              |       |
|---|----------|------------------|-------|--------|--------------|-------|
| STANDHYD ( 0225) <br> ID= 1 DT= 5.0 min | Area     | (ha)=<br>Imp(%)= | 0.90  | Din    | Conn.(%)=    | E2 00 |
|   | IUCAI    | IIIb(%)-         | 33.00 | DII.   | COIIII. (%)- | 33.00 |
|   |          | IMPERVI          | ous   | PERVIO | JS (i)       |       |
| Surface Area                            | (ha)=    | 0.4              | 8     | 0.42   | 2            |       |
| Dep. Storage                            | ( mm ) = | 2.0              | 0     | 5.00   | 9            |       |
| Average Slope                           | (%)=     | 1.0              | 0     | 2.00   | 9            |       |
| Length                                  | (m)=     | 320.0            | 0     | 25.00  | 9            |       |
| Mannings n                              | ` =      | 0.01             | 3     | 0.256  | 9            |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TRANSFORMED HYETOGRAPH |   |             |  |   |   |  |  |  |  |
|------------------------|---|-------------|--|---|---|--|--|--|--|
| RAIN                   | TIME  | RAIN        | ' TIME   | RAIN  | TIME  | RAIN   |  |  |  |
| mm/hr                  | hrs   | mm/hr       | ' hrs  | mm/hr   | hrs   | mm/hr  |  |  |  |
| 0.00                   | 3.167   | 3.05        | 6.250  | 74.17   | 9.33  | 3.05   |  |  |  |
| 0.00                   | 3.250   | 3.05        | 6.333  | 15.24   | 9.42  | 3.05   |  |  |  |
| 0.00                   | 3.333   | 3.05        | 6.417  | 15.24   | 9.50  | 3.05   |  |  |  |
| 2.03                   | 3.417   | 3.05        | 6.500  | 15.24   | 9.58  | 2.03   |  |  |  |
| 2.03                   | 3.500   | 3.05        | 6.583  | 14.22   | 9.67  | 2.03   |  |  |  |
| 2.03                   | 3.583   | 3.05        | 6.667  | 14.22   | 9.75  | 2.03   |  |  |  |
|                        | mm/hr<br>0.00<br>0.00<br>0.00<br>2.03<br>2.03 | RAIN   TIME | RAIN   TIME   RAIN   mm/hr   hrs   mm/hr   0.00   3.167   3.05   0.00   3.250   3.05   0.00   3.333   3.05   2.03   3.417   3.05   2.03   3.590   3.05 | RAIN   TIME   RAIN   TIME   mm/hr   hrs   mm/hr   hrs   mm/hr   hrs   0.00   3.167   3.05   6.250   0.00   3.250   3.05   6.333   0.00   3.333   3.05   6.417   2.03   3.417   3.05   6.500   2.03   3.500   3.05   6.580 | RAIN   TIME   RAIN   TIME   RAIN   TIME   RAIN   RAIN   TIME   RAIN | mm/hr         hrs         mm/hr         hrs         mm/hr         hrs           0.00         3.167         3.05         6.250         74.17         9.33           0.00         3.250         3.05         6.333         15.24         9.42           0.00         3.333         3.05         6.417         15.24         9.50           2.03         3.417         3.05         6.500         15.24         9.58           2.03         3.500         3.05         6.583         14.22         9.67 |  |  |  |

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|                    | Langs | taffRd F | Δ Fyist | ing WestDo | nWaters | hd         |      |
|--------------------|-------|----------|---------|------------|---------|------------|------|
| 0.583              | 1.02  |          |         | 6.750      | 14.22   |            | 3.05 |
| 0.667              | 1.02  | 3.750    | 3.05    |            | 7.11    |            | 3.05 |
| 0.750              | 1.02  | 3.833    |         | 6.917      | 7.11    |            | 3.05 |
| 0.833              |       | 3.917    |         | 7.000      | 7.11    |            | 2.03 |
| 0.917              | 2.03  |          | 4.06    |            | 6.10    |            | 2.03 |
| 1.000              |       | 4.083    |         | 7.167      | 6.10    |            | 2.03 |
| 1.083              | 1.02  |          | 3.05    |            | 6.10    |            | 2.03 |
| 1.167              |       | 4.250    | 3.05    |            | 5.08    |            | 2.03 |
| 1.250              |       | 4.333    | 5.08    |            | 5.08    |            | 2.03 |
| 1.333              |       | 4.417    | 5.08    |            | 5.08    |            | 1.02 |
| 1.417              |       | 4.500    | 5.08    |            | 5.08    |            | 1.02 |
| 1.500              |       | 4.583    | 6.10    |            | 5.08    |            | 1.02 |
| 1.583              | 2.03  |          | 6.10    |            | 5.08    |            | 2.03 |
| 1.667              |       | 4.750    | 6.10    |            | 5.08    |            | 2.03 |
| 1.750              | 2.03  |          | 6.10    |            | 5.08    |            | 2.03 |
| 1.833              | 1.02  |          | 6.10    |            | 5.08    |            | 2.03 |
| 1.917              |       | 5.000    |         | 8.083      | 4.06    |            | 2.03 |
| 2.000              | 1.02  |          | 5.08    |            | 4.06    |            | 2.03 |
| 2.083              | 2.03  |          | 5.08    |            | 4.06    |            | 1.02 |
| 2.167              |       | 5.250    |         | 8.333      | 4.06    |            | 1.02 |
| 2.250              | 2.03  |          | 10.16   |            | 4.06    |            | 1.02 |
| 2.333              | 3.05  | 5.417    | 10.16   | 8.500      | 4.06    |            | 2.03 |
| 2.417              | 3.05  |          |         | 8.583      | 3.05    |            | 2.03 |
| 2.500              | 3.05  |          | 10.16   | 8.667      | 3.05    |            | 2.03 |
| 2.583              | 3.05  |          |         | 8.750      | 3.05    |            | 1.02 |
| 2.667              | 3.05  | 5.750    | 10.16   | 8.833      | 3.05    | 11.92      | 1.02 |
| 2.750              | 3.05  | 5.833    | 73.15   | 8.917      | 3.05    | 12.00      | 1.02 |
| 2.833              | 4.06  | 5.917    | 73.15   | 9.000      | 3.05    | 12.08      | 2.03 |
| 2.917              | 4.06  | 6.000    | 73.15   | 9.083      | 3.05    | 12.17      | 2.03 |
| 3.000              | 4.06  | 6.083    | 74.17   | 9.167      | 3.05    | 12.25      | 2.03 |
| 3.083              | 3.05  | 6.167    | 74.17   | 9.250      | 3.05    | ĺ          |      |
| Max.Eff.Inten.(mm/ | hr)=  | 74.17    |         | 53.29      |         |            |      |
| over (m            |       | 5.00     |         | 15.00      |         |            |      |
|                    | in)=  | 5.79     | (ii)    | 12.63 (ii) |         |            |      |
| Unit Hyd. Tpeak (m | in)=  | 5.00     | ` ′     | 15.00      |         |            |      |
|                    | ms)=  | 0.20     |         | 0.08       |         |            |      |
|                    |       |          |         |            | *T0     | TALS*      |      |
| PEAK FLOW (c       | ms)=  | 0.10     |         | 0.05       | 0       | .145 (iii) |      |
| TIME TO PEAK (h    | rs)=  | 6.25     |         | 6.33       |         | 5.25 ` ′   |      |
| RUNOFF VOLUME (    | mm)=  | 80.04    |         | 45.99      | 64      | 4.03       |      |
| TOTAL RAINFALL (   | mm)=  | 82.04    |         | 82.04      | 8:      | 2.04       |      |
| RUNOFF COEFFICIENT | =     | 0.98     |         | 0.56       | (       | 2.78       |      |
|                    |       |          |         |            |         |            |      |

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  $CN^*=83.0$  Ia=Dep. Storage (Above) (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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LangstaffRd\_EA\_Existing\_WestDowNatersh 2.03 | 5.167 | 5.08 | 8.250 | 4.06 | 2.03 | 5.250 | 5.08 | 8.333 | 4.06 | 2.03 | 5.333 | 10.16 | 8.447 | 4.06 | 3.05 | 5.447 | 10.16 | 8.590 | 4.06 | 3.05 | 5.500 | 10.16 | 8.583 | 3.05 | 3.05 | 5.560 | 10.16 | 8.683 | 3.05 | 3.05 | 5.567 | 10.16 | 8.750 | 3.05 | 3.05 | 5.750 | 10.16 | 8.8750 | 3.05 | 3.05 | 5.533 | 73.15 | 8.917 | 3.05 | 3.05 | 5.750 | 10.16 | 8.833 | 3.05 | 3.05 | 5.750 | 10.16 | 8.833 | 3.05 | 3.05 | 5.750 | 10.16 | 8.833 | 3.05 | 4.06 | 6.903 | 73.15 | 9.000 | 3.05 | 4.06 | 6.003 | 74.17 | 9.167 | 3.05 | 3.05 | 6.167 | 74.17 | 9.250 | 3.05 | 2.083 2.167 2.250 11.33 11.42 11.50 1.02 1.02 1.02 2.03 2.333 3.05 | 5.417 3.05 | 5.500 3.05 | 5.583 3.05 | 5.667 3.05 | 5.750 3.05 | 5.83 4.06 | 6.900 4.06 | 6.008 3.05 | 6.167 11.58 11.67 11.75 11.83 11.92 12.00 12.08 12.17 2.417 2.03 2.41/ 2.500 2.583 2.667 2.750 2.833 2.03 1.02 1.02 1.02 2.03 2.03 2.03 2.917 12.25 3.083 Max.Eff.Inten.(mm/hr)= over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)= 74.17 5.00 5.11 (ii) 5.00 0.21 53.29 15.00 11.10 (ii) 15.00 0.09 \*TOTALS\* 0.06 6.25 80.04 82.04 0.98 PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 0.102 (iii) 6.25 61.64 82.04 0.75 0.04 6.33 45.99 82.04

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB | STANDHYD ( 0215)| |ID= 1 DT= 5.0 min | CALIB Area (ha)= 0.58 Total Imp(%)= 57.00 Dir. Conn.(%)= 57.00 (ha)= (mm)= (%)= (m)= Surface Area 0.33 2.00 1.00 0.25 5.00 2.00 Dep. Storage Average Slope Length Mannings n 260.00 30.00 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

- TRANSFORMED HYETOGRAPH -RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME mm/hr | hrs mm/hr | hrs mm/hr | hrs 0.00 | 3.167 | 3.05 | 6.250 | 74.17 | 9.33 TTME RATN

#### LangstaffRd\_EA\_Existing\_WestDonWatershd

| ADD HYD ( 0475)   |              |                |                |       |
|-------------------|--------------|----------------|----------------|-------|
| 1 + 2 = 3         | AREA<br>(ha) | QPEAK<br>(cms) | TPEAK<br>(hrs) | R.V.  |
| ID1= 1 ( 0225):   | 0.90         | 0.145          | 6.25           | 64.03 |
| + ID2= 2 ( 0230): | 0.70         | 0.112          | 6.25           | 64.30 |
| ================  |              |                | ======         |       |
| ID = 3 ( 0475):   | 1.60         | 0.257          | 6.25           | 64.14 |

| 10 = 3 ( 04       | /5): 1    | .00 0.2           | 0.25        | 64.14     |       |  |
|-------------------|-----------|-------------------|-------------|-----------|-------|--|
| NOTE: PEAK FLOI   | WS DO NOT | INCLUDE BA        | ASEFLOWS IF | ANY.      |       |  |
|                   |           |                   |             |           |       |  |
| CALIB             |           |                   |             |           |       |  |
| STANDHYD ( 0220)  | Area      | (ha)= 6           | 9.65        |           |       |  |
| ID= 1 DT= 5.0 min | Total I   | mp(%) = 46        | 5.00 Dir.   | Conn.(%)= | 46.00 |  |
|                   |           |                   |             |           |       |  |
|                   |           | <b>IMPERVIOUS</b> | 5 PERVIOL   | JS (i)    |       |  |
| Surface Area      | (ha)=     | 0.30              | 0.35        | 5         |       |  |
| Dep. Storage      | (mm)=     | 2.00              | 5.00        | )         |       |  |
| Average Slope     | (%)=      | 1.00              | 2.00        | )         |       |  |
| Length            | (m)=      | 260.00            | 20.00       | )         |       |  |
| Mannings n        | ` =       | 0.013             | 0.256       | )         |       |  |
| · ·               |           |                   |             |           |       |  |
|                   |           |                   |             |           |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       |       |      | HYETOGR |       |       |       |
|-------|-------|-------|------|---------|-------|-------|-------|
| TIME  | RAIN  |       |      | ' TIME  | RAIN  |       | RAIN  |
| hrs   | mm/hr | hrs   |      | ' hrs   |       |       | mm/hr |
| 0.083 | 0.00  |       |      |         | 74.17 |       | 3.05  |
| 0.167 | 0.00  |       |      |         | 15.24 |       | 3.05  |
| 0.250 | 0.00  |       | 3.05 |         | 15.24 |       | 3.05  |
| 0.333 | 2.03  | 3.417 | 3.05 | 6.500   | 15.24 | 9.58  | 2.03  |
| 0.417 | 2.03  | 3.500 | 3.05 | 6.583   | 14.22 | 9.67  | 2.03  |
| 0.500 | 2.03  | 3.583 | 3.05 | 6.667   | 14.22 | 9.75  | 2.03  |
| 0.583 | 1.02  |       | 3.05 | 6.750   | 14.22 |       | 3.05  |
| 0.667 | 1.02  | 3.750 | 3.05 | 6.833   | 7.11  | 9.92  | 3.05  |
| 0.750 | 1.02  | 3.833 | 4.06 | 6.917   | 7.11  | 10.00 | 3.05  |
| 0.833 | 2.03  | 3.917 | 4.06 | 7.000   | 7.11  | 10.08 | 2.03  |
| 0.917 | 2.03  | 4.000 | 4.06 | 7.083   | 6.10  | 10.17 | 2.03  |
| 1.000 | 2.03  | 4.083 | 3.05 | 7.167   | 6.10  | 10.25 | 2.03  |
| 1.083 | 1.02  | 4.167 | 3.05 | 7.250   | 6.10  | 10.33 | 2.03  |
| 1.167 | 1.02  | 4.250 | 3.05 | 7.333   | 5.08  | 10.42 | 2.03  |
| 1.250 | 1.02  | 4.333 | 5.08 | 7.417   | 5.08  | 10.50 | 2.03  |
| 1.333 | 2.03  | 4.417 | 5.08 | 7.500   | 5.08  | 10.58 | 1.02  |
| 1.417 | 2.03  | 4.500 | 5.08 | 7.583   | 5.08  | 10.67 | 1.02  |
| 1.500 | 2.03  | 4.583 | 6.10 | 7.667   | 5.08  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 6.10 | 7.750   | 5.08  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 6.10 | 7.833   | 5.08  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 6.10 | 7.917   | 5.08  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 6.10 | 8.000   | 5.08  | 11.08 | 2.03  |
| 1.917 | 1.02  | 5.000 | 6.10 | 8.083   | 4.06  | 11.17 | 2.03  |
| 2.000 | 1.02  | 5.083 | 5.08 | 8.167   | 4.06  | 11.25 | 2.03  |

|                      | Lange                                  | +affDd E       | A Evict | ing WestDo | nlılatono | hd         |      |
|----------------------|--|----------------|---------|------------|-----------|------------|------|
| 0.167                |  | 3.250          |         | 6.333      | 15.24     |            | 3.05 |
|                      | 0.00                                   |                | 3.05    |            | 15.24     |            | 3.05 |
|                      |  | 3.417          | 3.05    |            | 15.24     |            | 2.03 |
|                      |  | 3.500          |         | 6.583      | 14.22     |            | 2.03 |
|                      |  | 3.583          | 3.05    |            | 14.22     |            | 2.03 |
|                      |  | 3.667          |         | 6.750      | 14.22     |            | 3.05 |
|                      |  | 3.750          | 3.05    |            | 7.11      |            | 3.05 |
|                      |  | 3.833          |         | 6.917      | 7.11      |            | 3.05 |
|                      |  | 3.917          | 4.06    |            | 7.11      |            | 2.03 |
|                      |  | 4.000          | 4.06    |            | 6.10      |            | 2.03 |
|                      |  | 4.083          |         | 7.167      | 6.10      |            | 2.03 |
|                      |  | 4.063          | 3.05    |            | 6.10      |            | 2.03 |
|                      |  | 4.167          |         | 7.230      | 5.08      |            |      |
|                      |  | 4.230          |         |            |           |            | 2.03 |
|                      |  | 4.333          | 5.08    |            | 5.08      |            | 2.03 |
|                      |  | 4.417          | 5.08    |            | 5.08      |            | 1.02 |
|                      |  | 4.583          | 6.10    |            | 5.08      |            | 1.02 |
|                      |  |                |         |            | 5.08      |            |      |
|                      |  | 4.667          |         | 7.750      | 5.08      |            | 2.03 |
|                      |  | 4.750<br>4.833 | 6.10    |            | 5.08      |            | 2.03 |
|                      |  |                |         | 7.917      |           |            |      |
|                      |  | 4.917          | 6.10    |            | 5.08      |            | 2.03 |
|                      |  | 5.000          |         | 8.083      | 4.06      |            | 2.03 |
|                      |  | 5.083          | 5.08    |            | 4.06      |            | 2.03 |
|                      |  | 5.167          | 5.08    |            | 4.06      |            | 1.02 |
|                      |  | 5.250          |         | 8.333      | 4.06      |            | 1.02 |
|                      |  | 5.333          |         |            | 4.06      |            | 1.02 |
|                      |  | 5.417          |         | 8.500      | 4.06      |            | 2.03 |
|                      |  | 5.500          |         |            | 3.05      |            | 2.03 |
|                      |  | 5.583          |         | 8.667      | 3.05      |            | 2.03 |
|                      |  | 5.667          | 10.16   |            | 3.05      |            | 1.02 |
|                      |  | 5.750          |         | 8.833      | 3.05      |            | 1.02 |
|                      |  | 5.833          | 73.15   |            | 3.05      |            | 1.02 |
|                      | 4.06                                   |                | 73.15   |            | 3.05      |            | 2.03 |
|                      | 4.06                                   |                |         | 9.083      |           | 12.17      | 2.03 |
|                      | 4.06                                   |                | 74.17   |            | 3.05      |            | 2.03 |
| 3.083                | 3.05                                   | 6.167          | /4.1/   | 9.250      | 3.05      |            |      |
| Max.Eff.Inten.(mm/hr | )=                                     | 74.17          |         | 53.29      |           |            |      |
| over (min            | )                                      | 5.00           |         | 15.00      |           |            |      |
| Storage Coeff. (min  | )=                                     | 5.11           | (ii)    | 12.75 (ii  | )         |            |      |
| Unit Hyd. Tpeak (min | )=                                     | 5.00           |         | 15.00      | •         |            |      |
| Unit Hyd. peak (cms  | )=                                     | 0.21           |         | 0.08       |           |            |      |
| , , ,                |  |                |         |            | *T01      | TALS*      |      |
| PEAK FLOW (cms       | )=                                     | 0.07           |         | 0.03       | 0.        | .095 (iii) |      |
| TIME TO PEAK (hrs    |  | 6.25           |         | 6.33       |           | 5.25 ` ′   |      |
| RUNOFF VOLUME (mm    | )=                                     | 80.04          |         | 45.99      | 65        | 5.39       |      |
| TOTAL RAINFALL (mm   | TOTAL RAINFALL (mm)= 82.04 82.04 82.04 |                |         |            |           |            |      |
| RUNOFF COEFFICIENT   | =                                      | 0.98           |         | 0.56       | 6         | 9.80       |      |
|                      |  |                |         |            |           |            |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

# LangstaffRd\_EA\_Existing\_WestDonWatershd THAN THE STORAGE COEFFICIENT. (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0470) <br>  1 + 2 = 3 | AREA | QPEAK | TPEAK | R.V.  |
|---------------------------------|------|-------|-------|-------|
|                                 | (ha) | (cms) | (hrs) | (mm)  |
| ID1= 1 ( 0215):                 | 0.58 | 0.095 | 6.25  | 65.39 |
| + ID2= 2 ( 0220):               | 0.65 | 0.102 | 6.25  | 61.64 |
| ID = 3 ( 0470):                 | 1.23 | 0.197 | 6.25  | 63.41 |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD ( 0480)                      |                              |                                  |                                |                                |
|--------------------------------------|------------------------------|----------------------------------|--------------------------------|--------------------------------|
| ID1= 1 ( 0470):<br>+ ID2= 2 ( 0475): | AREA<br>(ha)<br>1.23<br>1.60 | QPEAK<br>(cms)<br>0.197<br>0.257 | TPEAK<br>(hrs)<br>6.25<br>6.25 | R.V.<br>(mm)<br>63.41<br>64.14 |
| ID = 3 ( 0480):                      | 2.83                         | 0.454                            | 6.25                           | 63.82                          |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| -    |                   |       |         |       |                |       |  |
|------|-------------------|-------|---------|-------|----------------|-------|--|
| -    |                   |       |         |       |                |       |  |
| - 1  | CALIB             |       |         |       |                |       |  |
| ij   | STANDHYD ( 0160)  | Area  | (ha)=   | 0.43  |                |       |  |
| - 13 | ID= 1 DT= 5.0 min | Total | Imp(%)= | 56.00 | Dir. Conn.(%)= | 56.00 |  |
| -    |                   |       |         |       |                |       |  |
|      |                   |       | IMPERVI | OUS   | PERVIOUS (i)   |       |  |
|      | Surface Area      | (ha)= | 0.2     | 4     | 0.19           |       |  |
|      | Dep. Storage      | (mm)= | 2.0     | 0     | 5.00           |       |  |
|      | Average Slope     | `(%)= | 1.0     | 0     | 2.00           |       |  |
|      | Length            | (m)=  | 260.0   | a     | 20.00          |       |  |
|      | Mannings n        | ()    | 0.01    |       | 0.250          |       |  |
|      |                   |       |         |       |                |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |        | TR    | ANSFORMED | HYETOGR | APH   |      |       |
|-------|--------|-------|-----------|---------|-------|------|-------|
| TIME  | RAIN   | TIME  | RAIN      | ' TIME  | RAIN  | TIME | RAIN  |
| hrs   | mm/hr  | hrs   | mm/hr     | ' hrs   | mm/hr | hrs  | mm/hr |
| 0.083 | 0.00   | 3.167 | 3.05      | 6.250   | 74.17 | 9.33 | 3.05  |
| 0.167 | 0.00   | 3.250 | 3.05      | 6.333   | 15.24 | 9.42 | 3.05  |
| 0.250 | 0.00   | 3.333 | 3.05      | 6.417   | 15.24 | 9.50 | 3.05  |
| 0.333 | 2.03   | 3.417 | 3.05      | 6.500   | 15.24 | 9.58 | 2.03  |
| 0.417 | 2.03   | 3.500 | 3.05      | 6.583   | 14.22 | 9.67 | 2.03  |
| 0.500 | 2.03   | 3.583 | 3.05      | 6.667   | 14.22 | 9.75 | 2.03  |
| 0.583 | 1.02 l | 3.667 | 3.05 l    | 6.750   | 14.22 | 9.83 | 3.05  |

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| STANDHYD ( 0155) | Area  | (ha)=      | A_Existing_W<br>0.56 |           |       |
|------------------|-------|------------|----------------------|-----------|-------|
| D= 1 DT= 5.0 min | lotal | Imp(%) = 4 | 5.00 Dir.            | Conn.(%)= | 45.00 |
|                  |       | IMPERVIOU  | S PERVIO             | JS (i)    |       |
| Surface Area     | (ha)= | 0.25       | 0.3                  | 1         |       |
| Dep. Storage     | (mm)= | 2.00       | 5.00                 | 9         |       |
| Average Slope    | (%)=  | 1.00       | 2.00                 | 9         |       |
| Length           | (m)=  | 260.00     | 25.00                | 9         |       |
| Mannings n       | =     | 0.013      | 0.29                 | 9         |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR/   | ANSFORME | HYETOGR | APH   | -     |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | l' TIME | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | i hrs | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05     | 6.250   | 74.17 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05     | 6.333   | 15.24 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417   | 15.24 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 3.05     | 6.500   | 15.24 | 9.58  | 2.03  |
| 0.417 | 2.03  | 3.500 | 3.05     | 6.583   | 14.22 | 9.67  | 2.03  |
| 0.500 | 2.03  | 3.583 | 3.05     | 6.667   | 14.22 | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 3.05     | 6.750   | 14.22 | 9.83  | 3.05  |
| 0.667 | 1.02  | 3.750 | 3.05     | 6.833   | 7.11  | 9.92  | 3.05  |
| 0.750 | 1.02  | 3.833 | 4.06     | 6.917   | 7.11  | 10.00 | 3.05  |
| 0.833 | 2.03  | 3.917 | 4.06     | 7.000   | 7.11  | 10.08 | 2.03  |
| 0.917 | 2.03  | 4.000 | 4.06     | 7.083   | 6.10  | 10.17 | 2.03  |
| 1.000 | 2.03  | 4.083 | 3.05     | 7.167   | 6.10  | 10.25 | 2.03  |
| 1.083 | 1.02  | 4.167 | 3.05     | 7.250   | 6.10  | 10.33 | 2.03  |
| 1.167 | 1.02  | 4.250 | 3.05     | 7.333   | 5.08  | 10.42 | 2.03  |
| 1.250 | 1.02  | 4.333 | 5.08     | 7.417   | 5.08  | 10.50 | 2.03  |
| 1.333 | 2.03  | 4.417 | 5.08     | 7.500   | 5.08  | 10.58 | 1.02  |
| 1.417 | 2.03  | 4.500 | 5.08     | 7.583   | 5.08  | 10.67 | 1.02  |
| 1.500 | 2.03  | 4.583 | 6.10     | 7.667   | 5.08  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 6.10     | 7.750   | 5.08  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 6.10     | 7.833   | 5.08  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 6.10     | 7.917   | 5.08  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 6.10     | 8.000   | 5.08  | 11.08 | 2.03  |
| 1.917 | 1.02  | 5.000 | 6.10     | 8.083   | 4.06  | 11.17 | 2.03  |
| 2.000 | 1.02  | 5.083 | 5.08     | 8.167   | 4.06  | 11.25 | 2.03  |
| 2.083 | 2.03  | 5.167 | 5.08     | 8.250   | 4.06  | 11.33 | 1.02  |
| 2.167 | 2.03  | 5.250 | 5.08     | 8.333   | 4.06  | 11.42 | 1.02  |
| 2.250 | 2.03  | 5.333 | 10.16    | 8.417   | 4.06  | 11.50 | 1.02  |
| 2.333 | 3.05  | 5.417 | 10.16    | 8.500   | 4.06  | 11.58 | 2.03  |
| 2.417 | 3.05  | 5.500 | 10.16    | 8.583   | 3.05  | 11.67 | 2.03  |
| 2.500 | 3.05  | 5.583 | 10.16    | 8.667   | 3.05  | 11.75 | 2.03  |
| 2.583 | 3.05  | 5.667 | 10.16    | 8.750   | 3.05  | 11.83 | 1.02  |
| 2.667 | 3.05  | 5.750 | 10.16    | 8.833   | 3.05  | 11.92 | 1.02  |
| 2.750 | 3.05  | 5.833 | 73.15    | 8.917   | 3.05  | 12.00 | 1.02  |
| 2.833 | 4.06  | 5.917 | 73.15    | 9.000   | 3.05  | 12.08 | 2.03  |
| 2.917 | 4.06  | 6.000 | 73.15    | 9.083   | 3.05  | 12.17 | 2.03  |
| 3.000 | 4.06  | 6.083 | 74.17    | 9.167   | 3.05  | 12.25 | 2.03  |
| 3.083 | 3.05  | 6.167 | 74.17    | 9.250   | 3.05  |       |       |

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|   | LangstaffRd  | FA Fxist | ing WestDon | Waters | hd         |      |
|---|--|----------|-------------|--------|------------|------|
|   |  |          |             |        | 9.92       | 3.05 |
| 0.750 1   | .02   3.750<br>.02   3.833   | 1.05     | 6.033       | 7 11   | 10.00      | 3.05 |
| 0.730 1   | 02   3.033   | 4.00     | 7 000       | 7 11   | 10.00      | 2.03 |
| 0.033 2   | 2.03   3.917<br>2.03   4.000<br>2.03   4.083<br>1.02   4.167<br>1.02   4.250<br>1.02   4.333   | 4.00     | 7.000       | 7.11   | 10.00      | 2.03 |
| 0.917 2   | .03   4.000  | 4.00     | 7.003       | 6.10   | 10.17      | 2.03 |
| 1.000 2   | 1.03   4.083   | 3.05     | /.16/       | 6.10   | 10.25      | 2.03 |
| 1.083 1   | 02   4.16/   | 3.05     | 7.250       | 6.10   | 10.33      | 2.03 |
| 1.167 1   | .02   4.250  | 3.05     | 7.333       | 5.08   | 10.42      | 2.03 |
| 1.250 1   | 02   4.333   | 5.08     | 7.417       | 5.08   | 10.50      | 2.03 |
| 1.333 2   | 2.03   4.417   | 5.08     | 7.500       | 5.08   | 10.58      | 1.02 |
| 1.417 2   | 2.03   4.500   | 5.08     | 7.583       | 5.08   | 10.67      | 1.02 |
| 1.500 2   | 2.03   4.583   | 6.10     | 7.667       | 5.08   | 10.75      | 1.02 |
| 1.583 2   | 2.03   4.667   | 6.10     | 7.750       | 5.08   | 10.83      | 2.03 |
| 1.667 2   | 2.03   4.750   | 6.10     | 7.833       | 5.08   | 10.92      | 2.03 |
| 1.750 2   | 2.03   4.833   | 6.10     | 7.917       | 5.08   | 11.00      | 2.03 |
| 1.833 1   | .02   4.917  | 6.10     | 8.000       | 5.08   | 11.08      | 2.03 |
| 1.917 1   | .02 i 5.000  | 6.10     | 8.083       | 4.06   | 11.17      | 2.03 |
| 2.000 1   | 02   4.333<br>2.03   4.417<br>2.03   4.500<br>2.03   4.583<br>2.03   4.667<br>2.03   4.750<br>2.03   4.917<br>2.02   5.000<br>2.02   5.083<br>2.03   5.167<br>2.03   5.250<br>2.03   5.250 | 5.08     | 8.167       | 4.06   | 11.25      | 2.03 |
| 2.083   | .03   5.167  | 5.08     | 8.250       | 4.06   | 11.33      | 1.02 |
| 2 167 2   | 03   5 250   | 5 08     | 8 333       | 4 96   | 11 42      | 1 02 |
| 2.107 2   | 2.03   5.250<br>2.03   5.333<br>3.05   5.417   | 10 16    | 8 417       | 1 06   | 11 50      | 1 02 |
| 2.250 2   | 05   5.555   | 10.10    | 0.417       | 4.00   | 111.50     | 2 02 |
| 2.333 3   | 0.05   5.417   | 10.10    | 1 0.500     | 2.00   | 11.50      | 2.03 |
| 2.41/ 3   | 0.05   5.500   | 10.16    | 0.505       | 3.05   | 11.07      | 2.03 |
| 2.500 3   | 5.05   5.583   | 10.16    | 8.667       | 3.05   | 111.75     | 2.03 |
| 2.583 3   | 3.05   5.66/   | 10.16    | 8.750       | 3.05   | 11.83      | 1.02 |
| 2.667 3   | .05   5.750  | 10.16    | 8.833       | 3.05   | 11.92      | 1.02 |
| 2.750 3   | 1.05   5.833   | 73.15    | 8.917       | 3.05   | 12.00      | 1.02 |
| 2.833 4   | 1.06   5.917   | 73.15    | 9.000       | 3.05   | 12.08      | 2.03 |
| 2.917 4   | 1.06   6.000   | 73.15    | 9.083       | 3.05   | 12.17      | 2.03 |
| 3.000 4   | 1.06   6.083   | 74.17    | 9.167       | 3.05   | 12.25      | 2.03 |
| 3.083 3   | 3.05   5.417<br>3.05   5.500<br>5.05   5.583<br>3.05   5.667<br>3.05   5.750<br>3.05   5.833<br>3.06   5.917<br>3.06   6.000<br>3.05   6.083<br>3.05   6.167                               | 74.17    | 9.250       | 3.05   | I          |      |
| Max.Eff.Inten.(mm/hr)   | = 74.17  |          | 61.96       |        |            |      |
| over (min)  | 5.00   |          | 10.00       |        |            |      |
| Storage Coeff. (min)<br>Unit Hyd. Tpeak (min)<br>Unit Hyd. peak (cms) | = 5.11   | (ii)     | 9.87 (ii)   |        |            |      |
| Unit Hyd. Tpeak (min)   | = 5.00   | 1        | 10.00       |        |            |      |
| Unit Hyd. peak (cms)  | = 0.21   |          | 0.11        |        |            |      |
|   |  |          |             | *T0    | TALS*      |      |
| PEAK FLOW (cms)   | = 0.05   |          | 0.03        | 0      | .078 (iii) |      |
| TIME TO PEAK (hrs)  | = 6.25<br>= 80.04  |          | 6.25        |        | 6.25       |      |
| RUNOFF VOLUME (mm)  | = 80.04  |          | 54.74       | 68     | 8.90       |      |
| TOTAL RAINFALL (mm)   | = 82.04  |          | 82.04       | 83     | 2.04       |      |
| RUNOFF COEFFICIENT  | = 0.98   |          | 0.67        |        | 0.84       |      |
| (i) CN PROCEDURE SE<br>CN* = 89.0                                     | Ia = Dep.  | Storage  | (Above)     |        |            |      |
| (ii) TIME STEP (DT)<br>THAN THE STORAG                                |  |          | EQUAL       |        |            |      |
| (iii) PEAK FLOW DOES  |  |          | IF ANY.     |        |            |      |
|   |  |          |             |        |            |      |
| ALIB  |  |          |             |        |            |      |
|   |  |          |             |        |            |      |

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{\tt LangstaffRd\_EA\_Existing\_WestDonWatershd}
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| Max.Eff.Inten.(mm/hr)= | 74.17   | 59.01          |             |
|------------------------|---------|----------------|-------------|
| over (min)             | 5.00    | 15.00          |             |
| Storage Coeff. (min)=  | 5.11 (i | ii) 12.29 (ii) |             |
| Unit Hyd. Tpeak (min)= | 5.00    | 15.00          |             |
| Unit Hyd. peak (cms)=  | 0.21    | 0.09           |             |
|                        |         |                | *TOTALS*    |
| PEAK FLOW (cms)=       | 0.05    | 0.04           | 0.091 (iii) |
| TIME TO PEAK (hrs)=    | 6.25    | 6.33           | 6.25        |
| RUNOFF VOLUME (mm)=    | 80.04   | 51.61          | 64.39       |
| TOTAL RAINFALL (mm)=   | 82.04   | 82.04          | 82.04       |
| RUNOFF COEFFICIENT =   | 0.98    | 0.63           | 0.78        |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 87.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0430)                         |      |       |       |       |
|---|------|-------|-------|-------|
| 1 + 2 = 3                               | AREA | QPEAK | TPEAK | R.V.  |
| ii                                      | (ha) | (cms) | (hrs) | (mm)  |
| ID1= 1 ( 0155):                         | 0.56 | 0.091 | 6.25  | 64.39 |
| + ID2= 2 ( 0160):                       | 0.43 | 0.078 | 6.25  | 68.90 |
| ======================================= |      |       |       |       |
| TD - 3 ( 0430).                         | a 99 | a 169 | 6 25  | 66 35 |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| IMPERVIOUS PERVIOUS (i) Surface Area (ha)= 3.58 0.23 | CALIB         | Area<br>Total | (ha)=<br>Imp(%)= | 3.81<br>94.00 | Dir. (   | Conn.(%)= | 94.00 |  |
|--|---------------|---------------|------------------|---------------|----------|-----------|-------|--|
|  |               |               | IMPERVIO         | ous           | PERVIOUS | (i)       |       |  |
| 2.00 5.00  | Surface Area  | (ha)=         | 3.58             | 3             | 0.23     |           |       |  |
| Dep. Storage (mm)= 2.00 5.00                         | Dep. Storage  | (mm)=         | 2.00             | 3             | 5.00     |           |       |  |
| Average Slope (%)= 1.00 2.00                         | Average Slope | (%)=          | 1.00             | 3             | 2.00     |           |       |  |
| Length (m)= 150.00 40.00                             | Length        | (m)=          | 150.00           | 3             | 40.00    |           |       |  |
| Mannings n = 0.013 0.250                             | Mannings n    | - '=          | 0.013            | 3             | 0.250    |           |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TRA   | ANSFORME | HYETOGR | APH   |      |       |
|-------|-------|-------|----------|---------|-------|------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs  | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05     | 6.250   | 74.17 | 9.33 | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05     | 6.333   | 15.24 | 9.42 | 3.05  |

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LangstaffRd_EA_Existing_MestDonWatershd
0.00 | 3.333 | 3.05 | 6.417 | 15.24 | 1.5
2.03 | 3.437 | 3.05 | 6.500 | 15.24 | 1.5
2.03 | 3.500 | 3.05 | 6.583 | 14.22 | 1.5
2.03 | 3.500 | 3.05 | 6.667 | 14.22 | 1.5
2.03 | 3.583 | 3.05 | 6.667 | 14.22 | 1.5
2.03 | 3.583 | 3.05 | 6.683 | 7.12 | 2.5
1.02 | 3.667 | 3.05 | 6.833 | 7.11 | 1.7
2.03 | 3.917 | 4.06 | 7.000 | 7.11 | 1.7
2.03 | 3.917 | 4.06 | 7.000 | 7.11 | 1.7
2.03 | 4.000 | 4.06 | 7.083 | 6.10 | 1.7
2.03 | 4.083 | 3.05 | 7.167 | 6.10 | 1.7
2.03 | 4.083 | 3.05 | 7.157 | 6.10 | 1.7
2.03 | 4.083 | 3.05 | 7.7333 | 5.08 | 1.7
2.03 | 4.17 | 3.05 | 7.250 | 6.10 | 1.7
2.03 | 4.17 | 5.08 | 7.417 | 5.08 | 1.7
2.03 | 4.500 | 5.08 | 7.583 | 5.08 | 1.7
2.03 | 4.500 | 5.08 | 7.583 | 5.08 | 1.7
2.03 | 4.530 | 6.10 | 7.757 | 5.08 | 1.7
2.03 | 4.530 | 6.10 | 7.757 | 5.08 | 1.7
2.03 | 4.530 | 6.10 | 7.757 | 5.08 | 1.7
2.03 | 4.575 | 6.10 | 7.757 | 5.08 | 1.7
2.03 | 4.533 | 6.10 | 7.757 | 5.08 | 1.7
2.03 | 4.533 | 6.10 | 7.757 | 5.08 | 1.7
2.03 | 4.533 | 6.10 | 7.757 | 5.08 | 1.7
2.03 | 4.533 | 6.10 | 7.757 | 5.08 | 1.7
2.03 | 5.567 | 5.08 | 8.250 | 4.06 | 1.7
2.03 | 5.550 | 5.08 | 8.333 | 4.06 | 1.7
2.03 | 5.550 | 5.08 | 8.333 | 4.06 | 1.7
2.03 | 5.550 | 5.08 | 8.333 | 4.06 | 1.7
2.03 | 5.550 | 5.08 | 8.333 | 4.06 | 1.7
2.03 | 5.550 | 5.08 | 8.333 | 4.06 | 1.7
2.03 | 5.550 | 5.08 | 8.333 | 4.06 | 1.7
2.03 | 5.550 | 5.08 | 8.333 | 4.06 | 1.7
2.03 | 5.550 | 5.08 | 8.333 | 4.06 | 1.7
2.03 | 5.550 | 5.08 | 8.333 | 4.06 | 1.7
2.03 | 5.550 | 5.08 | 8.333 | 4.06 | 1.7
2.03 | 5.550 | 5.08 | 8.333 | 4.06 | 1.7
2.03 | 5.550 | 5.08 | 8.333 | 4.06 | 1.7
2.03 | 5.550 | 5.08 | 8.333 | 4.06 | 1.7
2.03 | 5.550 | 5.08 | 8.333 | 4.06 | 1.7
2.03 | 5.550 | 5.08 | 8.333 | 4.06 | 1.7
2.03 | 5.550 | 5.08 | 8.333 | 4.06 | 1.7
2.03 | 5.550 | 5.08 | 8.333 | 4.06 | 1.7
2.03 | 5.550 | 5.08 | 8.333 | 4.06 | 1.7
2.03 | 5.550 | 5.08 | 8.333 | 4.06 | 1.7
2.03 | 5.550 | 5.08 | 8.333 | 4.06 | 1.7
2.03 | 5.550 | 5.08 | 8.333 | 4.06 | 1.7
2.03 | 5.550 | 5.08 | 8.333 | 4.06 | 1.7
2.03 | 5.550 | 5.08 | 8.333 | 4.06
   0.250
0.333
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        2.03
0.333
0.417
0.500
0.583
0.667
0.750
0.833
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 9.58
9.67
9.75
9.83
9.92
10.00
10.08
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2.03
3.05
3.05
3.05
2.03
   0.917
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    10.17
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10.25
10.33
10.42
10.50
10.58
10.67
   1.000
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     2.03
2.03
2.03
2.03
1.02
1.02
1.083
1.167
1.250
1.333
1.417
   1.583
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    10.83
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        2.03
   1.667
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    10.92
1.750
1.833
1.917
2.000
2.083
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              11.00
11.08
11.17
11.25
11.33
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        1.02
   2.167
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    11.42
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        1.02
2.167
2.250
2.333
2.417
2.500
2.583
2.667
2.750
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              11.42
11.50
11.58
11.67
11.75
11.83
11.92
12.00
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     1.02
2.03
2.03
2.03
1.02
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        1.02
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    12.08
   2.833
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        2.03
   2.917
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    12.17
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        2.03
```

60.48 10.00 6.32 (ii) 10.00 0.15 74.17 5.00 3.67 (ii) over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 5.00 0.25 \*TOTALS\* 0.74 6.25 80.04 82.04

PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 0.04 6.25 53.15 82.04 0.65 0.774 (iii) 6.25 78.43 82.04 0.98

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: CN\* = 88.0 Ia = Dep. Storage (Above) (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

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|             | Langs  | staffRd E | A Exist | ing WestDon | Waters | hd    |      |
|-------------|--------|-----------|---------|-------------|--------|-------|------|
| 1.667       | 7 2.03 | 4.750     | 6.10    | 7.833       | 5.08   | 10.92 | 2.03 |
| 1.756       | 2.03   | 4.833     | 6.10    | 7.917       | 5.08   | 11.00 | 2.03 |
| 1.833       | 1.02   | 4.917     | 6.10    | 8.000       | 5.08   | 11.08 | 2.03 |
| 1.917       | 7 1.02 | 5.000     | 6.10    | 8.083       | 4.06   | 11.17 | 2.03 |
| 2.000       | 1.02   | 5.083     | 5.08    | 8.167       | 4.06   | 11.25 | 2.03 |
| 2.083       | 3 2.03 | 5.167     | 5.08    | 8.250       | 4.06   | 11.33 | 1.02 |
| 2.167       | 7 2.03 | 5.250     | 5.08    | 8.333       | 4.06   | 11.42 | 1.02 |
| 2.256       | 2.03   | 5.333     | 10.16   | 8.417       | 4.06   | 11.50 | 1.02 |
| 2.333       | 3.05   | 5.417     | 10.16   | 8.500       | 4.06   | 11.58 | 2.03 |
| 2.417       | 7 3.05 | 5.500     | 10.16   | 8.583       | 3.05   | 11.67 | 2.03 |
| 2.500       | 3.05   | 5.583     | 10.16   | 8.667       | 3.05   | 11.75 | 2.03 |
| 2.583       | 3.05   | 5.667     | 10.16   | 8.750       | 3.05   | 11.83 | 1.02 |
| 2.667       | 7 3.05 | 5.750     | 10.16   | 8.833       | 3.05   | 11.92 | 1.02 |
| 2.756       | 3.05   | 5.833     | 73.15   | 8.917       | 3.05   | 12.00 | 1.02 |
| 2.833       | 4.06   | 5.917     | 73.15   | 9.000       | 3.05   | 12.08 | 2.03 |
| 2.917       | 4.06   | 6.000     | 73.15   | 9.083       | 3.05   | 12.17 | 2.03 |
| 3.000       | 4.06   | 6.083     | 74.17   | 9.167       | 3.05   | 12.25 | 2.03 |
| 3.083       | 3.05   | 6.167     | 74.17   | 9.250       | 3.05   |       |      |
|             |        |           |         |             |        |       |      |
| ff.Inten.(m |        | 74.17     |         | 47.96       |        |       |      |
|             | (min)  | 5.00      |         | 15.00       |        |       |      |
| ge Coeff.   |        |           | (ii)    | 12.51 (ii)  |        |       |      |
| Hyd. Tpeak  |        | 5.00      |         | 15.00       |        |       |      |
| Jud noak    | (cmc)- | a 22      |         | 0 00        |        |       |      |

Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)= 0.05 6.25 80.04 PEAK FLOW TIME TO PEAK 0.02 0.070 (iii) 6.25 59.75 (hrs)= 6.33 41.06 RUNOFF VOLUME (mm)= TOTAL RAINFALL (mm)= RUNOFF COEFFICIENT = 82.04 82.04

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

Max.Ef

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
- CN\* = 79.0 Ia = Dep. Storage (Above)
  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
  THAN THE STORAGE COEFFICIENT.
  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB<br>  STANDHYD ( 0180) <br> ID= 1 DT= 5.0 min | Area<br>Total | (ha)=<br>Imp(%)= | 0.65<br>33.00 | Dir. Conn.(%)= | 33.00 |
|--|---------------|------------------|---------------|----------------|-------|
|  |               | IMPERVIO         | OUS           | PERVIOUS (i)   |       |
| Surface Area                                       | (ha)=         | 0.2              | 1             | 0.44           |       |
| Dep. Storage                                       | (mm)=         | 2.00             | 9             | 5.00           |       |
| Average Slope                                      | (%)=          | 1.00             | 9             | 2.00           |       |
| Length   | (m)=          | 65.83            | 3             | 40.00          |       |
| Mannings n   | =             | 0.01             | 3             | 0.250          |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

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# $Lang staff Rd\_EA\_Existing\_WestDonWatershd \\ THAN \ THE \ STORAGE \ COEFFICIENT.$

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0440) <br>  1 + 2 = 3 | AREA<br>(ha)<br>3.81 | QPEAK<br>(cms)<br>0.774 | TPEAK<br>(hrs)<br>6.25 | R.V.<br>(mm)<br>78.43 |
|---------------------------------|----------------------|-------------------------|------------------------|-----------------------|
| + ID2= 2 ( 0430):               | 0.99                 | 0.169                   | 6.25                   | 66.35                 |
| ID = 3 ( 0440):                 | 4.80                 | 0.943                   | 6.25                   | 75.94                 |

| NOTE: PEAK FLO                                     | WS DO NO      | T INCLUDE        | BASEFL | OWS IF  | ANY.      |       |  |
|--|---------------|------------------|--------|---------|-----------|-------|--|
|  |               |                  |        |         |           |       |  |
| CALIB<br>  STANDHYD ( 0185) <br> ID= 1 DT= 5.0 min | Area<br>Total | (ha)=<br>Imp(%)= |        | Dir.    | Conn.(%)= | 48.00 |  |
| · · · · · · · · · · · · · · · · · · ·              |               |                  |        |         | , ,       |       |  |
|  |               | IMPERVIO         | OUS    | PERVIOL | JS (i)    |       |  |
| Surface Area                                       | (ha)=         | 0.23             | 3      | 0.24    | 1 ` ′     |       |  |
| Dep. Storage                                       | (mm)=         | 2.00             | )      | 5.00    | )         |       |  |
| Average Slope                                      | (%)=          | 1.00             | )      | 2.00    | )         |       |  |
| Length   | (m)=          | 240.00           | )      | 20.00   | )         |       |  |
| Mannings n   | =             | 0.013            | 3      | 0.356   | )         |       |  |
|  |               |                  |        |         |           |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORMED | ) HYETOGR | APH   |       |       |
|-------|-------|-------|-----------|-----------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN      | ' TIME    | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr     | ' hrs     | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05      | 6.250     | 74.17 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05      | 6.333     | 15.24 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 3.05      | 6.417     | 15.24 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 3.05      | 6.500     | 15.24 | 9.58  | 2.03  |
| 0.417 | 2.03  | 3.500 | 3.05      | 6.583     | 14.22 | 9.67  | 2.03  |
| 0.500 | 2.03  | 3.583 | 3.05      | 6.667     | 14.22 | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 3.05      | 6.750     | 14.22 | 9.83  | 3.05  |
| 0.667 | 1.02  | 3.750 | 3.05      | 6.833     | 7.11  | 9.92  | 3.05  |
| 0.750 | 1.02  | 3.833 | 4.06      | 6.917     | 7.11  | 10.00 | 3.05  |
| 0.833 | 2.03  | 3.917 | 4.06      | 7.000     | 7.11  | 10.08 | 2.03  |
| 0.917 | 2.03  | 4.000 | 4.06      | 7.083     | 6.10  | 10.17 | 2.03  |
| 1.000 | 2.03  | 4.083 | 3.05      | 7.167     | 6.10  | 10.25 | 2.03  |
| 1.083 | 1.02  | 4.167 | 3.05      | 7.250     | 6.10  | 10.33 | 2.03  |
| 1.167 | 1.02  | 4.250 | 3.05      | 7.333     | 5.08  | 10.42 | 2.03  |
| 1.250 | 1.02  | 4.333 | 5.08      | 7.417     | 5.08  | 10.50 | 2.03  |
| 1.333 | 2.03  | 4.417 | 5.08      | 7.500     | 5.08  | 10.58 | 1.02  |
| 1.417 | 2.03  | 4.500 | 5.08      | 7.583     | 5.08  | 10.67 | 1.02  |
| 1.500 | 2.03  | 4.583 | 6.10      | 7.667     | 5.08  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 6.10      | 7.750     | 5.08  | 10.83 | 2.03  |
|       |       |       |           |           |       |       |       |

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## ${\tt LangstaffRd\_EA\_Existing\_WestDonWatershd}$

|  |       | _                | _       | -                         |       |         |       |
|--|-------|------------------|---------|---------------------------|-------|---------|-------|
|  |       |                  |         |                           |       |         |       |
|  |       | TRA              | NSFORME | D HYETOGR                 | APH   | -       |       |
| TIME                                     | RAIN  | TIME             | RAIN    | ' TIME                    | RAIN  | TIME    | RAIN  |
| hrs                                      | mm/hr | hrs              | mm/hr   | hrs<br>  6.250<br>  6.333 | mm/hr | hrs     | mm/hr |
| 0.083                                    | 0.00  | 3.167            | 3.05    | 6.250                     | 74.17 | 9.33    | 3.05  |
| 0.167                                    | 0.00  | 3.250            | 3.05    | 6.333                     | 15.24 | 9.42    | 3.05  |
| 0.250                                    | 0.00  | 3.333            | 3.05    | 6.417                     | 15.24 | 9.50    | 3.05  |
| 0.333                                    | 2.03  | 3.417            | 3.05    | 6.500                     | 15.24 | 9.58    | 2.03  |
| 0.417                                    | 2.03  | 3.500            | 3.05    | 6.583                     | 14.22 | 9.67    | 2.03  |
| 0.500                                    | 2.03  | 3.583            | 3.05    | 6.583                     | 14.22 | 9.75    | 2.03  |
| 0.583                                    | 1.02  | 3.667            | 3.05    | 6.750                     | 14.22 | 9.83    | 3.05  |
| 0.667                                    | 1.02  | 3.750            | 3.05    | 6.833                     | 7.11  | 9.92    | 3.05  |
| 0.750                                    | 1.02  | 3.833            | 4.06    | 6.917                     | 7.11  | 10.00   | 3.05  |
| 0.833                                    | 2.03  | 3.917            | 4.06    | 7.000                     | 7.11  | 10.08   | 2.03  |
| 0.917                                    | 2.03  | 4.000            | 4.06    | 7.083                     | 6.10  | 10.17   | 2.03  |
| 1.000                                    | 2.03  | 4.083            | 3.05    | 7.167<br>7.250<br>7.333   | 6.10  | 10.25   | 2.03  |
| 1.083                                    | 1.02  | 4.167            | 3.05    | 7.250                     | 6.10  | 10.33   | 2.03  |
| 1.167                                    | 1.02  | 4.250            | 3.05    | 7.333                     | 5.08  | 10.42   | 2.03  |
| 1.250                                    | 1.02  | 4.333            | 5.08    | 7.417                     | 5.08  | 10.50   | 2.03  |
| 1.333                                    | 2.03  | 4.417            | 5.08    | 7.500                     | 5.08  | 10.58   | 1.02  |
| 1.417                                    | 2.03  | 4.500            | 5.08    | 7.583                     | 5.08  | 10.67   | 1.02  |
| 1.500                                    | 2.03  | 4.583            | 6.10    | 7.583<br>7.667<br>7.750   | 5.08  | 10.75   | 1.02  |
| 1.583                                    | 2.03  | 4.667            | 6.10    | 7.750                     | 5.08  | 10.83   | 2.03  |
| 1.667                                    | 2.03  | 4.750            | 6.10    | 7.833                     | 5.08  | 10.92   | 2.03  |
| 1.750                                    | 2.03  | 4.833            | 6.10    | /.91/                     | 5.08  | 11.00   | 2.03  |
| 1.833                                    | 1.02  | 4.91/            | 6.10    | 8.000                     | 5.08  | 11.08   | 2.03  |
| 1.91/                                    | 1.02  | 5.000            | 6.10    | 8.000<br>8.083<br>8.167   | 4.06  | 11.1/   | 2.03  |
| 2.000                                    | 1.02  | 5.083            | 5.08    | 8.16/                     | 4.06  | 11.25   | 2.03  |
| 2.083                                    | 2.03  | 5.16/            | 5.08    | 8.250                     | 4.06  | 11.33   | 1.02  |
| 2.16/                                    | 2.03  | 5.250            | 5.08    | 8.333                     | 4.06  | 11.42   | 1.02  |
| 2.250                                    | 2.03  | 5.333            | 10.16   | 8.417                     | 4.06  | 11.50   | 1.02  |
| 2.333                                    | 3.05  | 5.41/            | 10.16   | 8.417<br>8.500<br>8.583   | 4.06  | 11.58   | 2.03  |
| 2.417                                    | 3.05  | 5.500            | 10.16   | 8.583                     | 3.05  | 11.6/   | 2.03  |
| 2.500                                    | 3.05  | 5.583            | 10.16   | 8.667<br>8.750            | 3.05  | 11.75   | 2.03  |
| 2.563                                    | 3.05  | 5.00/<br>  F 7F0 | 10.10   | 0.750                     | 3.05  | 111.03  | 1.02  |
| 2.007                                    | 3.05  | J 5./50          | 72.10   | 8.833<br>8.917            | 3.05  | 11.92   | 1.02  |
| 2.750                                    | 4.00  | 5.655<br>  F.017 | 73.15   | 9.000                     | 3.05  | 12.00   | 2.02  |
| 2.033                                    | 4.00  | 5.91/            | 73.15   | 1 0 000                   | 3.05  | 12.00   | 2.03  |
| 2.917                                    | 4.00  | 0.000            | 73.13   | 9.083                     | 3.05  | 12.17   | 2.03  |
| 2.002                                    | 2.05  | 0.003            | 74.17   | 9.167                     | 3.05  | 1 12.25 | 2.03  |
| 3.063                                    | 3.05  | 0.10/            | /4.1/   | 9.250                     | 3.05  | 1       |       |
| ff.Inten.(mm,                            | /hr)= | 74.17            |         | 53.29                     |       |         |       |
| over (r<br>ge Coeff. (r<br>Hyd. Tpeak (r | min)  | 5.00             |         | 15.00                     |       |         |       |
| ge Coeff. (r                             | min)= | 2.24             | (ii)    | 11.32 (ii                 | .)    |         |       |
| Hyd. Tpeak (r                            | nin)= | 5.00             |         | 15.00                     |       |         |       |

| over            | (min)  | 5.00      | 15.00      |             |
|-----------------|--------|-----------|------------|-------------|
| Storage Coeff.  | (min)= | 2.24 (ii) | 11.32 (ii) |             |
| Unit Hyd. Tpeak | (min)= | 5.00      | 15.00      |             |
| Unit Hyd. peak  | (cms)= | 0.30      | 0.09       |             |
|                 |        |           |            | *TOTALS*    |
| PEAK FLOW       | (cms)= | 0.04      | 0.05       | 0.094 (iii) |
| TIME TO PEAK    | (hrs)= | 6.25      | 6.33       | 6.25        |
| RUNOFF VOLUME   | (mm)=  | 80.04     | 45.99      | 57.21       |
| TOTAL RAINFALL  | (mm)=  | 82.04     | 82.04      | 82.04       |
|                 |        |           |            |             |

Max.Ef

# 

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

| ADD HYD ( 0445)                         |      |       |       |       |
|---|------|-------|-------|-------|
| 1 + 2 = 3                               | AREA | QPEAK | TPEAK | R.V   |
|   | (ha) | (cms) | (hrs) | (mm   |
| ID1= 1 ( 0180):                         | 0.65 | 0.094 | 6.25  | 57.21 |
| + ID2= 2 ( 0185):                       | 0.47 | 0.070 | 6.25  | 59.75 |
| ======================================= |      |       |       |       |
| TD - 3 ( 0445) ·                        | 1 12 | 0 164 | 6 25  | 58 28 |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB         | Area<br>Total | (ha)= 0.60<br>Imp(%)= 40.00 |              | 40.00 |
|---------------|---------------|-----------------------------|--------------|-------|
|               |               |                             |              |       |
|               |               | IMPERVIOUS                  | PERVIOUS (i) |       |
| Surface Area  | (ha)=         | 0.24                        | 0.36         |       |
| Dep. Storage  | (mm)=         | 2.00                        | 5.00         |       |
| Average Slope | (%)=          | 1.00                        | 2.00         |       |
| Length        | (m)=          | 250.00                      | 20.00        |       |
| Mannings n    | =             | 0.013                       | 0.250        |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TRA   | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05     | 6.250   | 74.17 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05     | 6.333   | 15.24 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417   | 15.24 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 3.05     | 6.500   | 15.24 | 9.58  | 2.03  |
| 0.417 | 2.03  | 3.500 | 3.05     | 6.583   | 14.22 | 9.67  | 2.03  |
| 0.500 | 2.03  | 3.583 | 3.05     | 6.667   | 14.22 | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 3.05     | 6.750   | 14.22 | 9.83  | 3.05  |
| 0.667 | 1.02  | 3.750 | 3.05     | 6.833   | 7.11  | 9.92  | 3.05  |
| 0.750 | 1.02  | 3.833 | 4.06     | 6.917   | 7.11  | 10.00 | 3.05  |
| 0.833 | 2.03  | 3.917 | 4.06     | 7.000   | 7.11  | 10.08 | 2.03  |
| 0.917 | 2.03  | 4.000 | 4.06     | 7.083   | 6.10  | 10.17 | 2.03  |
| 1.000 | 2.03  | 4.083 | 3.05     | 7.167   | 6.10  | 10.25 | 2.03  |

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LangstaffRd\_EA\_Existing\_WestDonWatershd )= 0.25 0.18 )= 2.00 5.00 )= 1.00 2.00 (ha)= (mm)= (%)= (m)=

0.250

0.013 NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

Dep. Storage Average Slope Mannings n

|       |       | TR     | ANSFORMFI | D HYETOGR | APH   | -     |       |
|-------|-------|--------|-----------|-----------|-------|-------|-------|
| TIME  | RAIN  | l TIME | RAIN      | l' TIME   | RAIN  |       | RAIN  |
| hrs   | mm/hr | hrs    | mm/hr     | ' hrs     | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167  | 3.05      | 6.250     | 74.17 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250  | 3.05      | 6.333     | 15.24 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333  | 3.05      | 6.417     | 15.24 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417  | 3.05      | 6.500     | 15.24 | 9.58  | 2.03  |
| 0.417 | 2.03  | 3.500  | 3.05      | 6.583     | 14.22 | 9.67  | 2.03  |
| 0.500 | 2.03  | 3.583  | 3.05      | 6.667     | 14.22 | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667  | 3.05      | 6.750     | 14.22 | 9.83  | 3.05  |
| 0.667 | 1.02  | 3.750  | 3.05      | 6.833     | 7.11  | 9.92  | 3.05  |
| 0.750 | 1.02  | 3.833  | 4.06      | 6.917     | 7.11  | 10.00 | 3.05  |
| 0.833 | 2.03  | 3.917  | 4.06      | 7.000     | 7.11  | 10.08 | 2.03  |
| 0.917 | 2.03  | 4.000  | 4.06      | 7.083     | 6.10  |       | 2.03  |
| 1.000 | 2.03  | 4.083  | 3.05      | 7.167     | 6.10  |       | 2.03  |
| 1.083 | 1.02  | 4.167  | 3.05      | 7.250     | 6.10  |       | 2.03  |
| 1.167 | 1.02  | 4.250  | 3.05      | 7.333     | 5.08  | 10.42 | 2.03  |
| 1.250 | 1.02  | 4.333  | 5.08      | 7.417     | 5.08  | 10.50 | 2.03  |
| 1.333 | 2.03  | 4.417  | 5.08      | 7.500     | 5.08  | 10.58 | 1.02  |
| 1.417 | 2.03  | 4.500  | 5.08      | 7.583     | 5.08  | 10.67 | 1.02  |
| 1.500 | 2.03  | 4.583  | 6.10      | 7.667     | 5.08  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667  | 6.10      | 7.750     | 5.08  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750  | 6.10      | 7.833     | 5.08  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833  | 6.10      | 7.917     | 5.08  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917  | 6.10      | 8.000     | 5.08  | 11.08 | 2.03  |
| 1.917 | 1.02  | 5.000  | 6.10      |           | 4.06  | 11.17 | 2.03  |
| 2.000 | 1.02  | 5.083  | 5.08      | 8.167     | 4.06  | 11.25 | 2.03  |
| 2.083 | 2.03  | 5.167  | 5.08      | 8.250     | 4.06  | 11.33 | 1.02  |
| 2.167 | 2.03  | 5.250  | 5.08      | 8.333     | 4.06  | 11.42 | 1.02  |
| 2.250 | 2.03  | 5.333  | 10.16     | 8.417     | 4.06  | 11.50 | 1.02  |
| 2.333 | 3.05  | 5.417  | 10.16     | 8.500     | 4.06  | 11.58 | 2.03  |
| 2.417 | 3.05  | 5.500  | 10.16     | 8.583     | 3.05  | 11.67 | 2.03  |
| 2.500 | 3.05  | 5.583  | 10.16     | 8.667     | 3.05  | 11.75 | 2.03  |
| 2.583 | 3.05  | 5.667  | 10.16     | 8.750     | 3.05  | 11.83 | 1.02  |
| 2.667 | 3.05  | 5.750  | 10.16     | 8.833     | 3.05  | 11.92 | 1.02  |
| 2.750 | 3.05  | 5.833  | 73.15     | 8.917     | 3.05  | 12.00 | 1.02  |
| 2.833 | 4.06  | 5.917  | 73.15     | 9.000     | 3.05  | 12.08 | 2.03  |
| 2.917 | 4.06  | 6.000  | 73.15     | 9.083     | 3.05  | 12.17 | 2.03  |
| 3.000 | 4.06  | 6.083  | 74.17     | 9.167     | 3.05  | 12.25 | 2.03  |
| 3.083 | 3.05  | 6.167  | 74.17     | 9.250     | 3.05  | l     |       |

Max.Eff.Inten.(mm/hr)= 74.17 61.96 over (min)
Storage Coeff. (min)= 10.00 9.68 (ii) 4.99 (ii)

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1.02 | 4.167 | 3.05 | 7.250

1.02 | 4.250 | 3.05 | 7.333

1.02 | 4.333 | 5.08 | 7.417

2.03 | 4.417 | 5.08 | 7.500

2.03 | 4.500 | 5.08 | 7.583

2.03 | 4.583 | 6.10 | 7.667

2.03 | 4.583 | 6.10 | 7.750

2.03 | 4.833 | 6.10 | 7.933

2.03 | 4.833 | 6.10 | 7.937

1.01 | 7.01 | 7.017

1.02 | 4.017 | 6.10 | 8.000
                                                                                                        4.167
4.250
4.333
4.417
4.508
4.583
4.667
4.750
4.833
4.917
5.000
5.083
5.167
5.250
5.333
                                                    1.083
                                                                                                                                                                                              6.10 | 10.33
5.08 | 10.42
                                                     1.167
                                                                                                                                                                                              5.08
5.08
5.08
5.08
5.08
5.08
                                                    1.250
1.333
1.417
1.500
1.583
                                                                                                                                                                                                                     10.50
10.58
10.67
10.75
10.83
                                                                                                                                                                                                                                                    2.03
1.02
1.02
1.02
2.03
                                                     1.667
                                                                                                                                                                                                                     10.92
                                                    1.750
                                                                                                                                6.10 | 7.917
6.10 | 8.003
5.08 | 8.167
5.08 | 8.159
5.08 | 8.159
10.16 | 8.417
10.16 | 8.590
10.16 | 8.67
10.16 | 8.67
10.16 | 8.833
73.15 | 8.917
73.15 | 9.000
73.15 | 9.000
74.17 | 9.167
74.17 | 9.250
                                                                                                                                                                                               5.08
5.08
                                                                                                                                                                                                                     11.00
11.08
                                                     1.833
                                                                                  1.02
                                                    1.833
1.917
2.000
2.083
2.167
2.250
2.333
                                                                                  1.02
1.02
2.03
2.03
2.03
3.05
                                                                                                                                                                                                                     11.08
11.17
11.25
11.33
11.42
11.50
11.58
                                                                                                                                                                                              4.06
4.06
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4.06
4.06
                                                                                                                                                                                                                                                    2.03
2.03
1.02
1.02
1.02
                                                                                                          5.417
                                                                                                                                                                                               4.06
                                                                                                                                                                                                                                                     2.03
                                                                                                         5.417
5.500
5.583
5.667
5.750
5.833
5.917
6.000
                                                                                                                                                                                              3.05
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11.67
11.75
11.83
11.92
12.00
12.08
                                                    2.417
                                                                                   3.05
                                                                                                                                                                                                                                                    2.03
                                                    2.417
2.500
2.583
2.667
2.750
2.833
                                                                                  3.05
3.05
3.05
3.05
3.05
4.06
4.06
4.06
                                                     2.917
                                                                                                                                                                                                                                                     2.03
                                                                                                         6.083
6.167
                                                                                                                                                                                               3.05
                                                    3.083
                                                                                  3.05
              Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                                                                                                                         53.29
15.00
10.98 (ii)
15.00
                                                                                                                74.17
5.00
4.99 (ii)
5.00
                                                                                                                0.22
                                                                                                                                                            0.09
                                                                                                                                                                                                       *TOTALS*
              PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                                                                             0.05
6.25
80.04
82.04
0.98
                                                                                                                                                                                                          TOTALS*
0.091 (iii)
6.25
59.60
82.04
0.73
                                                                                                                                                             0.04
                                                                                                                                                         6.33
45.99
82.04
0.56
***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
                      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
                (1) CN* = 83.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
| STANDHYD ( 0170)|
|ID= 1 DT= 5.0 min |
                                                                          Area (ha)= 0.43
Total Imp(%)= 57.00 Dir. Conn.(%)= 57.00
```

IMPERVIOUS PERVIOUS (i)

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|                    | Land      | rc+affDd EA Ex | isting WestDo  | nWatanchd     |
|--------------------|-----------|----------------|----------------|---------------|
| Unit Hyd. Tpeak    |           | 5.00           | 10.00          | ilwa cer silu |
| Unit Hyd. peak     |           | 0.22           | 0.11           |               |
|                    |           |                |                | *TOTALS*      |
| PEAK FLOW          | (cms)=    | 0.05           | 0.03           | 0.079 (iii)   |
| TIME TO PEAK       | (hrs)=    | 6.25           | 6.25           | 6.25          |
| RUNOFF VOLUME      | (mm)=     | 80.04          | 54.74          | 69.15         |
| TOTAL RAINFALL     | (mm)=     | 82.04          | 82.04          | 82.04         |
| RUNOFF COEFFICIE   | ENT =     | 0.98           | 0.67           | 0.84          |
| ** WARNING: STORAG | GE COEFF. | IS SMALLER T   | HAN TIME STEP! |               |

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

(1) CN\* FINCEDORE SELECT FOR FEATURES LOSSES.

(CN\* = 89.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0450)| | 1 + 2 = 3 | QPEAK (cms) 0.091 0.079 R.V. (mm) 59.60 69.15 ΔRFΔ (ha) 0.60 0.43 (hrs) 6.25 6.25 ID1= 1 ( 0165): + ID2= 2 ( 0170): ID = 3 ( 0450): 1.03 0.170 6.25 63.59

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD ( 0450)| 3 + 2 = 1 | AREA QPEAK (ha) 1.03 (cms) (hrs) 6.25 (mm) 63.59 ID1= 3 ( 0450): + ID2= 2 ( 0445): 1.12 0.164 6.25 58.28

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB             |       |          |       |        |           |       |  |
|-------------------|-------|----------|-------|--------|-----------|-------|--|
| STANDHYD ( 0190)  | Area  | (ha)=    | 0.86  |        |           |       |  |
| ID= 1 DT= 5.0 min | Total | Imp(%)=  | 42.00 | Dir.   | Conn.(%)= | 42.00 |  |
|                   |       |          |       |        |           |       |  |
|                   |       | IMPERVIO | OUS   | PERVIO | JS (i)    |       |  |
| Surface Area      | (ha)= | 0.36     | 5     | 0.5    | 9         |       |  |
| Dep. Storage      | (mm)= | 2.00     | 3     | 5.00   | 9         |       |  |
| Average Slope     | (%)=  | 1.00     | 3     | 2.00   | 9         |       |  |
| Length            | (m)=  | 340.00   | 3     | 50.00  | 9         |       |  |
| Mannings n        | ` ′=  | 0.013    | 3     | 0.25   | 9         |       |  |
| =                 |       |          |       |        |           |       |  |

#### LangstaffRd\_EA\_Existing\_WestDonWatershd

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ---RAIN | TIME RAIN | TIME RAIN | TIME
mmm/hr | hrs mm/hr | hrs mm/hr | hrs
0.00 | 3.167 | 3.05 | 6.250 | 74.17 | 9.33
0.00 | 3.250 | 3.05 | 6.333 | 15.24 | 9.42 hrs 0.083 mm/hr mm/hr 3.05 mm/hr | 6.759
3.05 | 6.250
3.05 | 6.333
3.05 | 6.583
3.05 | 6.583
3.05 | 6.667
3.05 | 6.759
3.05 | 6.759
3.05 | 6.759
3.05 | 6.759
3.05 | 7.250
3.05 | 7.250
3.05 | 7.250
3.05 | 7.250
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3.05 | 7.250
3.05 | 7.250
3.05 | 7.250
3.05 0.167 0.250 0.00 3.05 3.333 15.24 9.50 3.05 0.250 0.333 0.417 0.500 0.583 0.667 0.750 2.03 2.03 2.03 1.02 1.02 3.333 3.417 3.500 3.583 3.667 3.750 3.833 2.03 2.03 2.03 3.05 3.05 3.05 9.58 9.67 9.75 9.83 9.92 2.03 | 2.03 | 2.03 | 1.02 | 1.02 | 1.02 | 2.03 | 0.833 3.917 4.000 4.083 4.167 4.250 4.333 4.417 4.500 4.583 4.667 4.750 4.833 4.917 5.000 5.083 10.08 10.17 2.03 0.917 10.17 10.25 10.33 10.42 10.50 10.58 2.03 2.03 2.03 2.03 2.03 1.333 1.02 1.417 2.03 10.67 1.02 10.67 10.75 10.83 10.92 11.00 11.08 11.17 1.500 2.03 2.03 2.03 2.03 1.02 1.02 1.02 2.03 1.02 2 03 1.667 1.750 1.833 1.917 2.03 2.03 2.03 2.03 2.03 2.000 11.25 2.03 2.083 5.167 11.33 1.02 2.03 2.03 2.03 3.05 3.05 3.05 3.05 3.05 5.167 5.250 5.333 5.417 5.500 5.583 5.667 5.750 1.02 1.02 2.03 2.03 2.03 1.02 2.167 11.42 2.167 2.250 2.333 2.417 2.500 2.583 11.42 11.50 11.58 11.67 11.75 11.83 2.667 11.92 3.05 | 5.750 3.05 | 5.833 4.06 | 5.917 4.06 | 6.000 4.06 | 6.083 3.05 | 6.167 12.00 12.08 12.17 12.25 2.750 1.02 2.833 2.03 2.917 2.03 Max.Eff.Inten.(mm/hr)= 74.17 over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 5.00 20.00 6.00 (ii) 16.50 (ii) 5.00 20.00 0.19 0.06 \*TOTALS\* 0.07 6.25 0.05 6.42 0.119 (iii) 6.25 PEAK FLOW (cms)= TIME TO PEAK (hrs)= Page 157

| Langs  | staffRd_E | A Existi | ng WestD | onWaters | hd        |      |
|--|-----------|----------|----------|----------|-----------|------|
| 2.000 1.02<br>2.083 2.03<br>2.167 2.03<br>2.250 2.03                                   | 5.083     | 5.08     | 8.167    | 4.06     | 11.25     | 2.03 |
| 2.083 2.03   | 5.167     | 5.08     | 8.250    | 4.06     | 11.33     | 1.02 |
| 2.167 2.03   | 5.250     | 5.08     | 8.333    | 4.06     | 11.42     | 1.02 |
| 2.250 2.03   | 5.333     | 10.16    | 8.417    | 4.06     | 11.50     | 1.02 |
| 2.333 3.05   | 5.417     | 10.16    | 8.500    | 4.06     | 11.58     | 2.03 |
| 2.333 3.05<br>2.417 3.05<br>2.500 3.05   | 5.500     | 10.16    | 8.583    | 3.05     | 11.67     | 2.03 |
| 2.500 3.05   | 5.583     | 10.16    | 8.667    | 3.05     | 11.75     | 2.03 |
| 2.583 3.05<br>2.667 3.05   | 5.667     | 10.16    | 8.750    | 3.05     | 11.83     | 1.02 |
| 2.667 3.05   | 5.750     | 10.16    | 8.833    | 3.05     | 11.92     | 1.02 |
| 2.750 3.05<br>2.750 3.05<br>2.833 4.06<br>2.917 4.06<br>3.000 4.06<br>3.083 3.05       | 5.833     | 73.15    | 8.917    | 3.05     | 12.00     | 1.02 |
| 2.833 4.06   | 5.917     | 73.15    | 9.000    | 3.05     | 12.08     | 2.03 |
| 2.917 4.06   | 6.000     | 73.15    | 9.083    | 3.05     | 12.17     | 2.03 |
| 3.000 4.06   | 6.083     | 74.17    | 9.167    | 3.05     | 12.25     | 2.03 |
| 3.083 3.05   | 6.167     | 74.17    | 9.250    | 3.05     |           |      |
| Max.Eff.Inten.(mm/hr)=   | 74.17     | 5        | 3.29     |          |           |      |
| over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)=                                | 5.00      | 1        | 5.00     |          |           |      |
| Storage Coeff. (min)=  | 6.00      | (ii) 1   | 1.99 (i  | i)       |           |      |
| Unit Hyd. Tpeak (min)=   | 5.00      | 1        | 5.00     |          |           |      |
| Unit Hyd. peak (cms)=  | 0.19      |          | 0.09     |          |           |      |
|  |           |          |          | *T0      | ΓALS*     |      |
| PEAK FLOW (cms)=   | 0.07      |          | 0.05     | 0.       | .120 (iii | )    |
| TIME TO PEAK (hrs)=  | 6.25      |          | 6.33     | 6        | 5.25      |      |
| RUNOFF VOLUME (mm)=  | 80.04     | 4        | 5.99     | 66       | 9.28      |      |
| PEAK FLOW (cms)=<br>TIME TO PEAK (hrs)=<br>RUNOFF VOLUME (mm)=<br>TOTAL RAINFALL (mm)= | 82.04     | 8        | 2.04     | 82       | 2.04      |      |
| RUNOFF COEFFICIENT =   | 0.98      |          | 0.56     | (        | 9.73      |      |
|  |           |          |          |          |           |      |
| (i) CN PROCEDURE SELECT  | FD FOR PF | RVTOUS I | OSSES:   |          |           |      |
| CN* = 83.0 Ia  |           |          |          |          |           |      |
| (ii) TIME STEP (DT) SHOU   |           |          |          |          |           |      |
| THAN THE STORAGE CO  |           |          |          |          |           |      |
| (iii) PEAK FLOW DOES NOT   |           |          | IF ANY.  |          |           |      |
| ` '  |           |          |          |          |           |      |
|  |           |          |          |          |           |      |
|  |           |          |          |          |           |      |
| ADD UND  |           |          |          |          |           |      |
| ADD HYD ( 0455)  | REA OP    |          |          |          |           |      |
| 1 + 2 = 3   A  | REA QP    | EAK T    | PEAK     | R.V.     |           |      |
| (  | ha) (c    | ms) (    | nrs)     | (mm)     |           |      |
| ID1= 1 ( 0190): 0<br>+ ID2= 2 ( 0195): 0   | .86 0.1   | 19 6     | . 25     | 60.28    |           |      |
|  |           |          |          |          |           |      |
| ID = 3 ( 0455): 1  |           |          |          |          |           |      |
| 10 - 3 ( 0455): 1  | .05 0.2   | 20 0     | .23      | 00.20    |           |      |
| NOTE: PEAK FLOWS DO NOT  | INCLUDE B | ASEFLOWS | IF ANY   |          |           |      |

AREA QPEAK

(ha) (cms) 2.15 0.334

TPFAK

(hrs) 6.25

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(mm) 60.82

ADD HYD ( 0458) 1 + 2 = 3

ID1= 1 ( 0450):

LangstaffRd\_EA\_Existing\_WestDonWatershd 1) = 80.04 45.99 60.2 1) = 82.04 82.04 82.0 RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 60.28 82.04

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
- CN\* = 83.0 Ia = Dep. Storage (Above)
  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
  THAN THE STORAGE COEFFICIENT.
  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB | STANDHYD ( 0195)| |ID= 1 DT= 5.0 min | Area (ha)= 0.79 Total Imp(%)= 42.00 Dir. Conn.(%)= 42.00 IMPERVIOUS PERVIOUS (i) Surface Area Dep. Storage Average Slope (ha)= (mm)= (%)= (m)= 0.33 2.00 1.00 340.00 0.46 5.00 2.00 Length Mannings n 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | ) HYETOGR | APH   |       |       |
|-------|-------|-------|----------|-----------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME    | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs     | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05     | 6.250     | 74.17 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05     | 6.333     | 15.24 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417     | 15.24 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 3.05     | 6.500     | 15.24 | 9.58  | 2.03  |
| 0.417 | 2.03  | 3.500 | 3.05     | 6.583     | 14.22 | 9.67  | 2.03  |
| 0.500 | 2.03  | 3.583 | 3.05     | 6.667     | 14.22 | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 3.05     | 6.750     | 14.22 | 9.83  | 3.05  |
| 0.667 | 1.02  | 3.750 | 3.05     | 6.833     | 7.11  | 9.92  | 3.05  |
| 0.750 | 1.02  | 3.833 | 4.06     | 6.917     | 7.11  | 10.00 | 3.05  |
| 0.833 | 2.03  | 3.917 | 4.06     | 7.000     | 7.11  | 10.08 | 2.03  |
| 0.917 | 2.03  | 4.000 | 4.06     | 7.083     | 6.10  | 10.17 | 2.03  |
| 1.000 | 2.03  | 4.083 | 3.05     | 7.167     | 6.10  | 10.25 | 2.03  |
| 1.083 | 1.02  | 4.167 | 3.05     | 7.250     | 6.10  | 10.33 | 2.03  |
| 1.167 | 1.02  | 4.250 | 3.05     | 7.333     | 5.08  | 10.42 | 2.03  |
| 1.250 | 1.02  | 4.333 | 5.08     | 7.417     | 5.08  | 10.50 | 2.03  |
| 1.333 | 2.03  | 4.417 | 5.08     | 7.500     | 5.08  | 10.58 | 1.02  |
| 1.417 | 2.03  | 4.500 | 5.08     | 7.583     | 5.08  | 10.67 | 1.02  |
| 1.500 | 2.03  | 4.583 | 6.10     | 7.667     | 5.08  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 6.10     | 7.750     | 5.08  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 6.10     | 7.833     | 5.08  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 6.10     | 7.917     | 5.08  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 6.10     | 8.000     | 5.08  | 11.08 | 2.03  |
| 1.917 | 1.02  | 5.000 | 6.10     | 8.083     | 4.06  | 11.17 | 2.03  |
|       |       |       |          |           |       |       |       |

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|   |        |   |        | Langstaff | Rd_EA_E | kisting_West | DonWater | sho |
|---|--------|---|--------|-----------|---------|--------------|----------|-----|
| + | ID2= 2 | ( | 0455): | 1.65      | 0.238   | 6.25         | 60.28    |     |
|   | ====== |   |        |           |         |              |          |     |
|   | TD = 3 | ( | 0458): | 3.80      | 0.573   | 6.25         | 60.59    |     |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS TE ANY.

| CALIB         | Area<br>Total | (ha)=<br>Imp(%)= | 10.00<br>80.00 | Dir.   | Conn.(%)= | 80.00 |
|---------------|---------------|------------------|----------------|--------|-----------|-------|
|               |               | TMPFRVTO         | บเร            | PERVIO | IS (i)    |       |
| Surface Area  | (ha)=         | 8.00             | )              | 2.00   |           |       |
| Dep. Storage  | (mm)=         | 1.00             | •              | 5.00   | 9         |       |
| Average Slope | (%)=          | 1.00             | )              | 2.00   | 9         |       |
| Length        | (m)=          | 258.26           | )              | 40.00  | 9         |       |
| Mannings n    | =             | 0.01             | 3              | 0.25   | 9         |       |
| . 0-          |               |                  |                |        |           |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TRANSFORMED HYETOGRAPH |       |       |       |        |       |       |       |  |  |  |  |  |
|------------------------|-------|-------|-------|--------|-------|-------|-------|--|--|--|--|--|
| TIME                   | RAIN  | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |  |  |  |  |
| hrs                    | mm/hr | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |  |  |  |  |
| 0.083                  | 0.00  | 3.167 | 3.05  | 6.250  | 74.17 | 9.33  | 3.05  |  |  |  |  |  |
| 0.167                  | 0.00  | 3.250 | 3.05  | 6.333  | 15.24 | 9.42  | 3.05  |  |  |  |  |  |
| 0.250                  | 0.00  | 3.333 | 3.05  | 6.417  | 15.24 | 9.50  | 3.05  |  |  |  |  |  |
| 0.333                  | 2.03  | 3.417 | 3.05  | 6.500  | 15.24 | 9.58  | 2.03  |  |  |  |  |  |
| 0.417                  | 2.03  | 3.500 | 3.05  | 6.583  | 14.22 | 9.67  | 2.03  |  |  |  |  |  |
| 0.500                  | 2.03  | 3.583 | 3.05  | 6.667  | 14.22 | 9.75  | 2.03  |  |  |  |  |  |
| 0.583                  | 1.02  | 3.667 | 3.05  | 6.750  | 14.22 | 9.83  | 3.05  |  |  |  |  |  |
| 0.667                  | 1.02  | 3.750 | 3.05  | 6.833  | 7.11  | 9.92  | 3.05  |  |  |  |  |  |
| 0.750                  | 1.02  | 3.833 | 4.06  | 6.917  | 7.11  | 10.00 | 3.05  |  |  |  |  |  |
| 0.833                  | 2.03  | 3.917 | 4.06  | 7.000  | 7.11  | 10.08 | 2.03  |  |  |  |  |  |
| 0.917                  | 2.03  | 4.000 | 4.06  | 7.083  | 6.10  | 10.17 | 2.03  |  |  |  |  |  |
| 1.000                  | 2.03  | 4.083 | 3.05  |        | 6.10  |       | 2.03  |  |  |  |  |  |
| 1.083                  | 1.02  | 4.167 | 3.05  |        | 6.10  |       | 2.03  |  |  |  |  |  |
| 1.167                  | 1.02  | 4.250 | 3.05  |        | 5.08  |       | 2.03  |  |  |  |  |  |
| 1.250                  | 1.02  |       | 5.08  |        | 5.08  |       | 2.03  |  |  |  |  |  |
| 1.333                  | 2.03  |       | 5.08  |        | 5.08  |       | 1.02  |  |  |  |  |  |
| 1.417                  | 2.03  |       | 5.08  |        | 5.08  |       | 1.02  |  |  |  |  |  |
| 1.500                  | 2.03  |       | 6.10  |        | 5.08  |       | 1.02  |  |  |  |  |  |
| 1.583                  | 2.03  | 4.667 | 6.10  |        | 5.08  |       | 2.03  |  |  |  |  |  |
| 1.667                  | 2.03  | 4.750 | 6.10  |        | 5.08  |       | 2.03  |  |  |  |  |  |
| 1.750                  | 2.03  | 4.833 | 6.10  | 7.917  | 5.08  | 11.00 | 2.03  |  |  |  |  |  |
| 1.833                  | 1.02  | 4.917 | 6.10  | 8.000  | 5.08  | 11.08 | 2.03  |  |  |  |  |  |
| 1.917                  | 1.02  | 5.000 | 6.10  | 8.083  | 4.06  | 11.17 | 2.03  |  |  |  |  |  |
| 2.000                  | 1.02  | 5.083 | 5.08  | 8.167  | 4.06  | 11.25 | 2.03  |  |  |  |  |  |
| 2.083                  | 2.03  | 5.167 | 5.08  | 8.250  | 4.06  | 11.33 | 1.02  |  |  |  |  |  |
| 2.167                  | 2.03  | 5.250 | 5.08  |        | 4.06  | 11.42 | 1.02  |  |  |  |  |  |
| 2.250                  | 2.03  | 5.333 | 10.16 |        | 4.06  |       | 1.02  |  |  |  |  |  |
| 2.333                  | 3.05  | 5.417 | 10.16 |        | 4.06  |       | 2.03  |  |  |  |  |  |
| 2.417                  | 3.05  | 5.500 | 10.16 | 8.583  | 3.05  | 11.67 | 2.03  |  |  |  |  |  |
|                        |       |       | Bago  | 160    |       |       |       |  |  |  |  |  |

|                  | Langs   | taffRd_E | A_Exist | ing_WestDon | Waters | hd         |      |
|------------------|---------|----------|---------|-------------|--------|------------|------|
| 2.500            | 3.05    | 5.583    | 10.16   | 8.667       | 3.05   | 11.75      | 2.03 |
| 2.583            | 3.05    | 5.667    | 10.16   | 8.750       | 3.05   | 11.83      | 1.02 |
| 2.667            | 7 3.05  | 5.750    | 10.16   | 8.833       | 3.05   | 11.92      | 1.02 |
| 2.756            | 3.05    | 5.833    | 73.15   | 8.917       | 3.05   | 12.00      | 1.02 |
| 2.833            | 3 4.06  | j 5.917  | 73.15   | 9.000       | 3.05 İ | 12.08      | 2.03 |
| 2.917            | 7 4.06  | i 6.000  | 73.15   | 9.083       | 3.05 İ | 12.17      | 2.03 |
| 3.000            | 4.06    | 6.083    | 74.17   | 9.167       | 3.05   | 12.25      | 2.03 |
| 3.083            | 3.05    | 6.167    | 74.17   | 9.250       | 3.05 İ |            |      |
|                  |         |          |         |             |        |            |      |
| Max.Eff.Inten.(r | nm/hr)= | 74.17    |         | 47.96       |        |            |      |
| over             | (min)   | 5.00     |         | 10.00       |        |            |      |
| Storage Coeff.   | (min)=  | 5.09     | (ii)    | 9.65 (ii)   |        |            |      |
| Unit Hyd. Tpeak  | (min)=  | 5.00     |         | 10.00       |        |            |      |
| Unit Hyd. peak   | (cms)=  | 0.21     |         | 0.11        |        |            |      |
|                  |         |          |         |             | *T01   | TALS*      |      |
| PEAK FLOW        | (cms)=  | 1.64     |         | 0.23        | 1.     | .871 (iii) |      |
| TIME TO PEAK     | (hrs)=  | 6.25     |         | 6.25        | 6      | 5.25 ` ´   |      |
| RUNOFF VOLUME    | (mm)=   | 81.04    |         | 41.06       | 73     | 3.04       |      |
| TOTAL RAINFALL   | (mm)=   | 82.04    |         | 82.04       | 82     | 2.04       |      |
| RUNOFF COEFFICIE | ENT =   | 0.99     |         | 0.50        |        | 3.89       |      |
|                  |         |          |         |             |        |            |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 79.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |            |           |           |       |  |
|-------------------|-------|------------|-----------|-----------|-------|--|
| STANDHYD ( 0350)  | Area  | (ha)=      | 0.90      |           |       |  |
| ID= 1 DT= 5.0 min | Total | Imp(%) = 7 | 0.00 Dir. | Conn.(%)= | 70.00 |  |
|                   |       |            |           |           |       |  |
|                   |       | IMPERVIOU: | S PERVIO  | JS (i)    |       |  |
| Surface Area      | (ha)= | 0.63       | 0.2       | 7         |       |  |
| Dep. Storage      | (mm)= | 1.00       | 5.00      | 9         |       |  |
| Average Slope     | (%)=  | 1.00       | 2.00      | 9         |       |  |
|                   |       | 77.46      | 40.00     |           |       |  |
| Length            | (m)=  | //.46      | 40.0      | )         |       |  |
| Mannings n        | =     | 0.013      | 0.25      | 9         |       |  |
|                   |       |            |           |           |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR/   | ANSFORMED | HYETOGR | APH   |      |       |
|-------|-------|-------|-----------|---------|-------|------|-------|
| TIME  | RAIN  | TIME  | RAIN      | ' TIME  | RAIN  | TIME | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr     | ' hrs   | mm/hr | hrs  | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05      | 6.250   | 74.17 | 9.33 | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05      | 6.333   | 15.24 | 9.42 | 3.05  |
| 0.250 | 0.00  | 3.333 | 3.05      | 6.417   | 15.24 | 9.50 | 3.05  |
| 0.333 | 2.03  | 3.417 | 3.05      | 6.500   | 15.24 | 9.58 | 2.03  |
| 0.417 | 2.03  | 3.500 | 3.05      | 6.583   | 14.22 | 9.67 | 2.03  |
| 0.500 | 2.03  | 3.583 | 3.05      | 6.667   | 14.22 | 9.75 | 2.03  |

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## ${\tt LangstaffRd\_EA\_Existing\_WestDonWatershd}$

|   | (H<br>90): 10.<br>50): 0.  | na) (cms<br>.00 1.871<br>.90 0.157  | 6.25<br>6.25  | (mm)<br>73.04<br>69.04   |   |   |
|---|--|---|---|--|---|---|
| ID = 3 ( 03<br>NOTE: PEAK FLO   | •  |   |   | 72.71  |   |   |
| **************************************  | ********   | **<br>**  |   |  |   |   |
| READ STORM  |  | ata\Loc<br>278a4b5  | s\ray.zhao\Ap<br>al\Temp\<br>4-8409-4519-9<br>2hrSCS  |  | 900a1c25\!  | 571caf6d  |
| 0.2<br>0.5<br>0.7<br>1.0<br>1.2<br>1.5<br>1.7<br>2.0<br>2.2<br>2.5<br>2.7                                   | mm/hr<br>6.00<br>2.03<br>5.203<br>1.02<br>5.203<br>2.03<br>2.03<br>5.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203<br>6.203 | hrs m<br>3.50<br>3.75<br>4.00<br>4.25<br>4.50<br>4.75<br>5.00<br>5.25<br>5.50 1<br>5.75 1<br>6.00 8 | RAIN   TIME m/hr   hrs 4.06   6.75   hrs 4.06   7.25   3.05   7.00   4.06   7.25   3.05   7.11   7.75   6.10   8.25   6.10   8.50   6.10   8.50   6.10   8.50   6.10   8.50   6.10   8.50   6.10   8.50   6.10   8.50   6.10   8.75   1.18   9.00   0.26   9.75   1.28   9.50   6.26   9.75 | mm/hr<br>16.26  <br>7.11  <br>7.11  <br>5.08  <br>5.08  <br>6.10  <br>5.08  <br>4.06  <br>3.05  <br>4.06  <br>3.05  <br>3.05 | hrs<br>10.00<br>10.25<br>10.50<br>10.75<br>11.00<br>11.25<br>11.50<br>11.75<br>12.00<br>12.25 | mm/hr<br>2.03<br>3.05<br>2.03<br>1.02<br>2.03<br>2.03<br>2.03<br>1.02<br>2.03 |
| CALIB<br>  STANDHYD ( 0145)<br>  ID= 1 DT= 5.0 min  <br>  Surface Area<br>  Dep. Storage<br>  Average Slope | (ha)=<br>(mm)=<br>(%)=   | 1.89<br>2.00<br>1.00  | PERVIOUS (<br>1.16<br>5.00<br>2.00  |  | 52.00   |   |
| Length<br>Mannings n  | (m)=<br>=  | 531.00<br>0.013   | 40.00<br>0.250  |  |   |   |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

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|  | staffRd_EA_ |       |            |       |            |      |
|--|-------------|-------|------------|-------|------------|------|
|  | 3.667       |       |            | 14.22 |            | 3.05 |
|  | 3.750       |       | 6.833      | 7.11  |            | 3.05 |
|  | 3.833       |       | 6.917      | 7.11  |            | 3.05 |
|  | 3.917       |       | 7.000      | 7.11  |            | 2.03 |
|  | 4.000       |       | 7.083      | 6.10  |            | 2.03 |
|  | 4.083       |       | 7.167      | 6.10  |            | 2.03 |
|  | 4.167       |       | 7.250      | 6.10  |            | 2.03 |
| 1.167 1.02                             | 4.250       | 3.05  | 7.333      | 5.08  |            | 2.03 |
| 1.250 1.02                             | 4.333       | 5.08  | 7.417      | 5.08  |            | 2.03 |
| 1.333 2.03<br>1.417 2.03               | 4.417       | 5.08  | 7.500      | 5.08  |            | 1.02 |
| 1.41/ 2.03                             | 4.500       |       | 7.583      | 5.08  |            | 1.02 |
| 1.500 2.03                             |             |       | 7.667      | 5.08  |            | 1.02 |
|  | 4.667       |       | 7.750      | 5.08  |            | 2.03 |
|  | 4.750       |       | 7.833      | 5.08  |            | 2.03 |
|  | 4.833       |       | 7.917      | 5.08  |            | 2.03 |
| 1.833 1.02                             | 4.917       | 6.10  | 8.000      | 5.08  |            | 2.03 |
| 1.917 1.02                             | 5.000       | 6.10  | 8.083      | 4.06  |            | 2.03 |
| 2.000 1.02                             | 5.083       | 5.08  | 8.167      | 4.06  |            | 2.03 |
| 2.083 2.03                             | 5.167       | 5.08  | 8.250      | 4.06  |            | 1.02 |
|  | 5.250       |       |            | 4.06  |            | 1.02 |
|  |             |       | 8.417      | 4.06  |            | 1.02 |
|  |             |       | 8.500      | 4.06  |            | 2.03 |
|  |             |       | 8.583      | 3.05  |            | 2.03 |
| 2.500 3.05                             | 5.583       | 10.16 | 8.667      | 3.05  |            | 2.03 |
| 2.583 3.05                             | 5.667       | 10.16 | 8.750      | 3.05  |            | 1.02 |
| 2.583 3.05<br>2.667 3.05<br>2.750 3.05 | 5.750       | 10.16 | 8.833      | 3.05  |            | 1.02 |
|  |             |       |            | 3.05  |            | 1.02 |
|  | 5.917       | 73.15 | 9.000      | 3.05  |            | 2.03 |
| 2.917 4.06                             |             |       | 9.083      | 3.05  |            | 2.03 |
| 3.000 4.06                             | 6.167       | 74.17 | 9.167      | 3.05  |            | 2.03 |
| 3.083 3.05                             | 6.16/       | /4.1/ | 9.250      | 3.05  | l          |      |
| Max.Eff.Inten.(mm/hr)=                 | 74.17       |       | 47.96      |       |            |      |
| over (min)                             | 5.00        |       | 15.00      |       |            |      |
| Storage Coeff. (min)=                  | 2.47 (      | ii)   | 11.94 (ii) |       |            |      |
| Unit Hyd. Tpeak (min)=                 | 5.00        |       | 15.00      |       |            |      |
| Unit Hyd. peak (cms)=                  | 0.29        |       | 0.09       | ***** | TALS*      |      |
| PEAK FLOW (cms)=                       | 0.13        |       | 0.03       |       | .157 (iii) |      |
| TIME TO PEAK (hrs)=                    | 6.25        |       | 6.33       |       | 5.25       |      |
| RUNOFF VOLUME (mm)=                    | 81.04       |       | 41.06      |       | 9.04       |      |
| TOTAL RAINFALL (mm)=                   | 82.04       |       | 82.04      |       | 2.04       |      |
| RUNOFF COEFFICIENT =                   | 0.99        |       | 0.50       |       | 0.84       |      |
| ***** WARNING: STORAGE COEFF.          | IS SMALLER  | THAN  | TIME STEP! |       |            |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 79.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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## ${\tt LangstaffRd\_EA\_Existing\_WestDonWatershd}$

|                     |       | TP/   | NNS EODME | D HYETOGRA | \DH   |            |       |
|---------------------|-------|-------|-----------|------------|-------|------------|-------|
| TIME                | RAIN  |       | RAIN      |            | RAIN  | TIME       | RAIN  |
|                     | mm/hr |       | mm/hr     |            | mm/hr |            | mm/hr |
| 0.083               | 0.00  |       | 3.05      |            | 81.28 |            | 3.05  |
| 0.167               | 0.00  |       |           | 6.333      | 16.26 |            | 3.05  |
| 0.250               |       | 3.333 |           | 6.417      | 16.26 |            | 3.05  |
| 0.333               |       | 3.417 | 4.06      |            | 16.26 |            | 3.05  |
| 0.417               |       | 3.500 | 4.06      |            | 16.26 |            | 3.05  |
| 0.500               | 2.03  |       | 3.05      |            | 16.26 |            | 3.05  |
| 0.583               |       | 3.667 | 3.05      |            | 16.26 |            | 2.03  |
| 0.667               |       | 3.750 | 3.05      |            | 7.11  |            | 2.03  |
| 0.750               | 2.03  | 3.833 | 4.06      | 6.917      | 7.11  | 10.00      | 2.03  |
| 0.833               |       | 3.917 | 4.06      |            | 7.11  |            | 3.05  |
| 0.917               |       | 4.000 | 4.06      | 7.083      | 7.11  | 10.17      | 3.05  |
| 1.000               |       | 4.083 | 3.05      |            | 7.11  |            | 3.05  |
| 1.083               |       | 4.167 | 3.05      |            | 7.11  |            | 2.03  |
| 1.167               |       | 4.250 | 3.05      | 7.333      | 5.08  | 10.42      | 2.03  |
| 1.250               |       | 4.333 | 7.11      |            | 5.08  |            | 2.03  |
| 1.333               | 2.03  | 4.417 | 7.11      | 7.500      | 5.08  | 10.58      | 1.02  |
| 1.417               | 2.03  | 4.500 | 7.11      | 7.583      | 5.08  | 10.67      | 1.02  |
| 1.500               | 2.03  | 4.583 | 6.10      | 7.667      | 5.08  | 10.75      | 1.02  |
| 1.583               | 2.03  | 4.667 | 6.10      | 7.750      | 5.08  | 10.83      | 2.03  |
| 1.667               | 2.03  | 4.750 | 6.10      | 7.833      | 6.10  | 10.92      | 2.03  |
| 1.750               | 2.03  | 4.833 | 6.10      | 7.917      | 6.10  | 11.00      | 2.03  |
| 1.833               | 1.02  | 4.917 |           | 8.000      | 6.10  |            | 2.03  |
| 1.917               | 1.02  | 5.000 | 6.10      | 8.083      | 5.08  |            | 2.03  |
| 2.000               | 1.02  | 5.083 | 6.10      | 8.167      | 5.08  | 11.25      | 2.03  |
| 2.083               | 2.03  |       |           | 8.250      | 5.08  |            | 2.03  |
| 2.167               |       | 5.250 | 6.10      |            | 4.06  |            | 2.03  |
| 2.250               |       | 5.333 |           | 8.417      | 4.06  |            | 2.03  |
| 2.333               |       | 5.417 |           | 8.500      | 4.06  |            | 1.02  |
| 2.417               | 4.06  |       | 11.18     |            | 3.05  |            | 1.02  |
| 2.500               |       | 5.583 |           | 8.667      | 3.05  |            | 1.02  |
| 2.583               |       | 5.667 |           | 8.750      | 3.05  |            | 2.03  |
| 2.667               | 3.05  |       | 11.18     |            | 4.06  |            | 2.03  |
| 2.750               |       | 5.833 | 80.26     |            | 4.06  |            | 2.03  |
| 2.833               |       | 5.917 | 80.26     |            | 4.06  |            | 2.03  |
| 2.917               |       | 6.000 |           | 9.083      | 3.05  |            | 2.03  |
| 3.000               |       | 6.083 |           | 9.167      | 3.05  |            | 2.03  |
| 3.083               | 3.05  | 6.167 | 81.28     | 9.250      | 3.05  |            |       |
| Max.Eff.Inten.(mm/h | n)-   | 81.28 |           | 64.97      |       |            |       |
| over (mi            |       | 10.00 |           | 20.00      |       |            |       |
|                     | n)=   | 7.56  | (ii)      | 15.94 (ii) | ١     |            |       |
| Unit Hyd. Tpeak (mi |       | 10.00 | (11)      | 20.00      | ,     |            |       |
|                     | 15)=  | 0.13  |           | 0.07       |       |            |       |
| onize nyar peak (en | .5)-  | 0.13  |           | 0.07       | *T01  | TALS*      |       |
| PEAK FLOW (cm       | ıs)=  | 0.42  |           | 0.15       |       | .550 (iii) |       |
|                     | `s)=  | 6.25  |           | 6.33       |       | 5.25       |       |
|                     | ım)=  | 87.92 |           | 57.11      |       | 5.21       |       |
|                     | ım)=  | 89.92 |           | 89.92      |       | 9.92       |       |
| ,                   |       |       |           |            |       |            |       |
|                     |       |       | Page      | 164        |       |            |       |

# 

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 86.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |         |       |         |           |       |
|-------------------|-------|---------|-------|---------|-----------|-------|
| STANDHYD ( 0140)  | Area  | (ha)=   | 1.27  |         |           |       |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 52.00 | Dir.    | Conn.(%)= | 52.00 |
|                   |       |         |       |         |           |       |
|                   |       | IMPERVI | OUS   | PERVIOU | JS (i)    |       |
| Surface Area      | (ha)= | 0.6     | 6     | 0.61    |           |       |
| Dep. Storage      | (mm)= | 2.0     | 10    | 5.00    | )         |       |
| Average Slope     | (%)=  | 1.0     | 0     | 2.00    | )         |       |
| Length            | (m)=  | 503.0   | 0     | 25.00   | )         |       |
| Mannings n        | ` =   | 0.01    | .3    | 0.250   | )         |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TRA   | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05     | 6.250   | 81.28 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05     | 6.333   | 16.26 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 4.06     | 6.417   | 16.26 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 4.06     | 6.500   | 16.26 | 9.58  | 3.05  |
| 0.417 | 2.03  | 3.500 | 4.06     | 6.583   | 16.26 | 9.67  | 3.05  |
| 0.500 | 2.03  | 3.583 | 3.05     | 6.667   | 16.26 | 9.75  | 3.05  |
| 0.583 | 2.03  | 3.667 | 3.05     | 6.750   | 16.26 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 3.05     | 6.833   | 7.11  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 4.06     | 6.917   | 7.11  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 4.06     | 7.000   | 7.11  | 10.08 | 3.05  |
| 0.917 | 1.02  | 4.000 | 4.06     | 7.083   | 7.11  | 10.17 | 3.05  |
| 1.000 | 1.02  | 4.083 | 3.05     | 7.167   | 7.11  | 10.25 | 3.05  |
| 1.083 | 2.03  | 4.167 | 3.05     | 7.250   | 7.11  | 10.33 | 2.03  |
| 1.167 | 2.03  | 4.250 | 3.05     | 7.333   | 5.08  | 10.42 | 2.03  |
| 1.250 | 2.03  | 4.333 | 7.11     | 7.417   | 5.08  | 10.50 | 2.03  |
| 1.333 | 2.03  | 4.417 | 7.11     | 7.500   | 5.08  | 10.58 | 1.02  |
| 1.417 | 2.03  | 4.500 | 7.11     | 7.583   | 5.08  | 10.67 | 1.02  |
| 1.500 | 2.03  | 4.583 | 6.10     | 7.667   | 5.08  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 6.10     | 7.750   | 5.08  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 6.10     | 7.833   | 6.10  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 6.10     | 7.917   | 6.10  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 6.10     | 8.000   | 6.10  | 11.08 | 2.03  |
| 1.917 | 1.02  | 5.000 | 6.10     | 8.083   | 5.08  | 11.17 | 2.03  |
| 2.000 | 1.02  | 5.083 | 6.10     | 8.167   | 5.08  | 11.25 | 2.03  |
| 2.083 | 2.03  | 5.167 | 6.10     | 8.250   | 5.08  | 11.33 | 2.03  |

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|          | Langs | taffRd_E | A Existi | ng WestD | onWaters | hd    |      |
|----------|-------|----------|----------|----------|----------|-------|------|
| 0.250    | 0.00  |          | 4.06     |          | 16.26    |       | 3.05 |
| 0.333    | 2.03  | 3.417    | 4.06     | 6.500    | 16.26    | 9.58  | 3.05 |
| 0.417    | 2.03  | 3.500    | 4.06     | 6.583    | 16.26    | 9.67  | 3.05 |
| 0.500    | 2.03  | 3.583    | 3.05     | 6.667    | 16.26    | 9.75  | 3.05 |
| 0.583    | 2.03  | 3.667    | 3.05     | 6.750    | 16.26    | 9.83  | 2.03 |
| 0.667    | 2.03  | 3.750    | 3.05     | 6.833    | 7.11     | 9.92  | 2.03 |
| 0.750    | 2.03  | 3.833    | 4.06     | 6.917    | 7.11     | 10.00 | 2.03 |
| 0.833    | 1.02  | 3.917    | 4.06     | 7.000    | 7.11     | 10.08 | 3.05 |
| 0.917    | 1.02  | 4.000    | 4.06     | 7.083    | 7.11     | 10.17 | 3.05 |
| 1.000    | 1.02  | 4.083    | 3.05     | 7.167    | 7.11     | 10.25 | 3.05 |
| 1.083    | 2.03  | 4.167    | 3.05     | 7.250    | 7.11     | 10.33 | 2.03 |
| 1.167    | 2.03  | 4.250    | 3.05     | 7.333    | 5.08     | 10.42 | 2.03 |
| 1.250    | 2.03  | 4.333    | 7.11     | 7.417    | 5.08     | 10.50 | 2.03 |
| 1.333    | 2.03  | 4.417    | 7.11     | 7.500    | 5.08     | 10.58 | 1.02 |
| 1.417    | 2.03  | 4.500    | 7.11     | 7.583    | 5.08     | 10.67 | 1.02 |
| 1.500    | 2.03  | 4.583    | 6.10     | 7.667    | 5.08     | 10.75 | 1.02 |
| 1.583    | 2.03  | 4.667    | 6.10     |          | 5.08     |       | 2.03 |
| 1.667    | 2.03  | 4.750    | 6.10     |          | 6.10     |       | 2.03 |
| 1.750    | 2.03  | 4.833    | 6.10     |          | 6.10     | 11.00 | 2.03 |
| 1.833    | 1.02  | 4.917    | 6.10     |          | 6.10     |       | 2.03 |
| 1.917    | 1.02  | 5.000    | 6.10     |          | 5.08     |       | 2.03 |
| 2.000    | 1.02  | 5.083    | 6.10     |          | 5.08     |       | 2.03 |
| 2.083    | 2.03  | 5.167    | 6.10     |          | 5.08     |       | 2.03 |
| 2.167    | 2.03  | 5.250    | 6.10     |          | 4.06     | 11.42 | 2.03 |
| 2.250    | 2.03  | 5.333    | 11.18    |          | 4.06     | 11.50 | 2.03 |
| 2.333    | 4.06  | 5.417    | 11.18    |          | 4.06     | 11.58 | 1.02 |
| 2.417    | 4.06  | 5.500    | 11.18    |          | 3.05     | 11.67 | 1.02 |
| 2.500    | 4.06  | 5.583    | 11.18    |          | 3.05     | 11.75 | 1.02 |
| 2.583    | 3.05  | 5.667    | 11.18    |          | 3.05     | 11.83 | 2.03 |
| 2.667    | 3.05  | 5.750    | 11.18    | 8.833    | 4.06     | 11.92 | 2.03 |
| 2.750    | 3.05  | 5.833    | 80.26    |          | 4.06     | 12.00 | 2.03 |
| 2.833    | 4.06  | 5.917    | 80.26    |          | 4.06     | 12.08 | 2.03 |
| 2.917    | 4.06  | 6.000    | 80.26    |          | 3.05     | 12.17 | 2.03 |
| 3.000    | 4.06  | 6.083    | 81.28    | 9.167    | 3.05     | 12.25 | 2.03 |
| 3.083    | 3.05  | 6.167    | 81.28    | 9.250    | 3.05     | l     |      |
| ten.(mm/ | hr)=  | 81.28    |          | 52.01    |          |       |      |

- Max.Eff.Inten.(mm/hr)= over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)= 81.28 5.00 7.32 (ii) 5.00 0.17 62.01 15.00 14.51 (ii) 15.00 0.08 \*TOTALS\*
  0.234 (iii)
  6.25
  67.62
  89.92
  0.75 PEAK FLOW (cms)=
  TIME TO PEAK (hrs)=
  RUNOFF VOLUME (mm)=
  TOTAL RAINFALL (mm)=
  RUNOFF COEFFICIENT = 0.13 6.25 87.92 89.92 0.98 0.11 6.33 54.09 89.92 0.60
- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: CN\* = 84.0 Ia = Dep. Storage (Above) (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

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|   |   | +~EED4 F     | A Fudami  | ina HastDa   |         | la al             |               |  |
|---|---|--------------|-----------|--|---------|-------------------|---------------|--|
| 2 165   |   |              |           | ing_WestDo<br>  8.333  |         |                   | 2.03          |  |
| 2 256   | 2.03  | 5 333        | 11 18     | 8 417  | 4.00    | 11.72             | 2.03          |  |
| 2.23  | 3 4 96  | 5 417        | 11 18     | 8.417<br>  8.500<br>  8.583  | 4.00    | 11.50             | 1.02          |  |
| 2.417   | 4.06  | 5.500        | 11.18     | 8.583  | 3.05    | 11.67             | 1.02          |  |
| 2 500   | 4 96  | 5 583        | 11 18     | 8 667  | 3 05    | 11 75             | 1 02          |  |
| 2.58  | 3.05  | 5.667        | 11.18     | 8.383<br>  8.667<br>  8.750<br>  8.833<br>  8.917<br>  9.000<br>  9.083<br>  9.167 | 3.05    | 11.83             | 2.03          |  |
| 2.667   | 7 3.05  | 5.750        | 11.18     | 8.833  | 4.06    | 11.92             | 2.03          |  |
| 2.756   | 3.05  | 5.833        | 80.26     | 8.917  | 4.06    | 12.00             | 2.03          |  |
| 2.833   | 4.06  | 5.917        | 80.26     | 9.000  | 4.06    | 12.08             | 2.03          |  |
| 2.917   | 4.06  | 6.000        | 80.26     | 9.083  | 3.05    | 12.17             | 2.03          |  |
| 3.006   | 4.06  | 6.083        | 81.28     | 9.167  | 3.05    | 12.25             | 2.03          |  |
| 3.083   | 3.05  | 6.167        | 81.28     | 9.250  | 3.05    |                   |               |  |
| Max.Eff.Inten.(m                                  |   |              |           |  |         |                   |               |  |
| max.err.inten.(                                   | /min/ 111.) =   | 01.20        |           | 60.55  |         |                   |               |  |
| over<br>Storage Coeff.<br>Unit Hyd. Tpeak         | (min)   | 5.00         | (::)      | 12 02 (44)   |         |                   |               |  |
| Unit Hud Thook                                    | (min)=  | 7.32<br>E 00 | (11)      | 15.62 (11)   |         |                   |               |  |
| Unit Hyd. peak                                    | (mIII)=   | 0.17         |           | 0.08   |         |                   |               |  |
| onit nyu. peak                                    | (CIIIS)=  | 0.17         |           | 0.00   | *****   | TALS*             |               |  |
| DEAK ELON   | (cmc)-  | 0 15         |           | 0 00   |         | .222 (iii         | `             |  |
| PEAK FLOW<br>TIME TO PEAK                         | (bnc)-  | 6.13         |           | 0.08<br>6.33   |         | .222 (111<br>5.25 | ,             |  |
| DINOEE VOLUME                                     | (III'S)-  | 97 02        |           | 52 66  |         | 3.23<br>3.98      |               |  |
| RUNOFF VOLUME<br>TOTAL RAINFALL                   | (mm)-   | 80 02        |           | 52.66<br>89.92   |         | 9.92              |               |  |
| RUNOFF COEFFICIE                                  | (IIIII) -<br>INT -  | 0.98         |           | 0.59   |         | 9.92<br>9.79      |               |  |
| NONOTT COLITICIE                                  |   | 0.50         |           | 0.55   | ,       | 5.75              |               |  |
| CN* = 8<br>(ii) TIME STEP<br>THAN THE S           | (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  CN* = 83.0 Ia = Dep. Storage (Above)  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  THAN THE STORAGE COEFTCIENT.  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY. |              |           |  |         |                   |               |  |
|   |   |              |           |  |         |                   |               |  |
| CALIB   |   |              |           |  |         |                   |               |  |
| CALIB<br>  STANDHYD ( 0135)<br> ID= 1 DT= 5.0 min | Area  | (ha)=        | 1.43      |  |         |                   |               |  |
| ID= 1 DT= 5.0 min                                 | Total I   | np(%)= 4     | 10.00     | Dir. Conn.   | (%)=    | 40.00             |               |  |
|   |   | TMPERVTOL    | IS PE     | RVIOUS (i)   |         |                   |               |  |
| Surface Area                                      | (ha)=   | 0.57         |           | 0.86   |         |                   |               |  |
| Dep. Storage                                      | (mm)=   | 2.00         |           | 5.00   |         |                   |               |  |
| Average Slope                                     | (%)=  | 1.00         |           | 2.00   |         |                   |               |  |
|   | (%)=<br>(m)=  | 503.00       |           | 30.00  |         |                   |               |  |
| Length<br>Mannings n                              | =   | 0.013        |           | 0.250  |         |                   |               |  |
|   |   |              |           |  | THE CT  |                   |               |  |
| NOTE: RAINF                                       | ALL WAS II  | KANSFURME    | יט וט     | 5.0 MIN. I   | TWE SII | EP.               |               |  |
|   |   | TD           | NCCODMC   | D HYETOGRA   | DII     |                   |               |  |
| TTM   | DATM  |              |           | TIME   |         |                   | RAIN          |  |
| I IME   | RAIN<br>mm/h=   | l ithe       | mm/h=     | hrs  | mm/b-   | IIIIE             | mm/hr         |  |
| nrs<br>a ao                                       | 0 00  | 1 2 167      | 11111/11P | 1 6 250  | 01 20   | 1 0 33            | mm/nr<br>3.05 |  |
| 0.08  | 7 0 00  | 3.10/        | 3.05      | 6.250  | 16 26   | 9.33              | 3.05          |  |
| 0.10  | 0.00  | 3.230        | 3.05      | 1 0.333  | 10.20   | 9.42              | 3.03          |  |

|       |      |      |      | Lang | staffRd_ | EA_ | Existi | ng_ | WestDonWatershd |
|-------|------|------|------|------|----------|-----|--------|-----|-----------------|
| 12221 | DEAK | FLOU | DOLC | MOT  | TNCLUDE  | D A | CEELOU | TE  | ANIX            |

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| 1 + 2 = 3     | ARE      |         |      |       |
|---------------|----------|---------|------|-------|
|               | (ha      |         |      | (mm)  |
| ID1= 1 ( 01   |          | 3 0.234 | 6.25 | 67.62 |
| + ID2= 2 ( 01 | 40): 1.2 | 7 0.222 | 6.25 | 70.98 |
| ID = 3 ( 04   | 20): 2.7 | 0.456   | 6.25 | 69.20 |

| ADD HYD ( 0425)                         |      |       |       |       |
|---|------|-------|-------|-------|
| 1 + 2 = 3                               | AREA | QPEAK | TPEAK | R.V.  |
|   | (ha) | (cms) | (hrs) | (mm)  |
| ID1= 1 ( 0145):                         | 3.05 | 0.550 | 6.25  | 76.21 |
| + ID2= 2 ( 0420):                       | 2.70 | 0.456 | 6.25  | 69.20 |
| ======================================= |      |       |       |       |
| ID = 3 ( 0425):                         | 5.75 | 1.006 | 6.25  | 72.92 |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----

| CALIB<br>  STANDHYD ( 0210) <br> ID= 1 DT= 5.0 min | Area<br>Total | (ha)= 6<br>Imp(%)= 44 | 9.96<br>1.00 | Dir. Conn.(%)= | 44.00 |
|--|---------------|-----------------------|--------------|----------------|-------|
|  |               | IMPERVIOUS            | 5            | PERVIOUS (i)   |       |
| Surface Area                                       | (ha)=         | 0.42                  |              | 0.54           |       |
| Dep. Storage                                       | (mm)=         | 2.00                  |              | 5.00           |       |
| Average Slope                                      | (%)=          | 1.00                  |              | 2.00           |       |
| Length   | (m)=          | 470.00                |              | 20.00          |       |
| Mannings n   | =             | 0.013                 |              | 0.250          |       |
|  |               |                       |              |                |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORMED | HYETOGR | APH   |      |       |
|-------|-------|-------|-----------|---------|-------|------|-------|
| TIME  | RAIN  | TIME  | RAIN      | ' TIME  | RAIN  | TIME | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr     | ' hrs   | mm/hr | hrs  | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05      | 6.250   | 81.28 | 9.33 | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05      | 6.333   | 16.26 | 9.42 | 3.05  |
| 0.250 | 0.00  | 3.333 | 4.06      | 6.417   | 16.26 | 9.50 | 3.05  |
| 0.333 | 2.03  | 3.417 | 4.06      | 6.500   | 16.26 | 9.58 | 3.05  |
| 0.417 | 2.03  | 3.500 | 4.06      | 6.583   | 16.26 | 9.67 | 3.05  |
| 0.500 | 2.03  | 3.583 | 3.05      | 6.667   | 16.26 | 9.75 | 3.05  |
| 0.583 | 2.03  | 3.667 | 3.05      | 6.750   | 16.26 | 9.83 | 2.03  |
| 0.667 | 2.03  | 3.750 | 3.05      | 6.833   | 7.11  | 9.92 | 2.03  |

|                      | Langs | taffRd F | Δ Frist | ing_WestDon | Waters | hd         |      |
|----------------------|-------|----------|---------|-------------|--------|------------|------|
| 0.750                |       | 3.833    |         | 6.917       | 7.11   |            | 2.03 |
|                      | 1.02  |          |         |             | 7.11   |            | 3.05 |
|                      | 1.02  |          |         | 7.083       | 7.11   |            | 3.05 |
| 1.000                |       | 4.083    |         | 7.167       | 7.11   |            | 3.05 |
|                      |       | 4.167    | 3.05    |             | 7.11   |            | 2.03 |
|                      |       | 4.250    |         | 7.333       | 5.08   |            | 2.03 |
|                      |       | 4.333    |         | 7.417       | 5.08   |            | 2.03 |
|                      |       | 4.417    | 7.11    |             | 5.08   |            | 1.02 |
|                      |       | 4.500    |         | 7.583       | 5.08   |            | 1.02 |
| 1.500                | 2.03  | 4.583    | 6.10    | 7.667       | 5.08   | 10.75      | 1.02 |
| 1.583                | 2.03  | 4.667    | 6.10    | 7.750       | 5.08   | 10.83      | 2.03 |
| 1.667                | 2.03  | 4.750    | 6.10    | 7.833       | 6.10   | 10.92      | 2.03 |
| 1.750                | 2.03  | 4.833    | 6.10    | 7.917       | 6.10   | 11.00      | 2.03 |
| 1.833                | 1.02  | 4.917    | 6.10    | 8.000       | 6.10   | 11.08      | 2.03 |
| 1.917                | 1.02  | 5.000    | 6.10    | 8.083       | 5.08   | 11.17      | 2.03 |
| 2.000                | 1.02  | 5.083    | 6.10    | 8.167       | 5.08   | 11.25      | 2.03 |
| 2.083                | 2.03  | 5.167    | 6.10    | 8.250       | 5.08   | 11.33      | 2.03 |
| 2.167                | 2.03  | 5.250    | 6.10    | 8.333       | 4.06   | 11.42      | 2.03 |
| 2.250                | 2.03  | 5.333    | 11.18   | 8.417       | 4.06   | 11.50      | 2.03 |
| 2.333                | 4.06  | 5.417    |         | 8.500       | 4.06   | 11.58      | 1.02 |
| 2.417                | 4.06  | 5.500    | 11.18   | 8.583       | 3.05   | 11.67      | 1.02 |
| 2.500                | 4.06  | 5.583    | 11.18   | 8.667       | 3.05   | 11.75      | 1.02 |
|                      |       | 5.667    |         | 8.750       | 3.05   |            | 2.03 |
|                      |       | 5.750    |         |             | 4.06   |            | 2.03 |
|                      |       | 5.833    |         | 8.917       | 4.06   |            | 2.03 |
|                      |       | 5.917    |         | 9.000       | 4.06   |            | 2.03 |
|                      |       | 6.000    |         |             | 3.05   |            | 2.03 |
|                      |       |          |         | 9.167       | 3.05   |            | 2.03 |
| 3.083                | 3.05  | 6.167    | 81.28   | 9.250       | 3.05   |            |      |
| Max.Eff.Inten.(mm/hr |       | 81.28    |         | 60.55       |        |            |      |
| over (min            |       | 5.00     |         | 15.00       |        |            |      |
| Storage Coeff. (min  |       |          | (ii)    | 12.72 (ii)  |        |            |      |
| Unit Hyd. Tpeak (min |       | 5.00     |         | 15.00       |        |            |      |
| Unit Hyd. peak (cms  | 5)=   | 0.17     |         | 0.08        | *****  | TALS*      |      |
| PEAK FLOW (cms       | ;)=   | 0.09     |         | 0.07        |        | .162 (iii) |      |
| TIME TO PEAK (hrs    |       | 6.25     |         | 6.33        |        | 5.25       |      |
| RUNOFF VOLUME (mm    |       | 87.92    |         | 52.66       |        | 3.16       |      |
| TOTAL RAINFALL (mm   |       | 89.92    |         | 89.92       |        | 9.92       |      |
| RUNOFF COEFFICIENT   | =     | 0.98     |         | 0.59        |        | 9.76       |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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LangstaffRd\_EA\_Existing\_WestDonWatershd )= 81.28 60.55 ) 5.00 15.00 )= 7.02 (ii) 12.72 (ii) Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 5.00 0.17 15.00

0.08 \*TOTALS\* PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 0.09 6.25 87.92 89.92 0.181 (iii) 6.25 66.05 89.92 0.98

QPEAK (cms) 0.181 TPEAK (hrs) 6.25 R.V. (mm) 66.05 (ha) 1.11 ID1= 1 ( 0205): + ID2= 2 ( 0210): 0.96 0.162 6.25 68.16 ID = 3 ( 0460): 2.07 0.344 6.25 67.03

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

STANDHYD ( 0230) (ha)= 0.70 | ID= 1 DT= 5.0 min | Total Imp(%)= 57.00 Dir. Conn.(%)= 57.00 TMPERVTOUS PERVIOUS (i)

Surface Area Dep. Storage Average Slope (ha)= (mm)= (%)= (m)= 0.30 5.00 2.00 0.40 2.00 1.00 Length 320.00 Mannings n 0.013 0.290

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ---
RAIN | TIME RAIN | TIME RAIN | TIME mm/hr | hrs mm/hr | hrs mm/hr | hrs |

0.00 | 3.167 | 3.05 | 6.250 | 81.28 | 9.33 |

0.00 | 3.250 | 3.05 | 6.333 | 6.26 | 9.42 |

0.00 | 3.333 | 4.06 | 6.417 | 16.26 | 9.50 RAIN mm/hr 3.05 3.05 hrs 0.083

 $LangstaffRd\_EA\_Existing\_WestDonWatershd\\ |\,ID=\,1\,\,DT=\,5.0\,\,min\,\mid\quad Total\,\,Imp(\%)=\,\,38.00\quad Dir.\,\,Conn.(\%)=\,\,38.00$ 

IMPERVIOUS PERVIOUS (i) (ha)= (mm)= (%)= (m)= Surface Area Dep. Storage Average Slope Length Mannings n 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ---RAIN | TIME RAIN | TIME RAIN | TIME
mm/hp | hos mm/hp | hos mm/hp | hos hrs mm/hr 0.00 hrs 3.167 mm/hr hrs mm/hr | 81.28 | mm/hr 0.083 6.250 3.05 3.05 6.250 6.333 6.417 6.500 6.583 6.667 6.750 6.833 9.33 9.42 9.50 9.58 9.67 9.75 9.83 0.167 0.00 3.250 16.26 3.05 0.250 0.00 3.333 2.03 2.03 2.03 2.03 2.03 2.03 0.333 0.417 0.500 0.583 3.417 3.500 3.583 3.667 3.750 16.26 16.26 16.26 16.26 3.05 3.05 3.05 2.03 0.667 3.05 4.06 7.11 7.11 9.92 2.03 0.750 3.833 6.917 7.000 10.00 2.03 0.750 0.833 0.917 1.000 1.083 1.167 1.250 1.333 3.833 3.917 4.000 4.083 4.167 4.250 4.333 4.417 10.00 10.08 10.17 10.25 10.33 10.42 10.50 3.05 3.05 3.05 2.03 2.03 2.03 1.02 4.06 7.11 1.02 1.02 1.02 2.03 2.03 2.03 4.06 3.05 3.05 3.05 7.11 7.083 7.167 7.250 7.333 7.417 7.500 7.583 7.667 7.750 7.833 7.917 8.000 8.083 8.167 2.03 7.11 5.08 5.08 10.58 1.02 4.417 4.500 4.583 4.667 4.750 4.833 4.917 5.000 5.083 1.417 2.03 7.11 10.67 1.02 1.417 1.500 1.583 1.667 1.750 1.833 1.917 2.03 2.03 2.03 2.03 2.03 1.02 1.02 6.10 6.10 6.10 6.10 6.10 6.10 10.67 10.75 10.83 10.92 11.00 11.08 11.17 1.02 2.03 2.03 2.03 2.03 2.03 5.08 5.08 2.000 6.10 2.083 2.03 5.167 6.10 8.250 8.333 8.417 8.500 8.583 8.667 8.750 8.833 8.917 9.000 9.083 9.167 9.250 5.08 11.33 2.03 2.167 2.03 5.250 6.10 4.06 11.42 2.03 2.250 2.333 2.417 2.500 2.583 2.03 4.06 4.06 4.06 3.05 3.05 5.250 5.333 5.417 5.500 5.583 5.667 5.750 11.18 11.18 11.18 11.18 11.18 4.06 4.06 3.05 3.05 11.50 11.58 11.67 11.75 11.83 2.03 1.02 1.02 1.02 2.03 3.05 2.667 11.18 11.92 2.03 2.750 3.05 5.833 5.917 80.26 4.06 12.00 12.08 2.03 2.833 4.06 80.26 4.06 2.03 80.26 | 81.28 | 81.28 | 2.03 2.917 4.06 4.06 6.000 3.05 12.17

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|                   | Lange  | taffRd F | Δ Frist | ing_WestDo | waters | hd    |      |
|-------------------|--------|----------|---------|------------|--------|-------|------|
| 0.333             |        | 3.417    |         |            | 16.26  |       | 3.05 |
| 0.417             |        | 3.500    |         |            | 16.26  |       | 3.05 |
| 0.500             |        | 3.583    |         |            | 16.26  |       | 3.05 |
| 0.583             |        | 3.667    |         |            | 16.26  |       | 2.03 |
| 0.667             |        |          |         | 6.833      | 7.11   |       | 2.03 |
| 0.750             |        | 3.833    |         | 6.917      | 7.11   |       | 2.03 |
| 0.833             |        | 3.917    |         | 7.000      |        | 10.08 | 3.05 |
| 0.917             |        | 4.000    |         | 7.083      | 7.11   |       | 3.05 |
| 1.000             |        | 4.083    |         | 7.167      |        | 10.25 | 3.05 |
| 1.083             |        | 4.167    |         | 7.250      |        | 10.33 | 2.03 |
| 1.167             |        | 4.250    |         | 7.333      |        | 10.42 | 2.03 |
| 1.250             | 2.03   | 4.333    | 7.11    |            | 5.08   | 10.50 | 2.03 |
| 1.333             | 2.03   | 4.417    | 7.11    | 7 500      | 5.08   | 10.58 | 1.02 |
| 1.417             | 2.03   | 4.500    | 7.11    | 7.583      | 5.08   | 10.67 | 1.02 |
| 1.500             | 2.03   | 4.583    | 6.10    | 7.667      | 5.08   | 10.75 | 1.02 |
| 1.583             | 2.03   | 4.667    | 6.10    | 7.750      | 5.08   | 10.83 | 2.03 |
| 1.667             | 2.03   | 4.750    | 6.10    | 7.833      | 6.10   | 10.92 | 2.03 |
| 1.750             | 2.03   | 4.833    | 6.10    | 7.917      | 6.10   | 11.00 | 2.03 |
| 1.833             | 1.02   | 4.917    | 6.10    | 8.000      | 6.10   | 11.08 | 2.03 |
| 1.917             | 1.02   | 5.000    | 6.10    | 8.083      | 5.08   | 11.17 | 2.03 |
| 2.000             |        | 5.083    | 6.10    | 8.167      | 5.08   | 11.25 | 2.03 |
| 2.083             |        | 5.167    | 6.10    | 1 8.250    | 5.08   | 11.33 | 2.03 |
| 2.167             |        | 5.250    | 6.10    | 8.333      | 4.06   | 11.42 | 2.03 |
| 2.250             |        | 5.333    | 11.18   | 8.417      | 4.06   | 11.50 | 2.03 |
| 2.333             |        | 5.417    |         | 8.500      | 4.06   | 11.58 | 1.02 |
| 2.417             |        |          | 11.18   |            |        |       |      |
| 2.500             |        | 5.583    |         | 8.667      |        | 11.75 | 1.02 |
| 2.583             |        | 5.667    |         | 8.750      |        | 11.83 | 2.03 |
| 2.667             |        | 5.750    |         | 8.833      |        | 11.92 | 2.03 |
| 2.750             |        | 5.833    |         | 8.917      |        | 12.00 | 2.03 |
| 2.833             |        | 5.917    |         | 9.000      |        | 12.08 | 2.03 |
| 2.917             |        | 6.000    |         | 9.083      |        | 12.17 | 2.03 |
| 3.000             |        |          | 81.28   |            | 3.05   |       | 2.03 |
| 3.083             | 3.05   | 6.167    | 81.28   | 9.250      | 3.05   | l     |      |
| Max.Eff.Inten.(mr | m/hr)= | 81.28    |         | 57.69      |        |       |      |
| over              |        | 5.00     |         | 15.00      |        |       |      |
|                   | (min)= | 5.58     |         | 12.83 (ii) |        |       |      |
| Unit Hyd. Tpeak   |        | 5.00     |         | 15.00      |        |       |      |
| Unit Hyd. peak    | (cms)= | 0.20     |         | 0.08       |        |       |      |
|                   |        |          |         |            |        |       |      |

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

6.25 87.92

(cms)=

PEAK FLOW

TIME TO PEAK

RUNOFF VOLUME TOTAL RAINFALL

TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =

CN\* = 81.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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6.33

0.126 (iii)

6.25 71.56

## LangstaffRd\_EA\_Existing\_WestDonWatershd

| CALIB             |       |                |                |       |
|-------------------|-------|----------------|----------------|-------|
| STANDHYD ( 0225)  | Area  | (ha)= 0.90     | )              |       |
| ID= 1 DT= 5.0 min | Total | Imp(%) = 53.00 | Dir. Conn.(%)= | 53.00 |
|                   |       |                |                |       |
|                   |       | IMPERVIOUS     | PERVIOUS (i)   |       |
| Surface Area      | (ha)= | 0.48           | 0.42           |       |
| Dep. Storage      | (mm)= | 2.00           | 5.00           |       |
| Average Slope     | (%)=  | 1.00           | 2.00           |       |
| Length            | (m)=  | 320.00         | 25.00          |       |
| Mannings n        | ` =   | 0.013          | 0.250          |       |
|                   |       |                |                |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05     | 6.250   | 81.28 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05     | 6.333   | 16.26 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 4.06     | 6.417   | 16.26 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 4.06     | 6.500   | 16.26 | 9.58  | 3.05  |
| 0.417 | 2.03  | 3.500 | 4.06     | 6.583   | 16.26 | 9.67  | 3.05  |
| 0.500 | 2.03  | 3.583 | 3.05     | 6.667   | 16.26 | 9.75  | 3.05  |
| 0.583 | 2.03  | 3.667 | 3.05     | 6.750   | 16.26 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 3.05     | 6.833   | 7.11  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 4.06     | 6.917   | 7.11  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 4.06     | 7.000   | 7.11  | 10.08 | 3.05  |
| 0.917 | 1.02  | 4.000 | 4.06     | 7.083   | 7.11  | 10.17 | 3.05  |
| 1.000 | 1.02  | 4.083 | 3.05     | 7.167   | 7.11  | 10.25 | 3.05  |
| 1.083 | 2.03  | 4.167 | 3.05     | 7.250   | 7.11  | 10.33 | 2.03  |
| 1.167 | 2.03  | 4.250 | 3.05     | 7.333   | 5.08  | 10.42 | 2.03  |
| 1.250 | 2.03  | 4.333 | 7.11     | 7.417   | 5.08  | 10.50 | 2.03  |
| 1.333 | 2.03  | 4.417 | 7.11     | 7.500   | 5.08  | 10.58 | 1.02  |
| 1.417 | 2.03  | 4.500 | 7.11     | 7.583   | 5.08  | 10.67 | 1.02  |
| 1.500 | 2.03  | 4.583 | 6.10     | 7.667   | 5.08  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 6.10     | 7.750   | 5.08  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 6.10     | 7.833   | 6.10  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 6.10     | 7.917   | 6.10  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 6.10     | 8.000   | 6.10  | 11.08 | 2.03  |
| 1.917 | 1.02  | 5.000 | 6.10     | 8.083   | 5.08  | 11.17 | 2.03  |
| 2.000 | 1.02  | 5.083 | 6.10     | 8.167   | 5.08  | 11.25 | 2.03  |
| 2.083 | 2.03  | 5.167 | 6.10     | 8.250   | 5.08  | 11.33 | 2.03  |
| 2.167 | 2.03  | 5.250 | 6.10     | 8.333   | 4.06  | 11.42 | 2.03  |
| 2.250 | 2.03  | 5.333 | 11.18    | 8.417   | 4.06  | 11.50 | 2.03  |
| 2.333 | 4.06  | 5.417 | 11.18    | 8.500   | 4.06  | 11.58 | 1.02  |
| 2.417 | 4.06  | 5.500 | 11.18    | 8.583   | 3.05  | 11.67 | 1.02  |
| 2.500 | 4.06  | 5.583 | 11.18    | 8.667   | 3.05  | 11.75 | 1.02  |
| 2.583 | 3.05  | 5.667 | 11.18    | 8.750   | 3.05  | 11.83 | 2.03  |
| 2.667 | 3.05  | 5.750 | 11.18    | 8.833   | 4.06  | 11.92 | 2.03  |
| 2.750 | 3.05  | 5.833 | 80.26    | 8.917   | 4.06  | 12.00 | 2.03  |

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|                    | Langs | taffRd E | A Existi | ing WestDo | nWaters | hd         |       |
|--------------------|-------|----------|----------|------------|---------|------------|-------|
| TIME               | RAIN  |          | RAIN     |            | RAIN    |            | RAIN  |
| hrs                | mm/hr | hrs      | mm/hr    | ' hrs      |         |            | mm/hr |
| 0.083              | 0.00  |          | 3.05     | 6.250      |         |            | 3.05  |
| 0.167              | 0.00  | 3.250    | 3.05     | 6.333      | 16.26   | 9.42       | 3.05  |
| 0.250              | 0.00  |          | 4.06     |            | 16.26   |            | 3.05  |
| 0.333              | 2.03  |          | 4.06     | 6.500      |         |            | 3.05  |
| 0.417              |       | 3.500    |          | 6.583      | 16.26   |            | 3.05  |
| 0.500              | 2.03  |          | 3.05     |            | 16.26   |            | 3.05  |
| 0.583              |       | 3.667    |          | 6.750      | 16.26   |            | 2.03  |
| 0.667              | 2.03  | 3.750    |          | 6.833      | 7.11    |            | 2.03  |
| 0.750              |       | 3.833    |          | 6.917      | 7.11    |            | 2.03  |
| 0.833              |       | 3.917    |          | 7.000      | 7.11    |            | 3.05  |
| 0.917              |       | 4.000    |          | 7.083      | 7.11    |            | 3.05  |
| 1.000              |       |          |          | 7.167      | 7.11    |            | 3.05  |
| 1.083              |       | 4.167    | 3.05     |            | 7.11    |            | 2.03  |
| 1.167              |       | 4.250    | 3.05     |            | 5.08    |            | 2.03  |
| 1.250              |       | 4.333    | 7.11     |            | 5.08    |            | 2.03  |
| 1.333              |       | 4.417    |          | 7.500      |         | 10.58      | 1.02  |
| 1.417              |       | 4.500    | 7.11     |            | 5.08    |            | 1.02  |
| 1.500              |       | 4.583    | 6.10     |            | 5.08    |            | 1.02  |
| 1.583              |       | 4.667    |          | 7.750      |         | 10.83      | 2.03  |
| 1.667              |       | 4.750    |          |            | 6.10    |            | 2.03  |
| 1.750              |       | 4.833    | 6.10     |            | 6.10    |            | 2.03  |
| 1.833              |       | 4.917    | 6.10     |            |         | 11.08      | 2.03  |
| 1.917              |       | 5.000    |          |            | 5.08    |            | 2.03  |
| 2.000              |       | 5.083    | 6.10     |            | 5.08    |            | 2.03  |
| 2.083              |       | 5.167    |          | 8.250      | 5.08    |            | 2.03  |
| 2.167              |       | 5.250    | 6.10     |            | 4.06    |            | 2.03  |
| 2.250              |       | 5.333    | 11.18    |            |         | 11.50      | 2.03  |
| 2.333              |       | 5.417    |          | 8.500      | 4.06    |            | 1.02  |
| 2.417              |       | 5.500    |          |            | 3.05    |            | 1.02  |
| 2.500              |       | 5.583    |          | 8.667      |         | 11.75      | 1.02  |
| 2.583              |       | 5.667    |          | 8.750      | 3.05    |            | 2.03  |
| 2,667              |       | 5.750    |          |            | 4.06    |            | 2.03  |
| 2.750              |       | 5.833    |          | 8.917      | 4.06    |            | 2.03  |
| 2.833              | 4.06  |          |          |            | 4.06    |            | 2.03  |
| 2.917              |       |          |          |            | 3.05    |            | 2.03  |
| 3.000              | 4.06  |          |          | 9.167      | 3.05    |            | 2.03  |
| 3.083              |       | 6.167    |          | 9.250      | 3.05    |            | 2.03  |
| /                  |       |          |          |            |         |            |       |
| Max.Eff.Inten.(mm/ |       | 81.28    |          | 60.55      |         |            |       |
| over (r            |       | 5.00     |          | 15.00      |         |            |       |
|                    | min)= | 4.92     |          | 10.62 (ii  | )       |            |       |
| Unit Hyd. Tpeak (r |       | 5.00     |          | 15.00      |         |            |       |
| Unit Hyd. peak (d  | cms)= | 0.22     |          | 0.09       |         |            |       |
|                    |       |          |          |            |         | TALS*      |       |
|                    | cms)= | 0.07     |          | 0.05       |         | .115 (iii) |       |
|                    | nrs)= | 6.25     |          | 6.33       |         | 5.25       |       |
|                    | (mm)= | 87.92    |          | 52.66      |         | 3.87       |       |
|                    | (mm)= | 89.92    |          | 89.92      |         | 9.92       |       |
| RUNOFF COEFFICIENT | Γ =   | 0.98     |          | 0.59       | (       | 9.77       |       |

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

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| Lan<br>2.833 4.06<br>2.917 4.06<br>3.000 4.06<br>3.083 3.05  | gstaffRd_EA_Exis<br>5   5.917              | ting_WestDonWate<br>5   9.000 4.6<br>5   9.083 3.6<br>3   9.167 3.6<br>3   9.250 3.6 | ershd<br>16   12.08 2.03<br>15   12.17 2.03<br>15   12.25 2.03<br>15 |  |  |  |  |
|--|--|--|--|--|--|--|--|
| Max.Eff.Inten.(mm/hr)= over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)=   | 81.28<br>5.00<br>5.58 (ii)<br>5.00<br>0.20 | 60.55<br>15.00<br>12.08 (ii)<br>15.00<br>0.09  | :TOTAL S*  |  |  |  |  |
| PEAK FLOW (cms)= TIME TO PEAK (hrs)= RUNOFF VOLUME (mm)= TOTAL RAINFALL (mm)= RUNOFF COEFFICIENT =   | 0.11<br>6.25<br>87.92<br>89.92<br>0.98     | 0.06<br>6.33<br>52.66<br>89.92<br>0.59   | 0.162 (iii)<br>6.25<br>71.34<br>89.92<br>0.79                        |  |  |  |  |
| (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  CN* = 83.0 Ia = Dep. Storage (Above)  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  THAN THE STORAGE COEFFICIENT.  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY. |  |  |  |  |  |  |  |
| ADD HYD ( 0475) <br>  1 + 2 = 3  <br>  101= 1 ( 0225):<br>+ 1D2= 2 ( 0230):  |  |  |  |  |  |  |  |
| ID = 3 ( 0475):  NOTE: PEAK FLOWS DO NOT   | 1.60 0.287                                 | 6.25 71.43   | :  |  |  |  |  |
| CALIB  | (ha)= 0.65<br>Imp(%)= 46.00                | Dir. Conn.(%)=   |  |  |  |  |  |
| Surface Area (ha)= Dep. Storage (mm)= Average Slope (%)= Length (m)= Mannings n =  | 1.00<br>260.00                             | 0.35   |  |  |  |  |  |
| NOTE: RAINFALL WAS   |  | 5.0 MIN. TIME<br>MED HYETOGRAPH -  |  |  |  |  |  |

 ${\tt LangstaffRd\_EA\_Existing\_WestDonWatershd}$ 

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |         |       |         |           |       |  |
|-------------------|-------|---------|-------|---------|-----------|-------|--|
| STANDHYD ( 0215)  | Area  | (ha)=   | 0.58  |         |           |       |  |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 57.00 | Dir.    | Conn.(%)= | 57.00 |  |
|                   |       |         |       |         |           |       |  |
|                   |       | IMPERVI | OUS   | PERVIOL | IS (i)    |       |  |
| Surface Area      | (ha)= | 0.33    |       | 0.25    |           |       |  |
| Dep. Storage      | (mm)= | 2.00    |       | 5.00    | )         |       |  |
| Average Slope     | (%)=  | 1.00    |       | 2.00    |           |       |  |
| Length            | (m)=  | 260.00  |       | 30.00   |           |       |  |
| Mannings n        |       |         |       | 0.250   |           |       |  |
|                   |       |         |       |         |           |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TRANSFORMED HYETOGRAPH |       |       |       |        |       |       |       |  |  |  |  |  |  |
|------------------------|-------|-------|-------|--------|-------|-------|-------|--|--|--|--|--|--|
| TIME                   | RAIN  | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |  |  |  |  |  |
| hrs                    | mm/hr | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |  |  |  |  |  |
| 0.083                  | 0.00  | 3.167 | 3.05  | 6.250  | 81.28 | 9.33  | 3.05  |  |  |  |  |  |  |
| 0.167                  | 0.00  | 3.250 | 3.05  | 6.333  | 16.26 | 9.42  | 3.05  |  |  |  |  |  |  |
| 0.250                  | 0.00  | 3.333 | 4.06  | 6.417  | 16.26 | 9.50  | 3.05  |  |  |  |  |  |  |
| 0.333                  | 2.03  | 3.417 | 4.06  | 6.500  | 16.26 | 9.58  | 3.05  |  |  |  |  |  |  |
| 0.417                  | 2.03  | 3.500 | 4.06  | 6.583  | 16.26 | 9.67  | 3.05  |  |  |  |  |  |  |
| 0.500                  | 2.03  | 3.583 | 3.05  | 6.667  | 16.26 | 9.75  | 3.05  |  |  |  |  |  |  |
| 0.583                  | 2.03  | 3.667 | 3.05  | 6.750  | 16.26 | 9.83  | 2.03  |  |  |  |  |  |  |
| 0.667                  | 2.03  | 3.750 | 3.05  | 6.833  | 7.11  | 9.92  | 2.03  |  |  |  |  |  |  |
| 0.750                  | 2.03  | 3.833 | 4.06  | 6.917  | 7.11  | 10.00 | 2.03  |  |  |  |  |  |  |
| 0.833                  | 1.02  | 3.917 | 4.06  | 7.000  | 7.11  | 10.08 | 3.05  |  |  |  |  |  |  |
| 0.917                  | 1.02  | 4.000 | 4.06  | 7.083  | 7.11  | 10.17 | 3.05  |  |  |  |  |  |  |
| 1.000                  | 1.02  | 4.083 | 3.05  | 7.167  | 7.11  | 10.25 | 3.05  |  |  |  |  |  |  |
| 1.083                  | 2.03  | 4.167 | 3.05  | 7.250  | 7.11  | 10.33 | 2.03  |  |  |  |  |  |  |
| 1.167                  | 2.03  |       | 3.05  | 7.333  | 5.08  | 10.42 | 2.03  |  |  |  |  |  |  |
| 1.250                  | 2.03  |       | 7.11  | 7.417  | 5.08  |       | 2.03  |  |  |  |  |  |  |
| 1.333                  | 2.03  | 4.417 | 7.11  | 7.500  | 5.08  | 10.58 | 1.02  |  |  |  |  |  |  |
| 1.417                  | 2.03  | 4.500 | 7.11  | 7.583  | 5.08  | 10.67 | 1.02  |  |  |  |  |  |  |
| 1.500                  | 2.03  | 4.583 | 6.10  | 7.667  | 5.08  | 10.75 | 1.02  |  |  |  |  |  |  |
| 1.583                  | 2.03  | 4.667 | 6.10  | 7.750  | 5.08  |       | 2.03  |  |  |  |  |  |  |
| 1.667                  | 2.03  | 4.750 | 6.10  | 7.833  | 6.10  | 10.92 | 2.03  |  |  |  |  |  |  |
| 1.750                  | 2.03  | 4.833 | 6.10  | 7.917  | 6.10  | 11.00 | 2.03  |  |  |  |  |  |  |
| 1.833                  | 1.02  | 4.917 | 6.10  |        | 6.10  |       | 2.03  |  |  |  |  |  |  |
| 1.917                  | 1.02  | 5.000 | 6.10  | 8.083  | 5.08  | 11.17 | 2.03  |  |  |  |  |  |  |
| 2.000                  | 1.02  | 5.083 | 6.10  | 8.167  | 5.08  | 11.25 | 2.03  |  |  |  |  |  |  |
| 2.083                  | 2.03  | 5.167 | 6.10  | 8.250  | 5.08  | 11.33 | 2.03  |  |  |  |  |  |  |
| 2.167                  | 2.03  | 5.250 | 6.10  | 8.333  | 4.06  | 11.42 | 2.03  |  |  |  |  |  |  |
| 2.250                  | 2.03  | 5.333 | 11.18 | 8.417  | 4.06  | 11.50 | 2.03  |  |  |  |  |  |  |
|                        |       |       |       |        |       |       |       |  |  |  |  |  |  |

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LangstaffRd EA Existing MestDonWatershd
4.06 | 5.417 | 11.18 | 8.590 | 4.06 | 1
4.06 | 5.590 | 11.18 | 8.583 | 3.05 | 1
4.06 | 5.583 | 11.18 | 8.657 | 3.05 | 1
3.05 | 5.667 | 11.18 | 8.750 | 3.05 | 1
3.05 | 5.750 | 11.18 | 8.833 | 4.06 | 1
3.05 | 5.833 | 80.26 | 8.917 | 4.06 | 1
4.06 | 5.917 | 80.26 | 9.080 | 4.06 | 1
4.06 | 6.000 | 80.26 | 9.083 | 3.05 | 1
4.06 | 6.008 | 80.26 | 9.083 | 3.05 | 1
3.05 | 6.167 | 81.28 | 9.250 | 3.05 |
                                                                                                                                                                                                                                                      NWATERSHO
4.06 | 11.58
3.05 | 11.67
3.05 | 11.73
3.05 | 11.83
4.06 | 11.92
4.06 | 12.00
4.06 | 12.08
3.05 | 12.17
3.05 | 12.25
3.05 |
                                                                     2.333
2.417
                                                                                                                                                                                                                                                                                                                                1.02
                                                                     2.583
2.667
2.750
2.833
                                                                                                                                                                                                                                                                                                                               1.02
2.03
2.03
2.03
2.03
                                                                      2.917
                  Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                                                                                                              81.28
5.00
4.92 (ii)
5.00
0.22
                                                                                                                                                                                                       60.55
15.00
12.18 (ii)
15.00
0.09
                                                                                                                                                                                                                                                                 *TOTALS*
0.107 (iii)
6.25
72.74
89.92
0.81
                   PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                                                                                                               0.07
6.25
87.92
89.92
0.98
                                                                                                                                                                                                         0.03
6.33
52.66
89.92
0.59
***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
                   (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN* = 83.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COFFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

| ADD HYD ( 0470)  <br>  1 + 2 = 3  <br> | AREA<br>(ha)<br>0.58<br>0.65 | QPEAK<br>(cms)<br>0.107<br>0.115 | TPEAK<br>(hrs)<br>6.25<br>6.25 | R.V.<br>(mm)<br>72.74<br>68.87 |
|--|------------------------------|----------------------------------|--------------------------------|--------------------------------|
| ID = 3 ( 0470):                        | 1.23                         | 0.221                            | 6.25                           | 70.69                          |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD ( 0480)  <br>  1 + 2 = 3  <br> | AREA<br>(ha)<br>1.23<br>1.60 | QPEAK<br>(cms)<br>0.221<br>0.287 | TPEAK<br>(hrs)<br>6.25<br>6.25 | R.V.<br>(mm)<br>70.69<br>71.43 |
|--|------------------------------|----------------------------------|--------------------------------|--------------------------------|
| ID = 3 ( 0480):                        | 2.83                         | 0.508                            | 6.25                           | 71.11                          |

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|                  | Langs   | staffRd_E | A_Existing | _WestDon | Watershd  |       |      |
|------------------|---------|-----------|------------|----------|-----------|-------|------|
| 2.750            | 3.05    | 5.833     | 80.26      | 8.917    | 4.06   12 | .00   | 2.03 |
| 2.83             | 3 4.06  | 5.917     | 80.26      | 9.000    | 4.06   12 | .08   | 2.03 |
| 2.91             | 7 4.06  | 6.000     | 80.26      | 9.083    | 3.05   12 | .17   | 2.03 |
| 3.000            | 4.06    | 6.083     | 81.28      | 9.167    | 3.05   12 | .25   | 2.03 |
| 3.08             | 3.05    | 6.167     | 81.28      | 9.250    | 3.05      |       |      |
|                  |         |           |            |          |           |       |      |
| Max.Eff.Inten.(r | mm/hr)= | 81.28     | 69         | .46      |           |       |      |
| over             | (min)   | 5.00      | 10         | .00      |           |       |      |
| Storage Coeff.   | (min)=  | 4.92      | (ii) 9     | .52 (ii) |           |       |      |
| Unit Hyd. Tpeak  | (min)=  | 5.00      | 10         | .00      |           |       |      |
| Unit Hyd. peak   | (cms)=  | 0.22      | 0          | .12      |           |       |      |
|                  |         |           |            |          | *TOTALS   | *     |      |
| PEAK FLOW        | (cms)=  | 0.05      | 0          | .03      | 0.087     | (iii) |      |
| TIME TO PEAK     | (hrs)=  | 6.25      | 6          | .25      | 6.25      |       |      |
| RUNOFF VOLUME    | (mm)=   | 87.92     | 62         | .00      | 76.50     |       |      |
| TOTAL RAINFALL   | (mm)=   | 89.92     | 89         | .92      | 89.92     |       |      |
| RUNOFF COEFFICIE | ENT =   | 0.98      | 0          | .69      | 0.85      |       |      |
|                  |         |           |            |          |           |       |      |

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 89.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB         | Area<br>Total | (ha)= 0<br>Imp(%)= 4 | 0.56<br>5.00 Dir. | Conn.(%)= | 45.00 |  |
|---------------|---------------|----------------------|-------------------|-----------|-------|--|
|               |               |                      |                   |           |       |  |
|               |               | IMPERVIOUS           | 5 PERVIOL         | JS (i)    |       |  |
| Surface Area  | (ha)=         | 0.25                 | 0.31              |           |       |  |
| Dep. Storage  | (mm)=         | 2.00                 | 5.00              | )         |       |  |
| Average Slope | (%)=          | 1.00                 | 2.00              | )         |       |  |
| Length        | (m)=          | 260.00               | 25.00             | )         |       |  |
| Mannings n    | ` =           | 0.013                | 0.296             | )         |       |  |
|               |               |                      |                   |           |       |  |

|       |       | TR/   | ANSFORME | HYETOGR | APH   |      |       |
|-------|-------|-------|----------|---------|-------|------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs  | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05     | 6.250   | 81.28 | 9.33 | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05     | 6.333   | 16.26 | 9.42 | 3.05  |
| 0.250 | 0.00  | 3.333 | 4.06     | 6.417   | 16.26 | 9.50 | 3.05  |
| 0.333 | 2.03  | 3.417 | 4.06     | 6.500   | 16.26 | 9.58 | 3.05  |
| 0.417 | 2.03  | 3.500 | 4.06     | 6.583   | 16.26 | 9.67 | 3.05  |
| 0.500 | 2.03  | 3.583 | 3.05     | 6.667   | 16.26 | 9.75 | 3.05  |
| 0.583 | 2.03  | 3.667 | 3.05     | 6.750   | 16.26 | 9.83 | 2.03  |
| 0.667 | 2.03  | 3.750 | 3.05     | 6.833   | 7.11  | 9.92 | 2.03  |
|       |       |       |          |         |       |      |       |

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#### LangstaffRd\_EA\_Existing\_WestDonWatershd

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB             |          |          |       |         |           |       |
|-------------------|----------|----------|-------|---------|-----------|-------|
| STANDHYD ( 0160)  | Area     | (ha)=    | 0.43  |         |           |       |
| ID= 1 DT= 5.0 min | Total    | Imp(%)=  | 56.00 | Dir.    | Conn.(%)= | 56.00 |
|                   |          |          |       |         |           |       |
|                   |          | IMPERVIO | US    | PERVIOL | IS (i)    |       |
| Surface Area      | (ha)=    | 0.24     | ļ.    | 0.19    | )         |       |
| Dep. Storage      | ( mm ) = | 2.00     | )     | 5.00    | )         |       |
| Average Slope     | (%)=     | 1.00     | )     | 2.00    | )         |       |
| Length            | (m)=     | 260.00   | )     | 20.00   | )         |       |
| Mannings n        | ` =      | 0.013    | 3     | 0.250   | )         |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | ) HYETOGR | APH   |       |       |
|-------|-------|-------|----------|-----------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME    | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs     | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05     | 6.250     | 81.28 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05     | 6.333     | 16.26 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 4.06     | 6.417     | 16.26 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 4.06     | 6.500     | 16.26 | 9.58  | 3.05  |
| 0.417 | 2.03  | 3.500 | 4.06     | 6.583     | 16.26 | 9.67  | 3.05  |
| 0.500 | 2.03  | 3.583 | 3.05     | 6.667     | 16.26 | 9.75  | 3.05  |
| 0.583 | 2.03  | 3.667 | 3.05     | 6.750     | 16.26 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 3.05     | 6.833     | 7.11  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 4.06     | 6.917     | 7.11  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 4.06     | 7.000     | 7.11  | 10.08 | 3.05  |
| 0.917 | 1.02  | 4.000 | 4.06     | 7.083     | 7.11  | 10.17 | 3.05  |
| 1.000 | 1.02  | 4.083 | 3.05     | 7.167     | 7.11  | 10.25 | 3.05  |
| 1.083 | 2.03  | 4.167 | 3.05     | 7.250     | 7.11  | 10.33 | 2.03  |
| 1.167 | 2.03  | 4.250 | 3.05     | 7.333     | 5.08  | 10.42 | 2.03  |
| 1.250 | 2.03  | 4.333 | 7.11     | 7.417     | 5.08  | 10.50 | 2.03  |
| 1.333 | 2.03  | 4.417 | 7.11     | 7.500     | 5.08  | 10.58 | 1.02  |
| 1.417 | 2.03  | 4.500 | 7.11     | 7.583     | 5.08  | 10.67 | 1.02  |
| 1.500 | 2.03  | 4.583 | 6.10     | 7.667     | 5.08  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 6.10     | 7.750     | 5.08  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 6.10     | 7.833     | 6.10  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 6.10     | 7.917     | 6.10  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 6.10     | 8.000     | 6.10  | 11.08 | 2.03  |
| 1.917 | 1.02  | 5.000 | 6.10     | 8.083     | 5.08  | 11.17 | 2.03  |
| 2.000 | 1.02  | 5.083 | 6.10     | 8.167     | 5.08  | 11.25 | 2.03  |
| 2.083 | 2.03  | 5.167 | 6.10     | 8.250     | 5.08  | 11.33 | 2.03  |
| 2.167 | 2.03  | 5.250 | 6.10     | 8.333     | 4.06  | 11.42 | 2.03  |
| 2.250 | 2.03  | 5.333 | 11.18    | 8.417     | 4.06  | 11.50 | 2.03  |
| 2.333 | 4.06  | 5.417 | 11.18    | 8.500     | 4.06  | 11.58 | 1.02  |
| 2.417 | 4.06  | 5.500 | 11.18    | 8.583     | 3.05  | 11.67 | 1.02  |
| 2.500 | 4.06  | 5.583 | 11.18    | 8.667     | 3.05  | 11.75 | 1.02  |
| 2.583 | 3.05  | 5.667 | 11.18    | 8.750     | 3.05  | 11.83 | 2.03  |
| 2.667 | 3.05  | 5.750 | 11.18    | 8.833     | 4.06  | 11.92 | 2.03  |

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|                     | Lange    | +>ffpd E       | A Evict | ing WestDon | Watone       | hd         |      |
|---------------------|----------|----------------|---------|-------------|--------------|------------|------|
| 0.750               | 2.03     |                | 4.06    |             | 7.11         |            | 2.03 |
| 0.833               |          | 3.917          | 4.06    |             | 7.11         |            | 3.05 |
| 0.917               | 1.02     |                | 4.06    |             | 7.11         |            | 3.05 |
| 1.000               |          | 4.083          | 3.05    |             | 7.11         |            | 3.05 |
| 1.083               | 2.03     | 4.167          | 3.05    | 7.250       | 7.11         | 10.33      | 2.03 |
| 1.167               | 2.03     | 4.250          | 3.05    | 7.333       | 5.08         | 10.42      | 2.03 |
| 1.250               | 2.03     | 4.333          | 7.11    | 7.417       | 5.08         | 10.50      | 2.03 |
| 1.333               |          | 4.417          | 7.11    | 7.500       | 5.08         |            | 1.02 |
| 1.417               |          | 4.500          | 7.11    |             | 5.08         |            | 1.02 |
| 1.500               |          | 4.583          | 6.10    |             | 5.08         |            | 1.02 |
| 1.583               |          | 4.667          | 6.10    |             | 5.08         |            | 2.03 |
| 1.667               |          | 4.750          | 6.10    |             | 6.10         |            | 2.03 |
| 1.750               |          | 4.833          | 6.10    |             | 6.10         |            | 2.03 |
| 1.833               |          | 4.917          | 6.10    |             | 6.10         |            | 2.03 |
| 1.917               |          | 5.000          | 6.10    |             | 5.08         |            | 2.03 |
| 2.000               |          | 5.083          | 6.10    |             | 5.08         |            | 2.03 |
| 2.083<br>2.167      |          | 5.167<br>5.250 | 6.10    | 8.250       | 5.08<br>4.06 |            | 2.03 |
| 2.167               |          | 5.333          | 11.18   |             | 4.06         |            | 2.03 |
| 2.333               |          | 5.417          |         | 8.500       | 4.06         |            | 1.02 |
| 2.417               | 4.06     |                | 11.18   |             | 3.05         |            | 1.02 |
| 2.500               |          | 5.583          |         | 8.667       | 3.05         |            | 1.02 |
| 2.583               | 3.05     |                | 11.18   |             | 3.05         |            | 2.03 |
| 2.667               |          | 5.750          | 11.18   |             | 4.06         |            | 2.03 |
| 2.750               |          | 5.833          | 80.26   |             | 4.06         |            | 2.03 |
| 2.833               |          | 5.917          | 80.26   |             | 4.06         |            | 2.03 |
| 2.917               | 4.06 İ   | 6.000          | 80.26   | 9.083       | 3.05         | 12.17      | 2.03 |
| 3.000               | 4.06     | 6.083          | 81.28   | 9.167       | 3.05         | 12.25      | 2.03 |
| 3.083               | 3.05     | 6.167          | 81.28   | 9.250       | 3.05         | ĺ          |      |
| Max.Eff.Inten.(mm/  | hr)=     | 81.28          |         | 66.47       |              |            |      |
| over (m             |          | 5.00           |         | 15.00       |              |            |      |
|                     | in)=     | 4.92           | (ii)    | 11.78 (ii)  |              |            |      |
| Unit Hyd. Tpeak (m. | in)=     | 5.00           | . ,     | 15.00       |              |            |      |
| Unit Hyd. peak (co  | ms)=     | 0.22           |         | 0.09        |              |            |      |
|                     |          |                |         |             | *T0          | TALS*      |      |
|                     | ms)=     | 0.06           |         | 0.05        |              | .102 (iii) | )    |
|                     | rs)=     | 6.25           |         | 6.33        |              | 5.25       |      |
|                     | mm)=     | 87.92          |         | 58.69       |              | 1.83       |      |
|                     | mm)=     | 89.92          |         | 89.92       |              | 9.92       |      |
| RUNOFF COEFFICIENT  | =        | 0.98           |         | 0.65        | (            | 9.80       |      |
| * WARNING: STORAGE  | COEFF. I | S SMALLE       | ER THAN | TIME STEP!  |              |            |      |
| (i) CN PROCEDURE    | SELECTE  | D FOR PE       | RVTOUS  | LOSSES:     |              |            |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 87.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

#### LangstaffRd\_EA\_Existing\_WestDonWatershd

| ADD H | YD (   | 0436 | ا ((و  |      |       |       |       |  |
|-------|--------|------|--------|------|-------|-------|-------|--|
| 1 +   | 2 =    | 3    | 1      | AREA | QPEAK | TPEAK | R.V.  |  |
|       |        |      |        | (ha) | (cms) | (hrs) | (mm)  |  |
|       | ID1= 1 | 1 (  | 0155): | 0.56 | 0.102 | 6.25  | 71.83 |  |
| +     | ID2= 2 | 2 (  | 0160): | 0.43 | 0.087 | 6.25  | 76.50 |  |
|       | =====  |      |        |      |       |       |       |  |
|       | ID = 3 | 3 (  | 0430): | 0.99 | 0.189 | 6.25  | 73.86 |  |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB  <br>  STANDHYD ( 0150) <br> ID= 1 DT= 5.0 min | Area<br>Total | (ha)= 3.8<br>Imp(%)= 94.0 |              | 94.0 |
|--|---------------|---------------------------|--------------|------|
|  |               | IMPERVIOUS                | PERVIOUS (i) |      |
| Surface Area   | (ha)=         | 3.58                      | 0.23         |      |
| Dep. Storage   | (mm)=         | 2.00                      | 5.00         |      |
| Average Slope  | (%)=          | 1.00                      | 2.00         |      |
| Length   | (m)=          | 150.00                    | 40.00        |      |
| Mannings n   | =             | 0.013                     | 0.250        |      |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR/   | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05     | 6.250   | 81.28 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05     | 6.333   | 16.26 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 4.06     | 6.417   | 16.26 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 4.06     | 6.500   | 16.26 | 9.58  | 3.05  |
| 0.417 | 2.03  | 3.500 | 4.06     | 6.583   | 16.26 | 9.67  | 3.05  |
| 0.500 | 2.03  | 3.583 | 3.05     | 6.667   | 16.26 | 9.75  | 3.05  |
| 0.583 | 2.03  | 3.667 | 3.05     | 6.750   | 16.26 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 3.05     | 6.833   | 7.11  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 4.06     | 6.917   | 7.11  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 4.06     | 7.000   | 7.11  | 10.08 | 3.05  |
| 0.917 | 1.02  | 4.000 | 4.06     | 7.083   | 7.11  | 10.17 | 3.05  |
| 1.000 | 1.02  | 4.083 | 3.05     | 7.167   | 7.11  | 10.25 | 3.05  |
| 1.083 | 2.03  | 4.167 | 3.05     | 7.250   | 7.11  | 10.33 | 2.03  |
| 1.167 | 2.03  | 4.250 | 3.05     | 7.333   | 5.08  | 10.42 | 2.03  |
| 1.250 | 2.03  | 4.333 | 7.11     | 7.417   | 5.08  | 10.50 | 2.03  |
| 1.333 | 2.03  | 4.417 | 7.11     | 7.500   | 5.08  | 10.58 | 1.02  |
| 1.417 | 2.03  | 4.500 | 7.11     | 7.583   | 5.08  | 10.67 | 1.02  |
| 1.500 | 2.03  | 4.583 | 6.10     | 7.667   | 5.08  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 6.10     | 7.750   | 5.08  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 6.10     | 7.833   | 6.10  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 6.10     | 7.917   | 6.10  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 6.10     | 8.000   | 6.10  | 11.08 | 2.03  |
| 1.917 | 1.02  | 5.000 | 6.10     | 8.083   | 5.08  | 11.17 | 2.03  |
| 2.000 | 1.02  | 5.083 | 6.10     | 8.167   | 5.08  | 11.25 | 2.03  |
| 2.083 | 2.03  | 5.167 | 6.10     | 8.250   | 5.08  | 11.33 | 2.03  |
|       |       |       |          |         | 5.08  |       |       |

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| LangstaffRd_EA_Existing_WestDonWatershd |
|---|
| (mm)= 2.00 5.00                         |
| (%)= 1.00 2.00                          |
| (m)= 240.00 20.00                       |
| = 0.013 0.350                           |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

Dep. Storage Average Slope Length

Mannings n

Max.Eff.Inten.(mm/hr)=

over (min) Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=

|       |       | TR/   | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05     | 6.250   | 81.28 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05     | 6.333   | 16.26 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 4.06     | 6.417   | 16.26 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 4.06     | 6.500   | 16.26 | 9.58  | 3.05  |
| 0.417 | 2.03  | 3.500 | 4.06     | 6.583   | 16.26 | 9.67  | 3.05  |
| 0.500 | 2.03  | 3.583 | 3.05     | 6.667   | 16.26 | 9.75  | 3.05  |
| 0.583 | 2.03  | 3.667 | 3.05     | 6.750   | 16.26 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 3.05     | 6.833   | 7.11  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 4.06     | 6.917   | 7.11  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 4.06     | 7.000   | 7.11  | 10.08 | 3.05  |
| 0.917 | 1.02  | 4.000 | 4.06     |         | 7.11  | 10.17 | 3.05  |
| 1.000 | 1.02  | 4.083 | 3.05     | 7.167   | 7.11  | 10.25 | 3.05  |
| 1.083 | 2.03  | 4.167 | 3.05     | 7.250   | 7.11  | 10.33 | 2.03  |
| 1.167 | 2.03  | 4.250 | 3.05     | 7.333   | 5.08  | 10.42 | 2.03  |
| 1.250 | 2.03  | 4.333 | 7.11     | 7.417   | 5.08  | 10.50 | 2.03  |
| 1.333 | 2.03  | 4.417 | 7.11     | 7.500   | 5.08  | 10.58 | 1.02  |
| 1.417 | 2.03  | 4.500 | 7.11     | 7.583   | 5.08  | 10.67 | 1.02  |
| 1.500 | 2.03  | 4.583 | 6.10     | 7.667   | 5.08  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 6.10     | 7.750   | 5.08  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 6.10     | 7.833   | 6.10  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 6.10     | 7.917   | 6.10  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 6.10     |         | 6.10  | 11.08 | 2.03  |
| 1.917 | 1.02  | 5.000 | 6.10     |         | 5.08  | 11.17 | 2.03  |
| 2.000 | 1.02  | 5.083 | 6.10     |         | 5.08  | 11.25 | 2.03  |
| 2.083 | 2.03  | 5.167 | 6.10     | 8.250   | 5.08  | 11.33 | 2.03  |
| 2.167 | 2.03  | 5.250 | 6.10     | 8.333   | 4.06  | 11.42 | 2.03  |
| 2.250 | 2.03  | 5.333 | 11.18    | 8.417   | 4.06  | 11.50 | 2.03  |
| 2.333 | 4.06  | 5.417 | 11.18    | 8.500   | 4.06  | 11.58 | 1.02  |
| 2.417 | 4.06  | 5.500 | 11.18    | 8.583   | 3.05  | 11.67 | 1.02  |
| 2.500 | 4.06  | 5.583 | 11.18    | 8.667   | 3.05  | 11.75 | 1.02  |
| 2.583 | 3.05  | 5.667 | 11.18    | 8.750   | 3.05  | 11.83 | 2.03  |
| 2.667 | 3.05  | 5.750 | 11.18    | 8.833   | 4.06  | 11.92 | 2.03  |
| 2.750 | 3.05  | 5.833 | 80.26    | 8.917   | 4.06  | 12.00 | 2.03  |
| 2.833 | 4.06  | 5.917 | 80.26    | 9.000   | 4.06  | 12.08 | 2.03  |
| 2.917 | 4.06  | 6.000 | 80.26    | 9.083   | 3.05  | 12.17 | 2.03  |
| 3.000 | 4.06  | 6.083 | 81.28    | 9.167   | 3.05  | 12.25 | 2.03  |
| 3.083 | 3.05  | 6.167 | 81.28    | 9.250   | 3.05  |       |       |
|       |       |       |          |         |       |       |       |

5.00 15.00 4.69 (ii) 11.94 (ii) 5.00 15.00

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54.91

|  | Langs            | taffRd_E/                          | A_Existi               | .ng_WestDo                         | onWaters                     | hd         |      |
|--|------------------|------------------------------------|------------------------|------------------------------------|------------------------------|------------|------|
| 2.167  | 2.03             | 5.250                              | 6.10                   | 8.333                              | 4.06                         | 11.42      | 2.03 |
| 2.250  | 2.03             | 5.333                              | 11.18                  | 8.41/                              | 4.06                         | 11.50      | 2.03 |
| 2.333  | 4.06             | 5.41/                              | 11.18                  | 8.500                              | 4.06                         | 11.58      | 1.02 |
| 2.41/  | 4.06             | 5.500                              | 11.18                  | 8.583                              | 3.05                         | 11.6/      | 1.02 |
| 2.500  | 4.06             | 5.583                              | 11.18                  | 8.66/                              | 3.05                         | 11.75      | 1.02 |
| 2.565  | 2.05             | 5.00/                              | 11.10                  | 0.750                              | 4.00                         | 11.03      | 2.03 |
| 2.007  | 3.05 J           | 5./50                              | 90 26                  | 0.033                              | 4.00                         | 11.92      | 2.03 |
| 2.730  | 1 06             | 5.033<br>E 017                     | 90.20                  | 0.917                              | 4.00                         | 12.00      | 2.03 |
| 2.033  | 4.00             | 6 000                              | 80.20                  | 0 083                              | 3 05                         | 12.00      | 2.03 |
| 3 000  | 4 96             | 6 083                              | 81 28                  | 9 167                              | 3.05                         | 12.17      | 2.03 |
| 3.083  | 3.05             | 6.167                              | 81.28                  | 9.250                              | 3.05                         | hd         | 2.03 |
| Max.Eff.Inten.(mm/h  |                  |                                    |                        |                                    |                              |            |      |
| over (mi   | in)              | 5.00                               |                        | 10.00                              |                              |            |      |
| over (mi<br>Storage Coeff. (mi<br>Unit Hyd. Tpeak (mi  | in)=             | 3.54                               | (ii)                   | 6.09 (ii                           | )                            |            |      |
| Unit Hvd. Tpeak (mi  | in)=             | 5.00                               | (/                     | 10.00                              | ,                            |            |      |
| Unit Hyd. peak (cr   | ns)=             | 0.26                               |                        | 0.15                               |                              |            |      |
|  |                  |                                    |                        |                                    | *T0                          | TALS*      |      |
| PEAK FLOW (cr  | ns)=             | 0.81                               |                        | 0.04                               | 0                            | .849 (iii) |      |
| TIME TO PEAK (hr   | rs)=             | 6.25                               |                        | 6.25                               |                              | 5.25 `´    |      |
| RUNOFF VOLUME (n   | nm)=             | 87.92                              |                        | 60.31                              | 86                           | 5.26       |      |
| PEAK FLOW (cm<br>TIME TO PEAK (hm<br>RUNOFF VOLUME (m<br>TOTAL RAINFALL (m<br>RUNOFF COEFFICIENT | nm)=             | 89.92                              |                        | 89.92                              | 89                           | 9.92       |      |
| RUNOFF COEFFICIENT   | =                | 0.98                               |                        | 0.67                               | (                            | 9.96       |      |
| CN* = 88.6<br>(ii) TIME STEP (DI<br>THAN THE STOR<br>(iii) PEAK FLOW DOR                         | r) SHOUL         | D BE SMA<br>FFICIENT               | LLER OR                | EQUAL                              |                              |            |      |
| ADD HYD ( 0440)<br>  1 + 2 = 3  <br>  ID1= 1 ( 0150)<br>+ ID2= 2 ( 0430)                         | AR<br>(h<br>: 3. | EA QP<br>a) (c<br>81 0.8<br>99 0.1 | EAK<br>ms)<br>49<br>89 | TPEAK<br>(hrs)<br>6.25 8<br>6.25 7 | R.V.<br>(mm)<br>6.26<br>3.86 |            |      |
| ID = 3 ( 0440):  | : 4.             | 80 1.0                             | 38                     | 6.25 8                             | 3.70                         |            |      |
| NOTE: PEAK FLOWS D   |                  |                                    |                        |                                    |                              |            |      |
| CALIB  | Total Im         | p(%)= 4                            | 8.00                   |                                    |                              | 18.00      |      |
| Surface Area (1  |                  | MPERVIOU<br>0.23                   |                        | RVIOUS (i<br>0.24                  | )                            |            |      |
|  |                  |                                    |                        |                                    |                              |            |      |

 ${\tt LangstaffRd\_EA\_Existing\_WestDonWatershd}$ 

| Unit Hyd. peak  | (cms)= | 0.22  | 0.09  |             |
|-----------------|--------|-------|-------|-------------|
|                 |        |       |       | *TOTALS*    |
| PEAK FLOW       | (cms)= | 0.05  | 0.03  | 0.079 (iii) |
| TIME TO PEAK    | (hrs)= | 6.25  | 6.33  | 6.25        |
| RUNOFF VOLUME   | (mm)=  | 87.92 | 47.30 | 66.78       |
| TOTAL RAINFALL  | (mm)=  | 89.92 | 89.92 | 89.92       |
| RUNOFF COEFFICI | ENT =  | 0.98  | 0.53  | 0.74        |
|                 |        |       |       |             |

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 79.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICENT:

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

IMPERVIOUS 0.21 2.00 1.00 65.83 PERVIOUS (i) 0.44 5.00 2.00 Surface Area Dep. Storage Average Slope Length (ha)= (mm)= (%)= (m)= 40.00 Mannings n 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO  $\,$  5.0 MIN. TIME STEP.

- TRANSFORMED HYETOGRAPH ---
IME RAIN | TIME RAIN | TIME
hrs mm/hr | hrs mm/hr | hrs
167 3.05 6.250 81.28 9.33
250 3.05 6.333 16.26 9.59
417 4.06 6.417 16.26 9.50
417 4.06 6.500 16.26 9.58
500 4.06 6.500 16.26 9.58
500 4.06 6.583 16.26 9.67
583 3.05 6.667 16.26 9.67
583 3.05 6.667 16.26 9.83
750 3.05 6.653 7.11 10.00
917 4.06 7.000 7.11 10.00
917 4.06 7.000 7.11 10.08
000 4.06 7.083 7.11 10.17
083 3.05 7.167 7.11 10.25
167 3.05 7.250 7.11 10.23
250 3.05 7.250 7.11 10.33
250 3.05 7.250 7.11 10.33
250 3.05 7.250 7.11 10.33
250 7.11 7.583 5.08 10.58
500 7.11 7.583 5.08 10.58
500 7.11 7.583 5.08 10.55 TIME RAIN hrs 0.083 mm/hr 3.05 0.167 0.250 0.333 0.417 0.500 0.583 3.05 3.05 3.05 3.05 3.05 3.05 2.03 0.667 0.750 0.833 0.917 1.000 1.083 2.03 2.03 | 3.750 2.03 | 3.833 1.02 | 3.917 1.02 | 4.000 1.02 | 4.083 2.03 | 4.167 2.03 | 4.250 2.03 | 4.333 2.03 | 4.417 2.03 | 4.500 2.03 | 4.583 3.05 3.05 3.05 2.03 2.03 1.167 1.250 2.03 1.333 1.02 1 417

```
nWatershd
5.88 | 10.83
6.10 | 10.92
6.10 | 11.00
6.10 | 11.00
6.10 | 11.00
6.10 | 11.01
5.08 | 11.25
5.08 | 11.33
4.06 | 11.42
4.06 | 11.50
4.06 | 11.50
4.06 | 11.50
4.06 | 11.50
4.06 | 11.50
4.06 | 12.08
3.05 | 16.07
3.05 | 17.57
3.05 | 12.25
3.05 | 12.25
                               1.583
                                1.667
                               1.750
1.833
1.917
2.000
2.083
                                                                                                                                                                                                2.03
2.03
2.03
2.03
2.03
2.03
                                2.167
                                2.250
                                2.333
                               2.533
2.417
2.500
2.583
2.667
2.750
                                                                                                                                                                                                1.02
1.02
2.03
2.03
2.03
                                2.833
                                                                                                                                                                                                2.03
                                2.917
                                                                                                                                                                                                2.03
                                3.083
                                                                               81.28
5.00
2.16 (ii)
Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                                                                                15.00
10.79 (ii)
15.00
                                                                                 5.00
0.31
                                                                                                                       0.09
                                                                                                                                                          *TOTALS*
PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                                               0.05
6.25
87.92
89.92
                                                                                                                    0.06
6.33
52.66
89.92
                                                                                                                                                               0.107 (iii)
6.25
64.28
89.92
```

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

0.98

0.59

0.71

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0445) <br>  1 + 2 = 3  <br>  | 0.65 | QPEAK<br>(cms)<br>0.107<br>0.079 | 6.25 | R.V.<br>(mm)<br>64.28<br>66.78 |
|--|------|----------------------------------|------|--------------------------------|
| ID = 3 ( 0445):  NOTE: PEAK FLOWS DO 1 | 1.12 | 0.186                            | 6.25 | 65.33                          |

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| LangstaffRd_EA_Existing_WestDonWatershd |              |               |              |      |  |  |  |  |  |
|---|--------------|---------------|--------------|------|--|--|--|--|--|
| 3.000                                   | 4.06   6.083 | 81.28   9.167 | 3.05   12.25 | 2.03 |  |  |  |  |  |
| 3.083                                   | 3.05   6.167 | 81.28   9.250 | 3.05         |      |  |  |  |  |  |

| Max.Eff.Inten.(r | nm/hr)= | 81.28     | 60.55      |             |
|------------------|---------|-----------|------------|-------------|
| over             | (min)   | 5.00      | 15.00      |             |
| Storage Coeff.   | (min)=  | 4.81 (ii) | 10.50 (ii) |             |
| Unit Hyd. Tpeak  | (min)=  | 5.00      | 15.00      |             |
| Unit Hyd. peak   | (cms)=  | 0.22      | 0.09       |             |
|                  |         |           |            | *TOTALS*    |
| PEAK FLOW        | (cms)=  | 0.05      | 0.05       | 0.103 (iii) |
| TIME TO PEAK     | (hrs)=  | 6.25      | 6.33       | 6.25        |
| RUNOFF VOLUME    | (mm)=   | 87.92     | 52.66      | 66.75       |
| TOTAL RAINFALL   | (mm)=   | 89.92     | 89.92      | 89.92       |
| RUNOFF COEFFICIE | ENT =   | 0.98      | 0.59       | 0.74        |

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
- CN\* = 83.0 Ia = Dep. Storage (Above)
  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
  THAN THE STORAGE COEFFICIENT.
  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |         |       |         |           |       |  |
|-------------------|-------|---------|-------|---------|-----------|-------|--|
| STANDHYD ( 0170)  | Area  | (ha)=   | 0.43  |         |           |       |  |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 57.00 | Dir.    | Conn.(%)= | 57.00 |  |
|                   |       |         |       |         |           |       |  |
|                   |       | IMPERVI | OUS   | PERVIOL | JS (i)    |       |  |
| Surface Area      | (ha)= | 0.2     | 5     | 0.18    | 3         |       |  |
| Dep. Storage      | (mm)= | 2.0     | 0     | 5.00    | )         |       |  |
| Average Slope     | (%)=  | 1.0     | 0     | 2.00    | )         |       |  |
| Length            | (m)=  | 250.0   | 0     | 20.00   | )         |       |  |
| Mannings n        | =     | 0.01    | 3     | 0.250   | )         |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR/   | ANSFORME | HYETOGR | APH   | -     |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05     | 6.250   | 81.28 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05     | 6.333   | 16.26 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 4.06     | 6.417   | 16.26 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 4.06     | 6.500   | 16.26 | 9.58  | 3.05  |
| 0.417 | 2.03  | 3.500 | 4.06     | 6.583   | 16.26 | 9.67  | 3.05  |
| 0.500 | 2.03  | 3.583 | 3.05     | 6.667   | 16.26 | 9.75  | 3.05  |
| 0.583 | 2.03  | 3.667 | 3.05     | 6.750   | 16.26 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 3.05     | 6.833   | 7.11  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 4.06     | 6.917   | 7.11  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 4.06     | 7.000   | 7.11  | 10.08 | 3.05  |
| 0.917 | 1.02  | 4.000 | 4.06     | 7.083   | 7.11  | 10.17 | 3.05  |
|       |       |       |          |         |       |       |       |

#### LangstaffRd\_EA\_Existing\_WestDonWatershd

| CALIB<br>  STANDHYD ( 0165) <br> ID= 1 DT= 5.0 min | Area<br>Total | (ha)=<br>Imp(%)= 4 | 0.60<br>10.00 | Dir. Conn.(%)= | 40.00 |
|--|---------------|--------------------|---------------|----------------|-------|
|  |               | IMPERVIO           | JS            | PERVIOUS (i)   |       |
| Surface Area                                       | (ha)=         | 0.24               |               | 0.36           |       |
| Dep. Storage                                       | (mm)=         | 2.00               |               | 5.00           |       |
| Average Slope                                      | (%)=          | 1.00               |               | 2.00           |       |
| Length   | (m)=          | 250.00             |               | 20.00          |       |
| Mannings n   | =             | 0.013              |               | 0.250          |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05     | 6.250   | 81.28 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05     | 6.333   | 16.26 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 4.06     | 6.417   | 16.26 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 4.06     | 6.500   | 16.26 | 9.58  | 3.05  |
| 0.417 | 2.03  | 3.500 | 4.06     | 6.583   | 16.26 | 9.67  | 3.05  |
| 0.500 | 2.03  | 3.583 | 3.05     | 6.667   | 16.26 | 9.75  | 3.05  |
| 0.583 | 2.03  | 3.667 | 3.05     | 6.750   | 16.26 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 3.05     | 6.833   | 7.11  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 4.06     | 6.917   | 7.11  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 4.06     | 7.000   | 7.11  | 10.08 | 3.05  |
| 0.917 | 1.02  | 4.000 | 4.06     | 7.083   | 7.11  | 10.17 | 3.05  |
| 1.000 | 1.02  | 4.083 | 3.05     | 7.167   | 7.11  | 10.25 | 3.05  |
| 1.083 | 2.03  | 4.167 | 3.05     | 7.250   | 7.11  | 10.33 | 2.03  |
| 1.167 | 2.03  | 4.250 | 3.05     | 7.333   | 5.08  | 10.42 | 2.03  |
| 1.250 | 2.03  | 4.333 | 7.11     | 7.417   | 5.08  | 10.50 | 2.03  |
| 1.333 | 2.03  | 4.417 | 7.11     | 7.500   | 5.08  | 10.58 | 1.02  |
| 1.417 | 2.03  | 4.500 | 7.11     | 7.583   | 5.08  | 10.67 | 1.02  |
| 1.500 | 2.03  | 4.583 | 6.10     | 7.667   | 5.08  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 6.10     | 7.750   | 5.08  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 6.10     | 7.833   | 6.10  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 6.10     | 7.917   | 6.10  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 6.10     | 8.000   | 6.10  | 11.08 | 2.03  |
| 1.917 | 1.02  | 5.000 | 6.10     | 8.083   | 5.08  | 11.17 | 2.03  |
| 2.000 | 1.02  | 5.083 | 6.10     | 8.167   | 5.08  | 11.25 | 2.03  |
| 2.083 | 2.03  | 5.167 | 6.10     | 8.250   | 5.08  | 11.33 | 2.03  |
| 2.167 | 2.03  | 5.250 | 6.10     | 8.333   | 4.06  | 11.42 | 2.03  |
| 2.250 | 2.03  | 5.333 | 11.18    | 8.417   | 4.06  | 11.50 | 2.03  |
| 2.333 | 4.06  | 5.417 | 11.18    | 8.500   | 4.06  | 11.58 | 1.02  |
| 2.417 | 4.06  | 5.500 | 11.18    | 8.583   | 3.05  | 11.67 | 1.02  |
| 2.500 | 4.06  | 5.583 | 11.18    | 8.667   | 3.05  | 11.75 | 1.02  |
| 2.583 | 3.05  | 5.667 | 11.18    | 8.750   | 3.05  | 11.83 | 2.03  |
| 2.667 | 3.05  | 5.750 | 11.18    | 8.833   | 4.06  | 11.92 | 2.03  |
| 2.750 | 3.05  | 5.833 | 80.26    | 8.917   | 4.06  | 12.00 | 2.03  |
| 2.833 | 4.06  | 5.917 | 80.26    | 9.000   | 4.06  | 12.08 | 2.03  |
| 2.917 | 4.06  | 6.000 | 80.26    | 9.083   | 3.05  | 12.17 | 2.03  |

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|       | Langs | taffRd E | A Existi | ng WestDo | onWaters | hd    |      |
|-------|-------|----------|----------|-----------|----------|-------|------|
| 1.000 | 1.02  | 4.083    | 3.05     | 7.167     | 7.11     | 10.25 | 3.05 |
| 1.083 | 2.03  | 4.167    | 3.05     | 7.250     | 7.11     | 10.33 | 2.03 |
| 1.167 | 2.03  | 4.250    | 3.05     | 7.333     | 5.08     | 10.42 | 2.03 |
| 1.250 | 2.03  | 4.333    | 7.11     | 7.417     | 5.08     | 10.50 | 2.03 |
| 1.333 | 2.03  | 4.417    | 7.11     | 7.500     | 5.08     | 10.58 | 1.02 |
| 1.417 | 2.03  | 4.500    | 7.11     | 7.583     | 5.08     | 10.67 | 1.02 |
| 1.500 | 2.03  | 4.583    | 6.10     | 7.667     | 5.08     | 10.75 | 1.02 |
| 1.583 | 2.03  | 4.667    | 6.10     | 7.750     | 5.08     | 10.83 | 2.03 |
| 1.667 | 2.03  | 4.750    | 6.10     | 7.833     | 6.10     | 10.92 | 2.03 |
| 1.750 | 2.03  | 4.833    | 6.10     | 7.917     | 6.10     | 11.00 | 2.03 |
| 1.833 | 1.02  | 4.917    | 6.10     | 8.000     | 6.10     | 11.08 | 2.03 |
| 1.917 | 1.02  | 5.000    | 6.10     | 8.083     | 5.08     | 11.17 | 2.03 |
| 2.000 | 1.02  | 5.083    | 6.10     | 8.167     | 5.08     | 11.25 | 2.03 |
| 2.083 | 2.03  | 5.167    | 6.10     | 8.250     | 5.08     | 11.33 | 2.03 |
| 2.167 | 2.03  | 5.250    | 6.10     | 8.333     | 4.06     | 11.42 | 2.03 |
| 2.250 | 2.03  | 5.333    | 11.18    | 8.417     | 4.06     | 11.50 | 2.03 |
| 2.333 | 4.06  | 5.417    | 11.18    | 8.500     | 4.06     | 11.58 | 1.02 |
| 2.417 | 4.06  | 5.500    | 11.18    | 8.583     | 3.05     | 11.67 | 1.02 |
| 2.500 | 4.06  | 5.583    | 11.18    | 8.667     | 3.05     | 11.75 | 1.02 |
| 2.583 | 3.05  | 5.667    | 11.18    | 8.750     | 3.05     | 11.83 | 2.03 |
| 2.667 | 3.05  | 5.750    | 11.18    | 8.833     | 4.06     | 11.92 | 2.03 |
| 2.750 | 3.05  | 5.833    | 80.26    | 8.917     | 4.06     | 12.00 | 2.03 |
| 2.833 | 4.06  | 5.917    | 80.26    | 9.000     | 4.06     | 12.08 | 2.03 |
| 2.917 | 4.06  | 6.000    | 80.26    | 9.083     | 3.05     | 12.17 | 2.03 |
| 3.000 | 4.06  | 6.083    | 81.28    | 9.167     | 3.05     | 12.25 | 2.03 |
| 3.083 | 3.05  | 6.167    | 81.28    | 9.250     | 3.05     | I     |      |
|       |       |          |          |           |          |       |      |

| max.ETT.Inten.(r | nm/nr)= | 81.28 | 69.46     |          |       |
|------------------|---------|-------|-----------|----------|-------|
| over             | (min)   | 5.00  | 10.00     |          |       |
| Storage Coeff.   | (min)=  | 4.81  | (ii) 9.33 | (ii)     |       |
| Unit Hyd. Tpeak  | (min)=  | 5.00  | 10.00     |          |       |
| Unit Hyd. peak   | (cms)=  | 0.22  | 0.12      |          |       |
|                  |         |       |           | *TOTALS* | *     |
| PEAK FLOW        | (cms)=  | 0.06  | 0.03      | 0.087    | (iii) |
| TIME TO PEAK     | (hrs)=  | 6.25  | 6.25      | 6.25     |       |
| RUNOFF VOLUME    | (mm)=   | 87.92 | 62.00     | 76.76    |       |
| TOTAL RAINFALL   | (mm)=   | 89.92 | 89.92     | 89.92    |       |
| RUNOFF COEFFICIE | ENT =   | 0.98  | 0.69      | 0.85     |       |
|                  |         |       |           |          |       |

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
- (1) CN\* PROCEDURE SELECT FOR FEATURES LOSSES.

  (M\* = 89.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COEFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0450) |      |       |       |     |
|-----------------|------|-------|-------|-----|
| 1 + 2 = 3       | AREA | QPEAK | TPEAK | R.  |
|                 | (ha) | (cms) | (hrs) | ( m |
|                 |      |       |       |     |

#### LangstaffRd\_EA\_Existing\_WestDonWatershd 0.60 0.103 6.25 66.75 0.43 0.087 6.25 76.76 ID1= 1 ( 0165): + ID2= 2 ( 0170): ID = 3 ( 0450): 1.03 0.190 6.25 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY. | ADD HYD ( 0450)| | 3 + 2 = 1 | AREA OPEAK TPEAK R.V.

|   | (ha)    | (cms)      | (hrs)    | (mm)  |
|---|---------|------------|----------|-------|
| ID1= 3 ( 0450):                         | 1.03    | 0.190      | 6.25     | 70.93 |
| + ID2= 2 ( 0445):                       | 1.12    | 0.186      | 6.25     | 65.33 |
| ======================================= |         | =======    |          |       |
| ID = 1 ( 0450):                         | 2.15    | 0.376      | 6.25     | 68.01 |
|   |         |            |          |       |
| NOTE: PEAK FLOWS DO NO                  | OT INCL | UDE BASEFL | OWS IF A | NY.   |
|   |         |            |          |       |

| CALIB  <br>  STANDHYD ( 0190) <br> ID= 1 DT= 5.0 min | (ha)=<br>Imp(%)= |     | Dir. Conn.(%)= | 42.00 |
|--|------------------|-----|----------------|-------|
|  | IMPERVI          | ous | PERVIOUS (i)   |       |

|               |       | IMPERVIOUS | PERVIOUS ( | i |
|---------------|-------|------------|------------|---|
| Surface Area  | (ha)= | 0.36       | 0.50       |   |
| Dep. Storage  | (mm)= | 2.00       | 5.00       |   |
| Average Slope | (%)=  | 1.00       | 2.00       |   |
| Length        | (m)=  | 340.00     | 50.00      |   |
| Mannings n    | =     | 0.013      | 0.250      |   |
|               |       |            |            |   |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | D HYETOGR | APH   |       |       |
|-------|-------|-------|----------|-----------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME    | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs     | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05     | 6.250     | 81.28 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05     | 6.333     | 16.26 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 4.06     | 6.417     | 16.26 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 4.06     | 6.500     | 16.26 | 9.58  | 3.05  |
| 0.417 | 2.03  | 3.500 | 4.06     | 6.583     | 16.26 | 9.67  | 3.05  |
| 0.500 | 2.03  | 3.583 | 3.05     | 6.667     | 16.26 | 9.75  | 3.05  |
| 0.583 | 2.03  | 3.667 | 3.05     | 6.750     | 16.26 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 3.05     | 6.833     | 7.11  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 4.06     | 6.917     | 7.11  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 4.06     | 7.000     | 7.11  | 10.08 | 3.05  |
| 0.917 | 1.02  | 4.000 | 4.06     | 7.083     | 7.11  | 10.17 | 3.05  |
| 1.000 | 1.02  | 4.083 | 3.05     | 7.167     | 7.11  | 10.25 | 3.05  |
| 1.083 | 2.03  | 4.167 | 3.05     | 7.250     | 7.11  | 10.33 | 2.03  |
| 1.167 | 2.03  | 4.250 | 3.05     | 7.333     | 5.08  | 10.42 | 2.03  |
| 1.250 | 2.03  | 4.333 | 7.11     | 7.417     | 5.08  | 10.50 | 2.03  |
| 1.333 | 2.03  | 4.417 | 7.11     | 7.500     | 5.08  | 10.58 | 1.02  |

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#### ${\tt LangstaffRd\_EA\_Existing\_WestDonWatershd}$

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|                   |       | TRA   | NSFORME | D HYETOGR | APH   |       |       |
|-------------------|-------|-------|---------|-----------|-------|-------|-------|
| TIME              | RAIN  | TIME  | RAIN    | ' TIME    | RAIN  | TIME  | RAIN  |
| hrs               | mm/hr | hrs   | mm/hr   | ' hrs     | mm/hr | hrs   | mm/hr |
| 0.083             | 0.00  | 3.167 | 3.05    | 6.250     | 81.28 | 9.33  | 3.05  |
| 0.167             | 0.00  | 3.250 | 3.05    | 6.333     | 16.26 | 9.42  | 3.05  |
| 0.250             | 0.00  | 3.333 | 4.06    | 6.417     | 16.26 | 9.50  | 3.05  |
| 0.333             | 2.03  | 3.417 | 4.06    | 6.500     | 16.26 | 9.58  | 3.05  |
| 0.417             | 2.03  | 3.500 | 4.06    | 6.583     | 16.26 | 9.67  | 3.05  |
| 0.500             | 2.03  | 3.583 | 3.05    | 6.667     | 16.26 | 9.75  | 3.05  |
| 0.583             |       | 3.667 |         | 6.750     | 16.26 | 9.83  | 2.03  |
| 0.667             | 2.03  | 3.750 | 3.05    | 6.833     | 7.11  | 9.92  | 2.03  |
| 0.750             | 2.03  |       |         |           | 7.11  |       | 2.03  |
| 0.833             | 1.02  |       |         | 7.000     | 7.11  | 10.08 | 3.05  |
| 0.917             |       | 4.000 |         | 7.083     | 7.11  |       | 3.05  |
| 1.000             |       | 4.083 |         | 7.167     |       |       | 3.05  |
| 1.083             | 2.03  |       |         |           | 7.11  |       | 2.03  |
| 1.167             |       | 4.250 |         | 7.333     | 5.08  |       | 2.03  |
| 1.250             | 2.03  | 4.333 | 7.11    | 7.417     | 5.08  | 10.50 | 2.03  |
|                   |       | 4.417 |         | 7.500     |       | 10.58 |       |
| 1.417             |       |       |         |           |       |       |       |
| 1.500             | 2.03  |       | 6.10    |           | 5.08  |       | 1.02  |
| 1.583             |       | 4.667 |         | 7.750     | 5.08  |       | 2.03  |
| 1.667             |       | 4.750 |         | 7.833     |       | 10.92 | 2.03  |
| 1.750             | 2.03  | 4.833 | 6.10    | 7.917     | 6.10  |       | 2.03  |
| 1.833             | 1.02  | 4.917 | 6.10    | 8.000     | 6.10  | 11.08 | 2.03  |
| 1.917             | 1.02  | 5.000 | 6.10    | 8.083     | 5.08  | 11.17 | 2.03  |
| 2.000             |       |       |         | 8.167     |       |       | 2.03  |
| 2.083             | 2.03  |       |         | 8.250     |       |       |       |
| 2.167             | 2.03  |       | 6.10    |           | 4.06  |       | 2.03  |
| 2.250             |       | 5.333 |         | 8.417     | 4.06  |       | 2.03  |
| 2.333             |       | 5.417 |         | 8.500     | 4.06  |       | 1.02  |
| 2.417             |       | 5.500 |         | 8.583     |       |       |       |
| 2.500             | 4.06  |       |         | 8.667     |       |       | 1.02  |
| 2.583             |       | 5.667 |         | 8.750     | 3.05  |       | 2.03  |
| 2.667             |       | 5.750 |         | 8.833     | 4.06  |       | 2.03  |
| 2.750             | 3.05  |       |         | 8.917     |       |       | 2.03  |
| 2.833             | 4.06  |       | 80.26   |           | 4.06  |       | 2.03  |
| 2.917             | 4.06  |       | 80.26   |           | 3.05  | 12.17 | 2.03  |
| 3.000             | 4.06  |       | 81.28   |           | 3.05  | 12.25 | 2.03  |
| 3.083             | 3.05  | 6.167 | 81.28   | 9.250     | 3.05  |       |       |
| Max.Eff.Inten.(mm | /hr)= | 81.28 |         | 60.55     |       |       |       |

| max.cii.tiiceii.(i | IIII/ III / – | 01.20     | 00.33      |             |
|--------------------|---------------|-----------|------------|-------------|
| over               | (min)         | 5.00      | 15.00      |             |
| Storage Coeff.     | (min)=        | 5.78 (ii) | 11.48 (ii) |             |
| Unit Hyd. Tpeak    | (min)=        | 5.00      | 15.00      |             |
| Unit Hyd. peak     | (cms)=        | 0.20      | 0.09       |             |
|                    |               |           |            | *TOTALS*    |
| PEAK FLOW          | (cms)=        | 0.07      | 0.06       | 0.135 (iii) |
| TIME TO PEAK       | (hrs)=        | 6.25      | 6.33       | 6.25        |

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| onWaters     | shd                    |      |
|--------------|------------------------|------|
|              | 10.67                  | 1.02 |
| 5 08         | 10.75                  | 1.02 |
| 5.08         | 10.83                  | 2.03 |
| 6.10         | 10.92                  | 2.03 |
| 6.10         | 11.00                  | 2.03 |
| 6.10         | 11.08                  | 2.03 |
| 5.08         | 11.17                  | 2.03 |
| 5.08         | 11.25                  |      |
|              | 11.33                  |      |
|              | 11.42                  | 2.03 |
| 4.06         | 11.50                  |      |
| 4.06         |                        |      |
|              | 11.67                  |      |
| 3.05<br>3.05 | 11.75                  | 1.02 |
| 3.05         | 11.83                  | 2.03 |
| 4.06         | 11.92                  | 2.03 |
| 4.06         | 1 12.00                | 2.03 |
| 4.06         | 12.08                  | 2.03 |
| 3.05         | 12.17                  | 2.03 |
| 3.05         | 12.25                  | 2.03 |
| 3.05         | İ                      |      |
|              |                        |      |
|              |                        |      |
| i)           |                        |      |
|              |                        |      |
|              |                        |      |
|              | TALS*                  |      |
|              | ).134 (ii              | i)   |
|              | 6.25                   |      |
|              | 7.45                   |      |
|              |                        |      |
|              | 0.75                   |      |
| 8            | 67.45<br>89.92<br>0.75 |      |
|              |                        |      |

| CALIB             |          |         |       |              |      |       |  |
|-------------------|----------|---------|-------|--------------|------|-------|--|
| STANDHYD ( 0195)  | Area     | (ha)=   | 0.79  |              |      |       |  |
| ID= 1 DT= 5.0 min | Total    | Imp(%)= | 42.00 | Dir. Conn.   | (%)= | 42.00 |  |
|                   |          |         |       |              |      |       |  |
|                   |          | IMPERVI | OUS   | PERVIOUS (i) |      |       |  |
| Surface Area      | (ha)=    | 0.3     | 3     | 0.46         |      |       |  |
| Dep. Storage      | ( mm ) = | 2.0     | 10    | 5.00         |      |       |  |

Average Slope Length Mannings n 1.00 340.00 0.013 2.00 20.00 0.250

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|                  | Lang  | staffRd_EA_E | kisting_WestDo | nWatershd |
|------------------|-------|--------------|----------------|-----------|
| RUNOFF VOLUME    | (mm)= | 87.92        | 52.66          | 67.46     |
| TOTAL RAINFALL   | (mm)= | 89.92        | 89.92          | 89.92     |
| RUNOFF COEFFICIE | NT =  | 0.98         | 0.59           | 0.75      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STOP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COEFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0455)| | 1 + 2 = 3 | | ID1= 1 ( 0190): + ID2= 2 ( 0195): QPEAK (cms) 0.134 0.135 TPEAK (hrs) 6.25 6.25 R.V. (mm) 67.45 67.46 0.79 ID = 3 ( 0455): 1.65 0.269 6.25 67.45

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD ( 0458)| | 1 + 2 = 3 | QPEAK (cms) 0.376 0.269 R.V. (mm) 68.01 67.45 AREA TPEAK (hrs) 6.25 6.25 ID1= 1 ( 0450): + ID2= 2 ( 0455): ========== ID = 3 ( 0458): 3.80 0.645 6.25 67.77

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

..... | CALIB | | STANDHYD ( 0300) | |ID= 1 DT= 5.0 min | Area (ha)= 10.00 Total Imp(%)= 80.00 Dir. Conn.(%)= 80.00 IMPERVIOUS PERVIOUS (i) 8.00 1.00 1.00 258.20 0.013 2.00 5.00 2.00 40.00 0.250 Surface Area (ha)= Dep. Storage Average Slope Length Mannings n (mm)= (%)= (m)= =

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ---TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN

| LangstaffRd EA Existing WestDonWatershd |           |        |                |       |            |       |
|---|-----------|--------|----------------|-------|------------|-------|
| hrs mm/hr                               | hrs       | mm/hr  | ' hrs          | mm/hr | hrs        | mm/hr |
| 0.083 0.00                              | 3.167     | 3.05   | 6.250          | 81.28 | 9.33       | 3.05  |
| 0.167 0.00                              | 3.250     | 3.05   | 6.333          | 16.26 | 9.42       | 3.05  |
| 0.250 0.00                              | 3.333     | 4.06   | 6.333          | 16.26 | 9.50       | 3.05  |
|   | 3.417     | 4.06   |                | 16.26 |            | 3.05  |
|   | 3.500     |        |                | 16.26 |            | 3.05  |
| 0.500 2.03                              | 3.583     | 3 05   |                | 16.26 |            | 3.05  |
| 0.583 2.03                              | 3 667     | 3 05   |                | 16.26 |            | 2.03  |
| 0.667 2.03                              | 3.667     | 3 05   | 6.833          | 7.11  |            | 2.03  |
|   | 3.833     |        | 6.917          |       | 10.00      | 2.03  |
| 0.833 1.02                              |           |        | 7.000          |       | 10.08      | 3.05  |
| 0.917 1.02                              | 4.000     | 4.00   | 7.083          |       | 10.17      | 3.05  |
|   |           |        | 7.167          |       | 10.17      | 3.05  |
| 1.000 1.02                              | 4.083     | 3.05   | 7.167          |       | 10.23      | 2.03  |
|   |           |        |                |       |            |       |
| 1.167 2.03                              | 4.250     | 3.05   | 7.333          |       | 10.42      | 2.03  |
| 1.250 2.03                              | 4.333     | 7.11   | 7.417          |       | 10.50      | 2.03  |
|   | 4.417     |        | 7.500          |       | 10.58      | 1.02  |
| 1.417 2.03<br>1.500 2.03                | 4.500     | 7.11   | 7.583          |       | 10.67      | 1.02  |
| 1.500 2.03                              | 4.583     | 6.10   | 7.667          |       | 10.75      | 1.02  |
| 1.583 2.03                              | 4.667     | 6.10   | 7.750          |       | 10.83      | 2.03  |
| 1.583 2.03<br>1.667 2.03<br>1.750 2.03  | 4.750     | 6.10   | 7.833          |       | 10.92      | 2.03  |
| 1.750 2.03                              | 4.833     | 6.10   | 7.917          | 6.10  | 11.00      | 2.03  |
| 1.833 1.02                              | 4.917     | 6.10   | 8.000          |       | 11.08      | 2.03  |
| 1.917 1.02                              | 5.000     | 6.10   | 8.083          | 5.08  | 11.17      | 2.03  |
| 2.000 1.02                              | 5.083     | 6.10   | 8.167          | 5.08  | 11.25      | 2.03  |
| 2.083 2.03                              | 5.167     | 6.10   | 8.250          | 5.08  | 11.33      | 2.03  |
| 2.167 2.03                              | 5.167     | 6.10   | 8.333          | 4.06  | 11.42      | 2.03  |
| 2.250 2.03                              | 5.333     | 11.18  | 8.417          | 4.06  | 11.50      | 2.03  |
| 2.333 4.06                              | j 5.417   | 11.18  | 8.500          | 4.06  | 11.58      | 1.02  |
|   | 5.500     |        |                | 3.05  | 11.67      | 1.02  |
|   |           |        |                |       | 11.75      | 1.02  |
| 2.583 3.05                              | 5.667     | 11.18  | 8.667<br>8.750 |       | 11.83      | 2.03  |
| 2.667 3.05                              | 5.750     | 11.18  | 8.833          |       | 11.92      | 2.03  |
|   | 5.833     |        |                |       | 12.00      | 2.03  |
|   |           |        | 9.000          |       | 12.08      | 2.03  |
| 2.917 4.06                              | 6 999     | 80.26  | 0 083          | 3 05  | 12.17      | 2.03  |
| 3.000 4.06                              | 6 083     | 81 28  | 9.083          | 3.05  | 12.25      | 2.03  |
|   | 6.167     |        |                | 3.05  |            | 2.03  |
| 3.003 3.03                              | 0.107     | 01.20  | 7 3.230        | 5.05  |            |       |
| Max.Eff.Inten.(mm/hr)=                  | 81.28     |        | 54.91          |       |            |       |
| over (min)                              | 5.00      |        | 10.00          |       |            |       |
| Storage Coeff. (min)=                   | 4.90      |        | 9.31 (ii)      |       |            |       |
| Unit Hyd. Tpeak (min)=                  | 5.00      |        | 10.00          |       |            |       |
| Unit Hyd. peak (cms)=                   | 0.22      |        | 0.12           |       |            |       |
| onize nya. peak (ems)=                  | 0.22      |        | 0.12           | *T0   | TALS*      |       |
| PEAK FLOW (cms)=                        | 1.80      |        | 0.26           |       | .067 (iii) |       |
| TIME TO PEAK (hrs)=                     | 6.25      |        | 6.25           |       | 5.25       |       |
| RUNOFF VOLUME (mm)=                     | 88.92     |        | 47.30          |       | 9.59       |       |
| TOTAL RAINFALL (mm)=                    | 89.92     |        | 89.92          |       | 9.92       |       |
| RUNOFF COEFFICIENT =                    | 0.99      |        | 0.53           |       | 9.92       |       |
| MONOFF COEFFECTENT =                    | 0.39      |        | 0.33           | ,     |            |       |
| ***** WARNING: STORAGE COEFF.           | IS SMALLE | R THAN | TIME STEP!     |       |            |       |

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|     |            |        | Lang      | staffR  | d FΔ Fyis | ting We | stDonWaters | .hd       |      |
|-----|------------|--------|-----------|---------|-----------|---------|-------------|-----------|------|
|     |            | 2.417  |           |         | 0 11.18   |         |             | 11.67     | 1.02 |
|     |            | 2.500  |           |         |           |         | 7 3.05      |           |      |
|     |            | 2.583  |           |         |           |         | 0 3.05      |           | 2.03 |
|     |            | 2.667  |           | 5.75    |           |         | 3 4.06      |           |      |
|     |            | 2.756  |           |         |           |         | 7 4.06      |           |      |
|     |            |        |           |         |           |         | 0 4.06      |           |      |
|     |            |        | 4.06      |         |           |         | 3.05        |           |      |
|     |            |        |           |         |           |         | 7 3.05      |           |      |
|     |            | 3.083  |           | 6.16    |           | 9.25    |             |           |      |
|     |            |        |           |         |           | ,       |             |           |      |
|     | Max.Eff.In | ten.(n | nm/hr)=   | 81.     | 28        | 54.91   |             |           |      |
|     |            | over   | (min)     | 5.      | 00        | 15.00   |             |           |      |
|     | Storage Co | eff.   | (min)=    | 2.      | 38 (ii)   | 11.35   | (ii)        |           |      |
|     | Unit Hyd.  |        |           |         |           | 15.00   | ` '         |           |      |
|     | Unit Hyd.  | oeak   | (cms)=    | 0.      | 30        | 0.09    |             |           |      |
|     | ,          |        | (/        |         |           |         | *T0         | TALS*     |      |
|     | PEAK FLOW  |        | (cms)=    | 0.      | 14        | 0.03    | 0           | .174 (iii | i)   |
|     | TIME TO PE | AΚ     | (hrs)=    | 6.      | 25        | 6.33    |             | 6.25      |      |
|     | RUNOFF VOL | JME    | (mm)=     | 88.     | 92        | 47.30   | 7           | 6.42      |      |
|     | TOTAL RAIN | FALL   | (mm)=     | 89.     | 92        | 89.92   | 8           | 9.92      |      |
|     | RUNOFF COE | FFICIE |           | 0.      |           | 0.53    |             | 0.85      |      |
| *** | * WARNING: | STORAG | GE COEFF. | IS SMA  | LLER THAN | TIME S  | TEP!        |           |      |
|     | (i) CN PI  | ROCEDL | JRE SELEC | TED FOR | PERVIOUS  | LOSSES  | :           |           |      |
|     | , ,        |        |           |         |           |         | 1.          |           |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 79.0 I a= Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0375)   | AREA  | QPEAK | TPEAK | R.V.  |
|-------------------|-------|-------|-------|-------|
| 1 + 2 = 3         | (ha)  | (cms) | (hrs) | (mm)  |
| TD1= 1 ( 0300):   | 10.00 | 2.067 | 6.25  | 80.59 |
| + ID2= 2 ( 0350): | 0.90  | 0.174 | 6.25  | 76.42 |
| ID = 3 ( 0375):   | 10.90 | 2.240 | 6.25  | 80.25 |

- LangstaffRd\_EA\_Existing\_WestDonWatershd

  (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 79.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COEFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

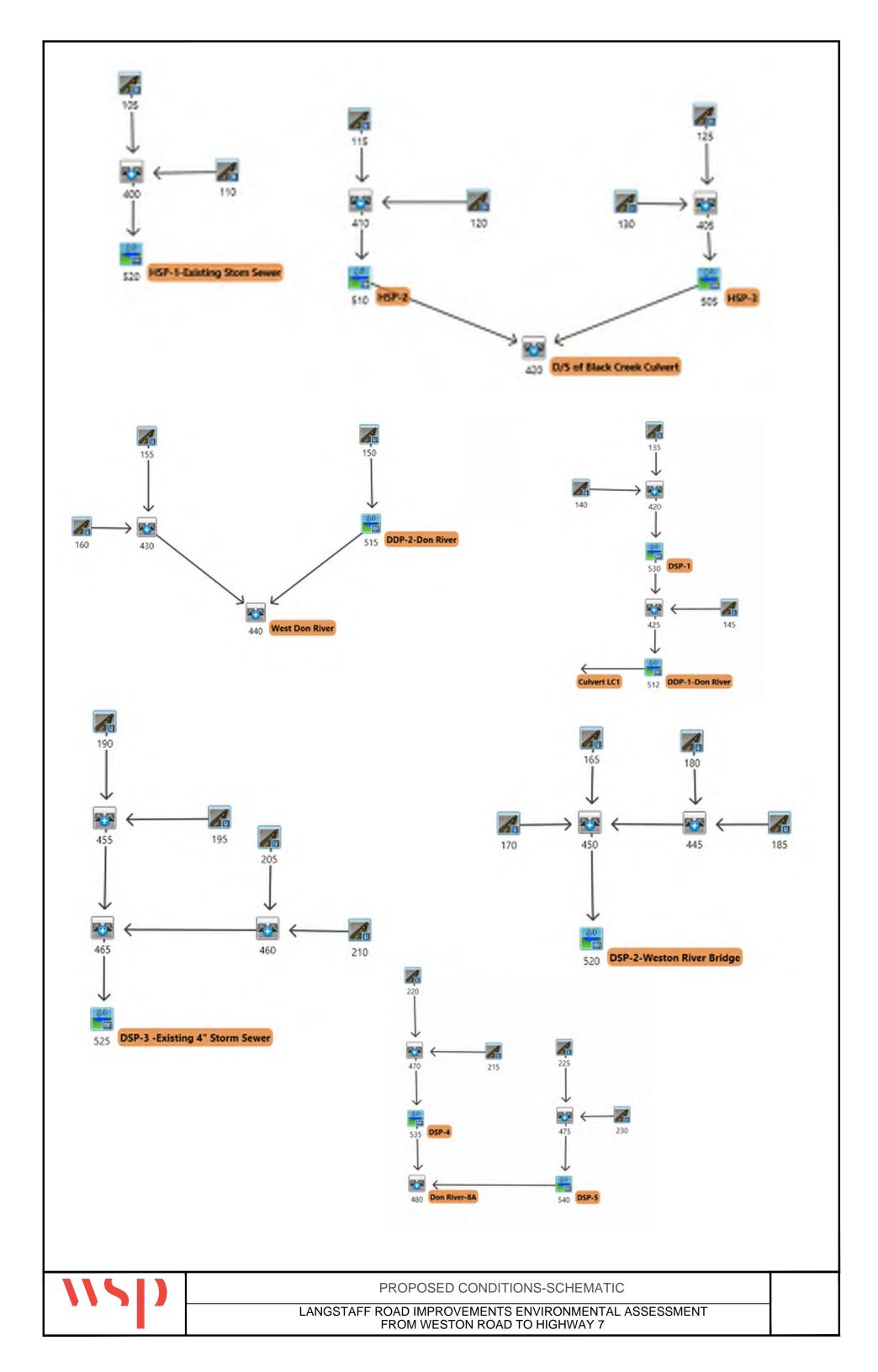
| CALIB             |       |         |      |         |           |       |
|-------------------|-------|---------|------|---------|-----------|-------|
| STANDHYD ( 0350)  | Area  | (ha)=   | 0.90 |         |           |       |
| ID= 1 DT= 5.0 min |       | Imp(%)= |      | Dir.    | Conn.(%)= | 70.00 |
|                   |       | 1 ( )   |      |         |           |       |
|                   |       | IMPERVI | OUS  | PERVIOL | JS (i)    |       |
| Surface Area      | (ha)= | 0.6     | 3    | 0.27    | 7 ` ´     |       |
| Dep. Storage      | (mm)= | 1.0     | 0    | 5.00    | 9         |       |
| Average Slope     | (%)=  | 1.0     | 0    | 2.00    | 9         |       |
| Length            | (m)=  | 77.4    | 6    | 40.00   | 9         |       |
| Mannings n        | - =   | 0.01    | 3    | 0.256   | 9         |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | ) HYETOGR | APH   |       |       |
|-------|-------|-------|----------|-----------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME    | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs     | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05     | 6.250     | 81.28 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05     | 6.333     | 16.26 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 4.06     | 6.417     | 16.26 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 4.06     | 6.500     | 16.26 | 9.58  | 3.05  |
| 0.417 | 2.03  | 3.500 | 4.06     | 6.583     | 16.26 | 9.67  | 3.05  |
| 0.500 | 2.03  | 3.583 | 3.05     | 6.667     | 16.26 |       | 3.05  |
| 0.583 | 2.03  | 3.667 | 3.05     | 6.750     | 16.26 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 3.05     | 6.833     | 7.11  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 4.06     | 6.917     | 7.11  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 4.06     | 7.000     | 7.11  | 10.08 | 3.05  |
| 0.917 | 1.02  | 4.000 | 4.06     | 7.083     | 7.11  | 10.17 | 3.05  |
| 1.000 | 1.02  | 4.083 | 3.05     | 7.167     | 7.11  | 10.25 | 3.05  |
| 1.083 | 2.03  | 4.167 | 3.05     | 7.250     | 7.11  | 10.33 | 2.03  |
| 1.167 | 2.03  | 4.250 | 3.05     | 7.333     | 5.08  |       | 2.03  |
| 1.250 | 2.03  | 4.333 | 7.11     | 7.417     | 5.08  | 10.50 | 2.03  |
| 1.333 | 2.03  | 4.417 | 7.11     | 7.500     | 5.08  | 10.58 | 1.02  |
| 1.417 | 2.03  | 4.500 | 7.11     | 7.583     | 5.08  | 10.67 | 1.02  |
| 1.500 | 2.03  | 4.583 | 6.10     | 7.667     | 5.08  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 6.10     | 7.750     | 5.08  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 6.10     | 7.833     | 6.10  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 6.10     | 7.917     | 6.10  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 6.10     | 8.000     | 6.10  | 11.08 | 2.03  |
| 1.917 | 1.02  | 5.000 | 6.10     | 8.083     | 5.08  | 11.17 | 2.03  |
| 2.000 | 1.02  | 5.083 | 6.10     | 8.167     | 5.08  | 11.25 | 2.03  |
| 2.083 | 2.03  | 5.167 | 6.10     | 8.250     | 5.08  | 11.33 | 2.03  |
| 2.167 | 2.03  | 5.250 | 6.10     | 8.333     | 4.06  | 11.42 | 2.03  |
| 2.250 | 2.03  | 5.333 | 11.18    | 8.417     | 4.06  | 11.50 | 2.03  |
| 2.333 | 4.06  | 5.417 | 11.18    | 8.500     | 4.06  | 11.58 | 1.02  |
|       |       |       |          |           |       |       |       |

## York Region Langstaff Road EA

# Proposed Conditions Hydrologic Summary



## Summary of Proposed Conditions Hydrologic Modelling Parameters

## 16M-01457-01 Langstaff Rd EA

| Sub-<br>Catchment | IUH      | Drainage<br>Area |        | Imper | viousne<br>(%) | ess |       | SCS<br>Curve |      | straction<br>nm) |      | ning's<br>n' | Time to<br>Peak | Number Flow Length (m) |    |            | Slope<br>(%) |            |               |
|-------------------|----------|------------------|--------|-------|----------------|-----|-------|--------------|------|------------------|------|--------------|-----------------|------------------------|----|------------|--------------|------------|---------------|
| ID                | Class    | (ha)             | Direct | +     | Indirect       | =   | Total | Number       | h    | Impervious       |      | Impervious   | (hours)         |                        |    | Impervious |              | Impervious | CN<br>AMC III |
| 105               | Standard | 1.63             | 69     | +     | 0              | =   | 69    | 86           | 5.0  | 2.0              | 0.25 | 0.013        | n/a             | n/a                    | 25 | 650        | 2.0          | 1.0        |               |
| 110               | Standard | 1.58             | 70     | +     | 0              | =   | 70    | 85           | 5.0  | 2.0              | 0.25 | 0.013        | n/a             | n/a                    | 25 | 650        | 2.0          | 1.0        |               |
| 115               | Standard | 1.00             | 63     | +     | 0              | =   | 63    | 83           | 5.0  | 2.0              | 0.25 | 0.013        | n/a             | n/a                    | 17 | 475        | 2.0          | 1.0        |               |
| 120               | Standard | 1.24             | 73     | +     | 0              | =   | 73    | 83           | 5.0  | 2.0              | 0.25 | 0.013        | n/a             | n/a                    | 17 | 475        | 2.0          | 1.0        |               |
| 125               | Standard | 2.27             | 77     | +     | 0              | =   | 77    | 83           | 5.0  | 2.0              | 0.25 | 0.013        | n/a             | n/a                    | 20 | 800        | 2.0          | 1.0        |               |
| 130               | Standard | 2.08             | 82     | +     | 0              | =   | 82    | 83           | 5.0  | 2.0              | 0.25 | 0.013        | n/a             | n/a                    | 20 | 800        | 2.0          | 1.0        |               |
| 135               | Standard | 1.43             | 99     | +     | 0              | =   | 99    | 84           | 5.0  | 2.0              | 0.25 | 0.013        | n/a             | n/a                    | 30 | 503        | 2.0          | 1.0        |               |
| 140               | Standard | 1.27             | 91     | +     | 0              | =   | 91    | 83           | 5.0  | 2.0              | 0.25 | 0.013        | n/a             | n/a                    | 25 | 503        | 2.0          | 1.0        |               |
| 145               | Standard | 3.05             | 76     | +     | 0              | =   | 76    | 86           | 5.0  | 2.0              | 0.25 | 0.013        | n/a             | n/a                    | 40 | 531        | 2.0          | 1.0        |               |
| 150               | Standard | 3.81             | 95     | +     | 0              | =   | 95    | 88           | 5.0  | 2.0              | 0.25 | 0.013        | n/a             | n/a                    | 40 | 150        | 2.0          | 1.0        |               |
| 155               | Standard | 0.56             | 93     | +     | 0              | =   | 93    | 87           | 5.0  | 2.0              | 0.29 | 0.013        | n/a             | n/a                    | 25 | 260        | 2.0          | 1.0        |               |
| 160               | Standard | 0.43             | 95     | +     | 0              | =   | 95    | 89           | 5.0  | 2.0              | 0.25 | 0.013        | n/a             | n/a                    | 20 | 260        | 2.0          | 1.0        |               |
| 165               | Standard | 0.60             | 72     | +     | 0              | =   | 72    | 83           | 5.0  | 2.0              | 0.25 | 0.013        | n/a             | n/a                    | 20 | 250        | 2.0          | 1.0        |               |
| 170               | Standard | 0.43             | 98     | +     | 0              | =   | 98    | 89           | 5.0  | 2.0              | 0.25 | 0.013        | n/a             | n/a                    | 20 | 250        | 2.0          | 1.0        |               |
| 180               | Standard | 0.65             | 52     | +     | 0              | =   | 52    | 83           | 5.0  | 2.0              | 0.25 | 0.013        | n/a             | n/a                    | 40 | 66         | 2.0          | 1.0        |               |
| 185               | Standard | 0.47             | 72     | +     | 0              | =   | 72    | 79           | 5.0  | 2.0              | 0.35 | 0.013        | n/a             | n/a                    | 20 | 240        | 2.0          | 1.0        |               |
| 190               | Standard | 0.86             | 57     | +     | 0              | =   | 57    | 83           | 5.0  | 2.0              | 0.25 | 0.013        | n/a             | n/a                    | 50 | 340        | 2.0          | 1.0        |               |
| 195               | Standard | 0.79             | 75     | +     | 0              | =   | 75    | 83           | 5.0  | 2.0              | 0.25 | 0.013        | n/a             | n/a                    | 20 | 340        | 2.0          | 1.0        |               |
| 205               | Standard | 1.11             | 77     | +     | 0              | =   | 77    | 83           | 5.0  | 2.0              | 0.25 | 0.013        | n/a             | n/a                    | 20 | 470        | 2.0          | 1.0        |               |
| 210               | Standard | 0.96             | 78     | +     | 0              | =   | 78    | 83           | 5.0  | 2.0              | 0.25 | 0.013        | n/a             | n/a                    | 20 | 470        | 2.0          | 1.0        |               |
| 215               | Standard | 0.58             | 81     | +     | 0              | =   | 81    | 83           | 5.0  | 2.0              | 0.25 | 0.013        | n/a             | n/a                    | 30 | 260        | 2.0          | 1.0        |               |
| 220               | Standard | 0.65             | 66     | +     | 0              | =   | 66    | 83           | 5.0  | 2.0              | 0.25 | 0.013        | n/a             | n/a                    | 20 | 260        | 2.0          | 1.0        |               |
| 225               | Standard | 0.90             | 53     | +     | 0              | =   | 53    | 83           | 5.0  | 2.0              | 0.25 | 0.013        | n/a             | n/a                    | 25 | 320        | 2.0          | 1.0        |               |
| 230               | Standard | 0.70             | 66     | +     | 0              | =   | 66    | 81           | 5.0  | 2.0              | 0.30 | 0.013        | n/a             | n/a                    | 25 | 320        | 2.0          | 1.0        |               |
| 235               | Standard | 0.66             | 67     | +     | 0              | =   | 67    | 83           | 5.0  | 2.0              | 0.25 | 0.013        | n/a             | n/a                    | 20 | 320        | 2.0          | 1.0        |               |
| 240               | Standard | 0.72             | 67     | +     | 0              | =   | 67    | 83           | 5.0  | 2.0              | 0.25 | 0.013        | n/a             | n/a                    | 20 | 320        | 2.0          | 1.0        |               |
| 350               | Standard | 0.90             | 70     | +     | 0              | =   | 70    | 79           | 5.0  | 2.0              | 0.25 | 0.013        | n/a             | n/a                    | 40 | 77         | 2.0          | 1.0        |               |
|                   |          |                  |        |       |                |     |       |              |      |                  |      |              |                 |                        |    |            |              |            |               |
| Total/Ave         |          | 41.33            | 78     | +     | 0              | =   | 78    | 83           | 5.00 |                  |      |              |                 |                        |    |            |              |            |               |

# Humber River Watershed Visual OTTHYMO Summary - Proposed

## LangstaffRd\_EA\_Proposed\_HumberWatershed

| * | * | s | Ι | М | U | L | Α | т | Ι | 0 | N | : | R | u | n | 0 | 2 |  |  |  |  |  | * | * |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--|--|--|--|--|---|---|--|
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |  |  |  |  |   |   |  |

| READ STORM       | Filenar       | ata\          | Local\Te       | .zhao∖App<br>mp∖<br>e-43ba-b1 |                | a28109d\       | f5bec23e      |
|------------------|---------------|---------------|----------------|-------------------------------|----------------|----------------|---------------|
| Ptotal= 42.00 mm | Commen        | ts: 2Y12      |                |                               |                |                |               |
| TIME<br>hrs      | RAIN          | TIME<br>  hrs | RAIN           | ' TIME                        | RAIN<br>mm/hr  | TIME           | RAIN          |
| 0.25             | mm/hr<br>0.00 | 3.50          | mm/hr<br>7.14  | 6.75                          | 2.94           | 10.00          | mm/hr<br>0.42 |
| 0.50<br>0.75     | 0.42<br>0.42  | 3.75<br>4.00  | 7.14<br>7.14   | 7.00                          | 2.94           | 10.25<br>10.50 | 0.42          |
| 1.00<br>1.25     | 0.42          | 4.25          | 7.14<br>19.32  | 7.50<br>7.75                  | 1.68           | 10.75<br>11.00 | 0.42<br>0.42  |
| 1.50             | 0.42          | 4.75          | 19.32          | 8.00                          | 1.68           | 11.25          | 0.42          |
| 1.75<br>2.00     | 0.42<br>0.42  | 5.00          | 19.32<br>19.32 | 8.25<br>8.50                  | 1.68  <br>0.84 | 11.50<br>11.75 | 0.42<br>0.42  |
| 2.25<br>2.50     | 0.42<br>2.52  | 5.50<br>5.75  | 5.46<br>5.46   | 8.75<br>9.00                  | 0.84  <br>0.84 | 12.00<br>12.25 | 0.42<br>0.42  |
| 2.75             | 2.52          | 6.00          | 5.46           | 9.25                          | 0.84           | 12.23          | 0.42          |
| 3.00<br>3.25     | 2.52<br>2.52  | 6.25          | 5.46<br>2.94   | 9.50<br>9.75                  | 0.42  <br>0.42 |                |               |

| CALIB  <br>  STANDHYD ( 0105) <br> ID= 1 DT= 5.0 min | Area<br>Total | (ha)=<br>Imp(%)= | 1.63<br>69.00 | Dir. Conn.(%)= | 69.00 |
|--|---------------|------------------|---------------|----------------|-------|
|  |               | IMPERVI          | ous           | PERVIOUS (i)   |       |
| Surface Area   | (ha)=         | 1.1              | 2             | 0.51           |       |
| Dep. Storage   | (mm)=         | 2.0              | 0             | 5.00           |       |
| Average Slope  | (%)=          | 1.0              | 0             | 2.00           |       |
| Length   | (m)=          | 650.0            | 0             | 25.00          |       |
| Mannings n   | =             | 0.01             | 3             | 0.250          |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TRA   | ANSFORME | HYETOGRA | APH   |      |       |
|-------|-------|-------|----------|----------|-------|------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME   | RAIN  | TIME | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs    | mm/hr | hrs  | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.52     | 6.250    | 5.46  | 9.33 | 0.42  |
| 0.167 | 0.00  | 3.250 | 2.52     | 6.333    | 2.94  | 9.42 | 0.42  |
| 0.250 | 0.00  | 3.333 | 7.14     | 6.417    | 2.94  | 9.50 | 0.42  |
| 0.333 | 0.42  | 3.417 | 7.14     | 6.500    | 2.94  | 9.58 | 0.42  |
| 0.417 | 0.42  | 3.500 | 7.14     | 6.583    | 2.94  | 9.67 | 0.42  |
| 0.500 | 0.42  | 3.583 | 7.14     | 6.667    | 2.94  | 9.75 | 0.42  |
| 0.583 | 0.42  | 3.667 | 7.14     | 6.750    | 2.94  | 9.83 | 0.42  |

Page 1

| LangstaffRd | EA | Proposed | _HumberWatershed |
|-------------|----|----------|------------------|

| Langstattkd_EA_Proposed_Humberwatersned |  |  |  |   |  |  |  |  |  |  |
|---|--|--|--|---|--|--|--|--|--|--|
|   |  |  |  |   |  |  |  |  |  |  |
| OUTFLOW                                 | STORAG   | 3E   | OUTFLOW  | STORAGE   |  |  |  |  |  |  |
| (cms)                                   | (ha.m.   | .)   | (cms)  | (ha.m.)   |  |  |  |  |  |  |
| 0.0000                                  | 0.000  | 90   | 0.0181   | 0.0161  |  |  |  |  |  |  |
| 0.0081                                  | 0.003  | 31   | 0.0584   | 0.0204  |  |  |  |  |  |  |
| 0.0123                                  | 0.007  | 74   | 0.0920   | 0.0259  |  |  |  |  |  |  |
| 0.0155                                  | 0.01   | 18   | 0.0000   | 0.0000  |  |  |  |  |  |  |
|   |  |  |  |   |  |  |  |  |  |  |
| ,                                       | AREA (   | QPEAK  | TPEAK  | R.V.  |  |  |  |  |  |  |
|   | (ha) (   | (cms)  | (hrs)  | (mm)  |  |  |  |  |  |  |
| 0105)                                   | 1.630  | 0.069  | 5.25   | 33.01   |  |  |  |  |  |  |
| 0520)                                   | 1.630  | 0.050  | 5.50   | 32.95   |  |  |  |  |  |  |
|   | OUTFLOW<br>(cms)<br>0.0000<br>0.0081<br>0.0123<br>0.0155 | OUTFLOW STORAI<br>(cms) (ha.m<br>0.0000 0.000<br>0.0081 0.000<br>0.0123 0.000<br>0.0155 0.01:<br>AREA (ha) | OUTFLOW STORAGE   (cms) (ha.m.)   0.0000 0.0000   0.0000   0.0001   0.0031   0.0123 0.0074   0.0155 0.0118   AREA QPEAK (ha) (cms)   0.005) 1.630 0.0609 | OUTFLOW STORAGE   OUTFLOW (cms) (ha.m.)   (cms) (0.0000 0.0000 0.0181 0.0051 0.0181 0.0051 0.0181 0.0051 0.0181 0.0051 0.0181 0.0000 0.0181 0.0000 0.0181 0.0000 0.0181 0.0000 0.0181 0.0000 0.0181 0.0000 0.0181 0.00000 0.000000 |  |  |  |  |  |  |

PEAK FLOW REDUCTION [Qout/Qin](%)= 72.39 TIME SHIFT OF PEAK FLOW (min)= 15.00 MAXIMUM STORAGE USED (ha.m.)= 0.0195

| CALIB             |       |         |       |                |       |
|-------------------|-------|---------|-------|----------------|-------|
| STANDHYD ( 0130)  | Area  | (ha)=   | 2.08  |                |       |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 82.00 | Dir. Conn.(%)= | 82.00 |
|                   |       |         |       |                |       |
|                   |       | IMPERVI | ous   | PERVIOUS (i)   |       |
| Surface Area      | (ha)= | 1.7     | 1     | 0.37           |       |
| Dep. Storage      | (mm)= | 2.0     | 0     | 5.00           |       |
| Average Slope     | (%)=  | 1.0     | 0     | 2.00           |       |
| Length            | (m)=  | 800.0   | 0     | 20.00          |       |
| Mannings n        | =     | 0.01    | 3     | 0.250          |       |
|                   |       |         |       |                |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORMFI | HYETOGR | ΔPH   |       |       |
|-------|-------|-------|-----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN      | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr     | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.52      | 6.250   | 5.46  | 9.33  | 0.42  |
| 0.167 | 0.00  | 3.250 | 2.52      | 6.333   | 2.94  | 9.42  | 0.42  |
| 0.250 | 0.00  | 3.333 | 7.14      | 6.417   | 2.94  | 9.50  | 0.42  |
| 0.333 | 0.42  | 3.417 | 7.14      | 6.500   | 2.94  | 9.58  | 0.42  |
| 0.417 | 0.42  | 3.500 | 7.14      | 6.583   | 2.94  | 9.67  | 0.42  |
| 0.500 | 0.42  | 3.583 | 7.14      | 6.667   | 2.94  | 9.75  | 0.42  |
| 0.583 | 0.42  | 3.667 | 7.14      | 6.750   | 2.94  | 9.83  | 0.42  |
| 0.667 | 0.42  | 3.750 | 7.14      | 6.833   | 2.94  | 9.92  | 0.42  |
| 0.750 | 0.42  | 3.833 | 7.14      | 6.917   | 2.94  | 10.00 | 0.42  |
| 0.833 | 0.42  | 3.917 | 7.14      | 7.000   | 2.94  | 10.08 | 0.42  |
| 0.917 | 0.42  | 4.000 | 7.14      | 7.083   | 2.94  | 10.17 | 0.42  |
| 1.000 | 0.42  | 4.083 | 7.14      | 7.167   | 2.94  | 10.25 | 0.42  |
| 1.083 | 0.42  | 4.167 | 7.14      | 7.250   | 2.94  | 10.33 | 0.42  |
| 1.167 | 0.42  | 4.250 | 7.14      | 7.333   | 1.68  | 10.42 | 0.42  |
| 1.250 | 0.42  | 4.333 | 19.32     | 7.417   | 1.68  | 10.50 | 0.42  |
| 1.333 | 0.42  | 4.417 | 19.32     | 7.500   | 1.68  | 10.58 | 0.42  |
| 1.417 | 0.42  | 4.500 | 19.32     | 7.583   | 1.68  | 10.67 | 0.42  |
|       |       |       | Page      | 3       |       |       |       |

|                      | Langs | taffRd_E | A_Propo | sed_HumberW | latersh | ed        |    |
|----------------------|-------|----------|---------|-------------|---------|-----------|----|
| 0.667                | 0.42  | 3.750    | 7.14    | 6.833       | 2.94    | 9.92      | 0. |
| 0.750                | 0.42  | 3.833    | 7.14    | 6.917       | 2.94    | 10.00     | 0. |
| 0.833                | 0.42  | 3.917    | 7.14    | 7.000       | 2.94    | 10.08     | 0. |
| 0.917                |       | 4.000    | 7.14    |             | 2.94    |           | 0. |
| 1.000                |       | 4.083    | 7.14    |             | 2.94    |           | 0. |
| 1.083                |       | 4.167    | 7.14    |             | 2.94    |           | 0. |
| 1.167                |       | 4.250    | 7.14    |             | 1.68    |           | 0. |
| 1.250                |       | 4.333    | 19.32   |             | 1.68    |           | 0. |
| 1.333                |       | 4.417    | 19.32   |             | 1.68    |           | 0. |
| 1.417                |       | 4.500    | 19.32   |             | 1.68    |           | 0. |
| 1.500                |       | 4.583    | 19.32   |             | 1.68    |           | 0. |
| 1.583                |       | 4.667    | 19.32   |             | 1.68    |           | 0. |
| 1.667                |       | 4.750    | 19.32   |             | 1.68    |           | 0. |
| 1.750                |       | 4.833    | 19.32   |             |         | 11.00     | 0. |
| 1.833                |       | 4.917    | 19.32   |             | 1.68    |           | 0. |
| 1.917                |       | 5.000    | 19.32   |             |         | 11.17     | 0. |
| 2.000                |       | 5.083    | 19.32   |             | 1.68    |           | 0. |
| 2.083                |       | 5.167    | 19.32   |             | 1.68    |           | 0. |
| 2.167                |       | 5.250    | 19.32   |             | 0.84    |           | 0. |
| 2.250                |       | 5.333    | 5.46    |             | 0.84    |           | 0. |
| 2.333                |       | 5.417    | 5.46    |             | 0.84    |           | 0. |
| 2.417                | 2.52  |          | 5.46    |             | 0.84    |           | 0. |
| 2.500                |       | 5.583    |         | 8.667       | 0.84    |           | 0. |
| 2.583                |       | 5.667    | 5.46    |             | 0.84    |           | 0. |
| 2.667                |       | 5.750    |         | 8.833       | 0.84    |           | 0. |
| 2.750                |       | 5.833    | 5.46    |             | 0.84    |           | 0. |
| 2.833                | 2.52  |          | 5.46    |             | 0.84    |           | 0. |
| 2.917                |       | 6.000    |         | 9.083       |         | 12.17     | 0. |
| 3.000                |       | 6.083    | 5.46    |             | 0.84    |           | 0. |
| 3.083                |       | 6.167    | 5.46    |             | 0.84    |           | 0. |
| Max.Eff.Inten.(mm/h  | n)-   | 19.32    |         | 11.18       |         |           |    |
| over (mi             |       | 15.00    |         | 30.00       |         |           |    |
|                      | n)=   | 15.16    | (11)    | 27.95 (ii)  |         |           |    |
| Unit Hyd. Tpeak (mi  |       | 15.00    | (11)    | 30.00       |         |           |    |
|                      | s)=   | 0.07     |         | 0.04        |         |           |    |
| onic nyu. peak (ciii | 3)-   | 0.07     |         | 0.04        | *T0     | TALS*     |    |
|                      | s)=   | 0.06     |         | 0.01        | 0       | .069 (iii | )  |
| TIME TO PEAK (hr     | s)=   | 5.25     |         | 5.50        |         | 5.25      |    |
| RUNOFF VOLUME (m     | m)=   | 40.00    |         | 17.47       | 3       | 3.01      |    |
|                      | m)=   | 42.00    |         | 42.00       | 4       | 2.00      |    |
| TOTAL RAINFALL (m    |       |          |         |             |         |           |    |

(1) CN PROJECUME SELECTED FOR PERVIOUS LOSSES:

CN\* = 86.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| RESERVOIR( 0520)| OVERFLOW IS OFF

Page 2

|                  |         |       |       | sed_HumberW |      |            |      |
|------------------|---------|-------|-------|-------------|------|------------|------|
| 1.500            |         |       | 19.32 |             | 1.68 |            | 0.42 |
| 1.58             |         | 4.667 | 19.32 | 7.750       | 1.68 | 10.83      | 0.42 |
| 1.66             |         |       | 19.32 |             | 1.68 |            | 0.42 |
| 1.75             |         | 4.833 | 19.32 |             | 1.68 |            | 0.42 |
| 1.83             |         |       | 19.32 |             | 1.68 |            | 0.42 |
| 1.91             |         |       | 19.32 |             | 1.68 |            | 0.42 |
| 2.000            |         | 5.083 | 19.32 |             | 1.68 |            | 0.42 |
| 2.083            |         | 5.167 | 19.32 | 8.250       | 1.68 | 11.33      | 0.42 |
| 2.16             |         |       | 19.32 | 8.333       | 0.84 | 11.42      | 0.42 |
| 2.256            |         |       | 5.46  | 8.417       | 0.84 |            | 0.42 |
| 2.33             |         |       | 5.46  |             | 0.84 |            | 0.42 |
| 2.41             | 7 2.52  | 5.500 | 5.46  | 8.583       | 0.84 | 11.67      | 0.42 |
| 2.500            | 2.52    | 5.583 | 5.46  | 8.667       | 0.84 | 11.75      | 0.42 |
| 2.583            | 3 2.52  | 5.667 | 5.46  | 8.750       | 0.84 | 11.83      | 0.42 |
| 2.66             | 7 2.52  | 5.750 | 5.46  | 8.833       | 0.84 | 11.92      | 0.42 |
| 2.75             | 2.52    | 5.833 | 5.46  | 8.917       | 0.84 | 12.00      | 0.42 |
| 2.83             | 3 2.52  | 5.917 | 5.46  | 9.000       | 0.84 | 12.08      | 0.42 |
| 2.91             | 7 2.52  | 6.000 | 5.46  | 9.083       | 0.84 | 12.17      | 0.42 |
| 3.000            | 2.52    | 6.083 | 5.46  | 9.167       | 0.84 | 12.25      | 0.42 |
| 3.083            | 3 2.52  | 6.167 | 5.46  | 9.250       | 0.84 | ĺ          |      |
|                  |         |       |       |             |      |            |      |
| Max.Eff.Inten.(r | nm/hr)= | 19.32 |       | 10.08       |      |            |      |
| over             | (min)   | 15.00 |       | 25.00       |      |            |      |
| Storage Coeff.   | (min)=  | 17.17 | (ii)  | 22.07 (ii)  |      |            |      |
| Unit Hyd. Tpeak  | (min)=  | 15.00 |       | 25.00       |      |            |      |
| Unit Hyd. peak   | (cms)=  | 0.07  |       | 0.05        |      |            |      |
|                  |         |       |       |             | *T0  | TALS*      |      |
| PEAK FLOW        | (cms)=  | 0.09  |       | 0.01        | 0    | .096 (iii) |      |
| TIME TO DEAK     | (hnc)-  | E 2E  |       | E 42        |      | - 25 ` ′   |      |

| over             | (min)  | 15.00      | 25.00      |             |
|------------------|--------|------------|------------|-------------|
| Storage Coeff.   | (min)= | 17.17 (ii) | 22.07 (ii) |             |
| Unit Hyd. Tpeak  | (min)= | 15.00      | 25.00      |             |
| Unit Hyd. peak   | (cms)= | 0.07       | 0.05       |             |
|                  |        |            |            | *TOTALS*    |
| PEAK FLOW        | (cms)= | 0.09       | 0.01       | 0.096 (iii) |
| TIME TO PEAK     | (hrs)= | 5.25       | 5.42       | 5.25        |
| RUNOFF VOLUME    | (mm)=  | 40.00      | 15.38      | 35.56       |
| TOTAL RAINFALL   | (mm)=  | 42.00      | 42.00      | 42.00       |
| RUNOFF COEFFICIE | ENT =  | 0.95       | 0.37       | 0.85        |
|                  |        |            |            |             |

|       |           |       |            |             | . , |
|-------|-----------|-------|------------|-------------|-----|
|       |           |       | IMPERVIOUS | PERVIOUS (i | )   |
| Surfa | ace Area  | (ha)= | 1.75       | 0.52        |     |
| Dep.  | Storage   | (mm)= | 2.00       | 5.00        |     |
| Avera | age Slope | (%)=  | 1.00       | 2.00        |     |
| Lengt | th        | (m)=  | 800.00     | 20.00       |     |
| Manni | ings n    | =     | 0.013      | 0.250       |     |
|       |           |       |            |             |     |

## LangstaffRd\_EA\_Proposed\_HumberWatershed NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|                         |        | TR/   | ANSFORME | D HYETOGRA | PH    | -          |       |
|-------------------------|--------|-------|----------|------------|-------|------------|-------|
| TIME                    | RAIN   | TIME  | RAIN     | ' TIME     | RAIN  | TIME       | RAIN  |
| hrs                     | mm/hr  | hrs   | mm/hr    | ' hrs      | mm/hr | hrs        | mm/hr |
| 0.083                   | 0.00   | 3.167 | 2.52     | 6.250      | 5.46  | 9.33       | 0.42  |
| 0.167                   | 7 0.00 | 3.250 | 2.52     | 6.333      | 2.94  | 9.42       | 0.42  |
| 0.256                   | 0.00   | 3.333 | 7.14     | 6.417      | 2.94  | 9.50       | 0.42  |
| 0.333                   | 0.42   | 3.417 | 7.14     | 6.500      | 2.94  | 9.58       | 0.42  |
| 0.417                   |        | 3.500 | 7.14     | 6.583      | 2.94  | 9.67       | 0.42  |
| 0.506                   | 0.42   | 3.583 | 7.14     | 6.667      | 2.94  | 9.75       | 0.42  |
| 0.583                   | 0.42   | 3.667 | 7.14     | 6.750      | 2.94  | 9.83       | 0.42  |
| 0.667                   | 0.42   | 3.750 | 7.14     | 6.833      | 2.94  | 9.92       | 0.42  |
| 0.756                   | 0.42   | 3.833 | 7.14     | 6.917      | 2.94  | 10.00      | 0.42  |
| 0.833                   | 0.42   | 3.917 | 7.14     | 7.000      | 2.94  | 10.08      | 0.42  |
| 0.917                   | 0.42   | 4.000 | 7.14     | 7.083      | 2.94  | 10.17      | 0.42  |
| 1.000                   | 0.42   | 4.083 | 7.14     | 7.167      | 2.94  | 10.25      | 0.42  |
| 1.083                   | 0.42   | 4.167 | 7.14     | 7.250      | 2.94  | 10.33      | 0.42  |
| 1.167                   | 0.42   | 4.250 | 7.14     | 7.333      | 1.68  | 10.42      | 0.42  |
| 1.256                   | 0.42   | 4.333 | 19.32    | 7.417      | 1.68  | 10.50      | 0.42  |
| 1.333                   | 0.42   | 4.417 | 19.32    | 7.500      | 1.68  | 10.58      | 0.42  |
| 1.417                   | 0.42   | 4.500 | 19.32    | 7.583      | 1.68  | 10.67      | 0.42  |
| 1.506                   | 0.42   | 4.583 | 19.32    | 7.667      | 1.68  | 10.75      | 0.42  |
| 1.583                   |        | 4.667 | 19.32    | 7.750      | 1.68  | 10.83      | 0.42  |
| 1.583<br>1.667<br>1.756 | 0.42   | 4.750 | 19.32    | 7.833      | 1.68  | 10.92      | 0.42  |
| 1.756                   | 0.42   | 4.833 | 19.32    | 7.917      | 1.68  | 11.00      | 0.42  |
| 1.83                    | 0.42   | 4.917 | 19.32    | 8.000      | 1.68  | 11.08      | 0.42  |
| 1.917                   | 0.42   | 5.000 | 19.32    | 8.083      | 1.68  | 11.17      | 0.42  |
| 2.000                   |        | 5.083 |          | 8.167      | 1.68  | 11.25      | 0.42  |
| 2.083                   | 0.42   | 5.167 | 19.32    | 8.250      | 1.68  | 11.33      | 0.42  |
| 2.167                   |        |       | 19.32    | 8.333      | 0.84  | 11.42      | 0.42  |
| 2.256                   | 0.42   | 5.333 | 5.46     | 8.417      | 0.84  | 11.50      | 0.42  |
| 2.333                   | 3 2.52 | 5.417 | 5.46     | 8.500      | 0.84  | 11.58      | 0.42  |
| 2.417                   |        | 5.500 |          | 8.583      | 0.84  |            | 0.42  |
| 2.500                   |        | 5.583 |          | 8.667      | 0.84  |            | 0.42  |
| 2.583                   |        | 5.667 | 5.46     | 8.750      | 0.84  |            | 0.42  |
| 2.667                   |        | 5.750 | 5.46     | 8.833      |       | 11.92      | 0.42  |
| 2.756                   | 2.52   | 5.833 |          | 8.917      |       |            | 0.42  |
| 2.833                   | 3 2.52 | 5.917 | 5.46     | 9.000      | 0.84  | 12.08      | 0.42  |
| 2.917                   | 7 2.52 | 6.000 | 5.46     |            |       | 12.17      | 0.42  |
| 3.000                   |        | 6.083 | 5.46     | 9.167      | 0.84  |            | 0.42  |
| 3.083                   | 3 2.52 | 6.167 | 5.46     | 9.250      | 0.84  |            |       |
|                         |        |       |          |            |       |            |       |
| .Eff.Inten.(r           |        | 19.32 |          | 9.87       |       |            |       |
|                         | (min)  | 15.00 |          | 30.00      |       |            |       |
| rage Coeff.             | (min)= | 17.17 | (ii)     | 28.93 (ii) |       |            |       |
| t Hyd. Tpeak            |        | 15.00 |          | 30.00      |       |            |       |
| t Hyd. peak             | (cms)= | 0.07  |          | 0.04       |       |            |       |
| V 51011                 | (      | 0.00  |          | 0.01       |       | TALS*      |       |
| K FLOW                  | (cms)= | 0.09  |          | 0.01       |       | .100 (iii) |       |
| E TO PEAK               | (hrs)= | 5.25  |          | 5.50       |       | 5.25       |       |
| OFF VOLUME              | (mm)=  | 40.00 |          | 15.38      | 34    | 1.33       |       |
|                         |        |       | Page     | - 5        |       |            |       |
|                         |        |       | 1 46     |            |       |            |       |

 ${\tt LangstaffRd\_EA\_Proposed\_HumberWatershed}$ Mannings n

Unit

Unit

over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=

(cms)=

PEAK FLOW

0.08

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|                    |       |                             |       | D HYETOGRA |      |       |      |
|--------------------|-------|-----------------------------|-------|------------|------|-------|------|
| TIME               | RAIN  | :                           | RAIN  |            | RAIN |       |      |
| hrs                | mm/hr | hrs                         | mm/hr |            |      | hrs   |      |
| 0.083              | 0.00  | hrs<br>  3.167<br>  3.250   | 2.52  | 6.250      | 5.46 |       | 0.42 |
| 0.167              | 0.00  | 3.250                       | 2.52  | 6.333      | 2.94 |       | 0.42 |
| 0.250              | 0.00  | 3.333                       | 7.14  | 6.417      | 2.94 |       | 0.42 |
| 0.333              | 0.42  | 3.41/                       | 7.14  | 6.500      | 2.94 |       | 0.42 |
| 0.417              |       | 3.500                       |       | 6.583      |      |       |      |
| 0.500              | 0.42  | 3.583                       | 7.14  | 6.667      | 2.94 |       | 0.42 |
| 0.583              |       | 3.667                       | 7.14  | 6.750      | 2.94 |       | 0.42 |
| 0.667              | 0.42  | 3.750                       | 7.14  | 6.833      | 2.94 |       | 0.42 |
| 0.750              | 0.42  | 3.750                       | 7.14  | 6.917      |      | 10.00 | 0.42 |
| 0.833              | 0.42  | 3.917                       | 7.14  | 7.000      | 2.94 | 10.08 | 0.42 |
| 0.917              | 0.42  | 4.000                       | 7.14  | 7.083      | 2.94 | 10.17 | 0.42 |
| 1.000              | 0.42  | 4.083                       | 7.14  | 7.167      | 2.94 | 10.25 | 0.42 |
| 1.083              | 0.42  | 4.083<br>  4.167<br>  4.250 | 7.14  | 7.250      | 2.94 | 10.33 | 0.42 |
| 1.167              | 0.42  | 4.250                       | 7.14  | 7.333      | 1.68 | 10.42 | 0.42 |
| 1.250              | 0.42  | 4.333                       | 19.32 | 7.417      | 1.68 | 10.50 | 0.42 |
| 1.333              | 0.42  | 4.417                       | 19.32 | 7.500      | 1.68 | 10.58 | 0.42 |
| 1.417              | 0.42  | 4.500                       | 19.32 | 7.583      | 1.68 | 10.67 | 0.42 |
| 1.500              |       | 4.583                       |       | 7.667      | 1.68 | 10.75 | 0.42 |
| 1.583              | 0.42  | 4.667                       | 19.32 | 7.750      | 1.68 | 10.83 | 0.42 |
| 1.667              | 0.42  | 4.750                       | 19.32 | 7.833      | 1.68 | 10.92 | 0.42 |
| 1.750              | 0.42  | 4.833                       | 19.32 | 7.917      | 1.68 | 11.00 | 0.42 |
| 1.833              | 0.42  | 4.917                       | 19.32 | 8.000      | 1.68 | 11.08 | 0.42 |
| 1.917              | 0.42  | 5.000                       | 19.32 | 8.083      | 1.68 | 11.17 | 0.42 |
| 2.000              | 0.42  | 5.083                       | 19.32 | 8.167      | 1.68 | 11.25 | 0.42 |
| 2.083              | 0.42  | 5.167                       | 19.32 | 8.250      | 1.68 | 11.33 | 0.42 |
| 2.167              | 0.42  | 5.250                       | 19.32 | 8.250      | 0.84 | 11.42 | 0.42 |
| 2.250              | 0.42  | 5.333                       | 5.46  | 8.417      | 0.84 | 11.50 | 0.42 |
| 2.333              | 2.52  | 5.417                       | 5.46  | 8.500      | 0.84 | 11.58 | 0.42 |
| 2.417              | 2.52  | 5.500                       | 5.46  | 8.583      | 0.84 | 11.67 | 0.42 |
| 2.500              |       |                             |       | 8.667      | 0.84 | 11.75 | 0.42 |
| 2.583              | 2.52  | 5.583<br>  5.667            | 5.46  | 8.750      | 0.84 | 11.83 | 0.42 |
| 2.667              | 2.52  | 5.750                       | 5.46  | 8.833      | 0.84 | 11.92 | 0.42 |
| 2.750              | 2.52  | 5.833                       | 5.46  | 8.917      |      | 12.00 | 0.42 |
| 2.833              | 2.52  | 5.917                       | 5.46  | 9.000      | 0.84 | 12.08 | 0.42 |
| 2.917              | 2.52  | 6.000                       | 5.46  | 9.083      | 0.84 | 12.17 | 0.42 |
| 3.000              | 2.52  | 6.000                       | 5.46  | 9.167      | 0.84 | 12.25 | 0.42 |
| 3.083              | 2.52  | 6.167                       | 5.46  | 9.250      | 0.84 |       |      |
| Max.Eff.Inten.(mm/ | hr)=  | 19.32                       |       | 9.87       |      |       |      |
| over (m            |       | 15.00                       |       | 25.00      |      |       |      |
| Storage Coeff. (m  |       | 12.56                       | (ii)  | 23.22 (ii) |      |       |      |
| Unit Hyd. Tpeak (m | in)=  | 15.00                       |       | 25.00      |      |       |      |
| Unit Hyd neak (c   | mc)-  | 0 08                        |       | 0 05       |      |       |      |

\*TOTALS\* 0.05 0.01 0.055 (iii) Page 7

0.05

LangstaffRd\_EA\_Proposed\_HumberWatershed (mm)= 42.00 42.00 42.0 NT = 0.95 0.37 0.8 TOTAL RAINFALL

RUNOFF COEFFICIENT

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 83.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COFFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0405)| | 1 + 2 = 3 | QPEAK (cms) 0.100 0.096 R.V. (mm) 34.33 (ha) 2.27 (hrs) 5.25 ID1= 1 ( 0125): + ID2= 2 ( 0130): 5.25 ID = 3 ( 0405): 4.35 0.196 5.25 34.92

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR( 0505)| IN= 2---> OUT= 1 | DT= 5.0 min | OVERFLOW IS OFF OUTFLOW OUTFLOW STORAGE STORAGE (cms) 0.0000 0.0185 (ha.m.) 0.0000 0.0030 (cms) 0.2110 0.2743 (ha.m.) 0.0383 0.0515 0.0302 0.0120 0.3250 0.0792 0.0120 | 0.0251 | 0.1102 0.0000 QPEAK (cms) 0.196 0.171 AREA TPFΔK R V

| CALIB | | STANDHYD ( 0120) | |ID= 1 DT= 5.0 min | Area (ha)= 1.24 Total Imp(%)= 73.00 Dir. Conn.(%)= 73.00 IMPERVIOUS PERVIOUS (i) Surface Area Dep. Storage Average Slope Length (ha)= (mm)= (%)= (m)= 0.33 5.00 2.00 17.00

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LangstaffRd\_EA\_Proposed\_HumberWatershed
TIME TO PEAK (hrs)= 5.25 5.42 5.2
RUNOFF VOLUME (mm)= 40.00 15.38 33.3
TOTAL RAINFALL (mm)= 42.00 42.00 42 n
RUNOFF COEFFICIENT = 0.95 5.25 33.34 42.00

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 83.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COFFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB | STANDHYD ( 0115) |ID= 1 DT= 5.0 min Area (ha)= 1.00 Total Imp(%)= 63.00 Dir. Conn.(%)= 63.00 IMPERVIOUS PERVIOUS (i) 0.63 2.00 1.00 475.00 0.013 Surface Area 0.37 5.00 2.00 Dep. Storage Average Slope Length (mm)= (%)= (m)= Mannings n

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TRANSFORMED HYETOGRAPH -RAIN | mm/hr | 0.00 | 0.00 | 0.00 | PH ---RAIN | TIME
mm/hr | hrs
5.46 | 9.33
2.94 | 9.42
2.94 | 9.50
2.94 | 9.58 TIME hrs 3.167 mm/hr 0.42 0.42 0.167 3.250 0.250 3.333 0.42 0.333 0.42 3.417 9.58 9.67 0.42 0.42 | 3.590 0.42 | 3.590 0.42 | 3.583 0.42 | 3.667 0.42 | 3.750 0.42 | 3.917 0.42 | 3.917 0.42 | 4.083 0.42 | 4.083 0.42 | 4.167 0.42 | 4.593 0.42 | 4.593 0.42 | 4.593 0.42 | 4.593 0.42 | 4.593 0.42 | 4.593 0.42 | 4.593 0.42 | 4.593 0.42 | 4.593 0.42 | 4.593 0.42 | 4.593 0.42 | 4.593 0.42 | 4.593 0.42 | 4.593 0.42 | 4.593 0.42 | 4.593 0.42 | 4.593 0.42 | 4.593 0.42 | 4.917 0.417 0.42 2.94 0.42 2.94 2.94 2.94 2.94 2.94 2.94 2.94 0.500 0.583 0.667 0.750 0.42 0.42 0.42 0.42 0.42 0.833 10.08 10.17 0.917 0.42 1.000 2.94 10.25 0.42 1.083 0.42 1.083 1.167 1.250 1.333 1.417 1.500 1.583 0.42 0.42 0.42 0.42 0.42 0.42 10.42 10.50 10.58 10.67 1.68 10.75 1.68 10.83 1.667 1.68 10.92 0.42

|                  |         | +- ((n) = |       |             |      |            |      |
|------------------|---------|-----------|-------|-------------|------|------------|------|
|                  |         |           |       | sed_HumberW |      |            |      |
| 1.917            |         |           |       |             | 1.68 |            | 0.42 |
| 2.000            |         | 5.083     |       | 8.167       | 1.68 | 11.25      | 0.42 |
| 2.083            |         |           |       | 8.250       | 1.68 |            | 0.42 |
| 2.167            |         |           | 19.32 |             | 0.84 |            | 0.42 |
| 2.256            |         |           | 5.46  |             | 0.84 |            | 0.42 |
| 2.333            |         |           |       | 8.500       | 0.84 |            | 0.42 |
| 2.417            |         | 5.500     | 5.46  | 8.583       | 0.84 |            | 0.42 |
| 2.500            | 2.52    | 5.583     | 5.46  | 8.667       | 0.84 | 11.75      | 0.42 |
| 2.583            | 3 2.52  | 5.667     | 5.46  | 8.750       | 0.84 | 11.83      | 0.42 |
| 2.667            | 7 2.52  | 5.750     | 5.46  | 8.833       | 0.84 | 11.92      | 0.42 |
| 2.756            | 2.52    | 5.833     | 5.46  | 8.917       | 0.84 | 12.00      | 0.42 |
| 2.833            | 3 2.52  | 5.917     | 5.46  | 9.000       | 0.84 | 12.08      | 0.42 |
| 2.917            | 7 2.52  | 6.000     | 5.46  | 9.083       | 0.84 | 12.17      | 0.42 |
| 3.000            | 2.52    | 6.083     | 5.46  | 9.167       | 0.84 | 12.25      | 0.42 |
| 3.083            | 2.52    | 6.167     | 5.46  | 9.250       | 0.84 |            |      |
| Max.Eff.Inten.(r | nm/hr)= | 19.32     |       | 9.87        |      |            |      |
| over             | (min)   | 15.00     |       | 25.00       |      |            |      |
| Storage Coeff.   | (min)=  | 12.56     | (ii)  | 23.22 (ii)  |      |            |      |
| Unit Hyd. Tpeak  | (min)=  | 15.00     |       | 25.00       |      |            |      |
| Unit Hvd. peak   | (cms)=  | 0.08      |       | 0.05        |      |            |      |
| 7                | ,       |           |       |             | *T01 | ΓALS*      |      |
| PEAK FLOW        | (cms)=  | 0.03      |       | 0.01        | 0.   | .041 (iii) |      |
| TIME TO PEAK     | (hrs)=  | 5.25      |       | 5.42        |      | 5.25       |      |
| RUNOFF VOLUME    | (mm)=   | 40.00     |       | 15.38       | 36   | 3.88       |      |
| TOTAL RAINFALL   | (mm)=   | 42.00     |       | 42.00       | 42   | 2.00       |      |
| RUNOFF COEFFICIE | ENT =   | 0.95      |       | 0.37        |      | 3.74       |      |
|                  |         |           |       |             |      |            |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: CN\* = 83.0 Ia = Dep. Storage (Above) (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

| THAN THE STORAGE                        | COEFFI  | CIENT.       |           |       |      |
|---|---------|--------------|-----------|-------|------|
| (iii) PEAK FLOW DOES N                  | OT INCL | JDE BASEFL   | OW IF AN' | Υ.    |      |
|   |         |              |           |       |      |
|   |         |              |           |       | <br> |
|   |         |              |           |       |      |
|   |         |              |           |       |      |
| ADD HYD ( 0410)                         |         |              |           |       |      |
| 1 + 2 = 3                               | AREA    | <b>OPEAK</b> | TPEAK     | R.V.  |      |
| ii                                      | (ha)    | (cms)        | (hrs)     | (mm)  |      |
| ID1= 1 ( 0115):                         | 1.00    | 0.041        | 5.25      | 30.88 |      |
| + ID2= 2 ( 0120):                       | 1.24    | 0.055        | 5.25      | 33.34 |      |
| ======================================= | ======  |              |           |       |      |
| ID = 3 ( 0410):                         | 2.24    | 0.095        | 5.25      | 32.24 |      |
| (,                                      |         |              |           |       |      |
| NOTE: PEAK FLOWS DO N                   | OT TNCL | IDE BASEEL   | OWS TE A  | WY.   |      |
| NOTE: TEAK TEONS DO II                  |         |              |           | ···   | <br> |
|   |         |              |           |       |      |

| RESERVOIR( 0510) <br>  IN= 2> OUT= 1 | OVERFLOW         | IS OFF          |                   |                    |
|--------------------------------------|------------------|-----------------|-------------------|--------------------|
| DT= 5.0 min                          | OUTFLOW<br>(cms) | STORAGE (ha.m.) | <br>OUTFLOW (cms) | STORAGE<br>(ha.m.) |

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0.750 0.833 0.917 10.00 10.08 10.17 0.42 0.42 0.42 0.42 1.000 10.25 10.33 10.42 10.50 10.58 10.67 10.75 1.083 0.42 1 167 0 42 1.167 1.250 1.333 1.417 1.500 1.583 0.42 0.42 0.42 0.42 0.42 0.42 1.667 10.92 11.08 11.17 11.25 11.33 11.42 1.750 0.42 0.42 0.42 0.42 0.42 0.42 1.833 1.917 2.000 2.083 2.167 11.50 2.250 2.333 11.58 0.42 2.333 2.417 2.500 2.583 2.667 2.750 2.833 11.58 11.67 11.75 11.83 11.92 12.00 12.08 0.42 0.42 0.42 0.42 0.42 0.42 2.917 12.17 0.42 12.25 0.42 3.083 Max.Eff.Inten.(mm/hr)= over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)= 19.32 15.00 15.16 (ii) 15.00 10.72 30.00 28.16 (ii) 30.00 0.07 0.04 \*TOTALS\* PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 0.06 5.25 40.00 42.00 0.95 0.01 0.067 (iii) 5.25 33.01 42.00 5.50 16.73 42.00 (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

- (1) CN\* = 85.0 Ia = Dep. Storage (Above)
  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
  THAN THE STORAGE COEFFICIENT.
  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| RESERVOIR( 0525)| | IN= 2---> OUT= 1 | OVERFLOW IS OFF

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LangstaffRd\_EA\_Proposed\_HumberWatershed 0.0000 0.0000 0.0699 0.0792 0.0309 0.0414 0.0264 0.0457 0.0099 0.0876 (ha) 2.240 (cms) 0.095 (hrs) INFLOW : ID= 2 ( 0410) OUTFLOW: ID= 1 ( 0510) 5.25 5.58 2.240 0.056 32.24 PEAK FLOW REDUCTION [Qout/Qin](%)= 58.59 TIME SHIFT OF PEAK FLOW (min)= 20.00 MAXIMUM STORAGE USED (ha.m.)= 0.0179ADD HYD ( 0420)| 1 + 2 = 3 | QPEAK (cms) 0.171 0.056 TPEAK (hrs) 5.42 5.58 R.V. (mm) 34.91 32.24 ARFA (ha) 4.35 2.24 ID = 3 ( 0420): 6.59 0.226 34.00 5.42 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY. | CALIB | | STANDHYD ( 0110) | |ID= 1 DT= 5.0 min | Area (ha)= 1.58 Total Imp(%)= 70.00 Dir. Conn.(%)= 70.00 PERVIOUS (i) IMPERVIOUS Surface Area Dep. Storage Average Slope Length Mannings n (ha)= (mm)= (%)= (m)= 1.11 2.00 1.00 650.00 0.013 0.47 5.00 2.00 25.00 0.250 NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP. TRANSFORMED HYETOGRAPH NSFORMED HYETOGR RAIN | TIME mm/hr | hrs 2.52 | 6.250 2.52 | 6.333 7.14 | 6.541 7.14 | 6.580 7.14 | 6.667 7.14 | 6.750 7.14 | 6.750 7.14 | 6.833 RAIN | mm/hr | 5.46 | 2.94 | 2.94 | 2.94 | 2.94 | 2.94 | 2.94 | 2.94 | RAIN mm/hr 0.00 0.00 0.00 TIME hrs 0.083 0.167 TIME hrs 3.167 TIME hrs 9.33 9.42 9.50 9.58 9.67 9.75 9.83 9.92 RAIN mm/hr 0.42 0.42 3.250 0.250 3.333 0.42 0.42 0.42 0.42 0.42 0.42 0.42 3.417 0.417 0.500 0.583 0.667 0.42 0.42 0.42 0.42 3.500 3.583 3.667 3.750 Page 10

| DT= 5.0 min   | I OUTFL  | ow sto                     | A_Propose<br>DRAGE  <br>a.m.)  <br>.0000  <br>.0031  | OUTFLO   | W STO   | DRAGE  |        |
|---|--|----------------------------|--|--|---|--|--------|
|   | 0.00   | 00 0                       | .0000  | 0.018  | 1 (   | 0.0161   |        |
|   | 0.00   | 81 0                       | .0031  | 0.058  | 4 (   | 0.0204   |        |
|   | 0.01   | 55 0                       | .0074<br>.0118   | 0.000  | 0 6   | 0.0000   |        |
|   |  | AREA                       | QPEAK<br>(cms)   | TPEA   | ĸ   | R.V.   |        |
|   |  | (ha)                       | (cms)  | (hrs   | )   | (mm)   |        |
| INFLOW : ID= 2 (<br>OUTFLOW: ID= 1 (                                      | 0110)<br>0525)   | 1.580                      | 0.06<br>0.04   | 7 5<br>8 5   | .25<br>.50  | 33.01<br>32.95   |        |
|   | PEAK FLOW  |                            |  |  |   |  |        |
|   | TIME SHIFT   |                            |  |  |   |  |        |
|   | MAXIMUM ST   | ORAGE I                    | JSED   | (min<br>(ha.m.   | )= 0.01   | 193  |        |
|   |  |                            |  |  |   |  |        |
|   |  |                            |  |  |   |  |        |
| ************  |  | **                         |  |  |   |  |        |
| SIMULATION:Run 6  | / <del></del>  |                            |  |  |   |  |        |
|   |  | **                         |  |  |   |  |        |
|   | _  |                            |  |  |   |  |        |
| READ STORM  | Filena   | me · C · \ II ·            | sers\rav   | zhan\ Anni   | D   |  |        |
| MEAD STORM  | 1 111000   |                            |  |  |   |  |        |
|   | 1  | ata\I                      | local\Tem  |  |   |  |        |
|   |  |                            | Local∖Tem<br>f5d6-df0e   | p\   |   | 9a28109d\  | 4ca76b |
| Ptotal= 54.38 mm  | Commen   | efdd:                      | f5d6-df0e  | p\   |   | 9a28109d\  | 4ca76b |
|   | . <u>.</u>   | efdd<br>ts: 5Y12           | f5d6-df0e  | p\<br>-43ba-b1   | 39-2f589  |  |        |
| T]  | <br>IME RAIN   | efdd<br>ts: 5Y12<br>  TIME | f5d6-df0e<br>RAIN  | p\<br>-43ba-b1<br>' TIME   | 39-2f589<br>RAIN  | TIME   | RAI    |
| T]  | <br>IME RAIN   | efdd<br>ts: 5Y12<br>  TIME | f5d6-df0e<br>RAIN  | p\<br>-43ba-b1<br>' TIME   | 39-2f589<br>RAIN  | TIME   | RAI    |
| T]  | <br>IME RAIN   | efdd<br>ts: 5Y12<br>  TIME | f5d6-df0e<br>RAIN  | p\<br>-43ba-b1<br>' TIME   | 39-2f589<br>RAIN  | TIME   | RAI    |
| T]  | <br>IME RAIN   | efdd<br>ts: 5Y12<br>  TIME | f5d6-df0e<br>RAIN  | p\<br>-43ba-b1<br>' TIME   | 39-2f589<br>RAIN  | TIME   | RAI    |
| T]  | <br>IME RAIN   | efdd<br>ts: 5Y12<br>  TIME | f5d6-df0e<br>RAIN  | p\<br>-43ba-b1<br>' TIME   | 39-2f589<br>RAIN  | TIME   | RAI    |
| T]  | <br>IME RAIN   | efdd<br>ts: 5Y12<br>  TIME | f5d6-df0e<br>RAIN  | p\<br>-43ba-b1<br>' TIME   | 39-2f589<br>RAIN  | TIME   | RAI    |
| T]  | <br>IME RAIN   | efdd<br>ts: 5Y12<br>  TIME | f5d6-df0e<br>RAIN  | p\<br>-43ba-b1<br>' TIME   | 39-2f589<br>RAIN  | TIME   | RAI    |
| TI  | <br>IME RAIN   | efdd<br>ts: 5Y12<br>  TIME | f5d6-df0e<br>RAIN  | p\<br>-43ba-b1<br>' TIME   | 39-2f589<br>RAIN  | TIME   | RAI    |
| TI  | <br>IME RAIN   | efdd<br>ts: 5Y12<br>  TIME | f5d6-df0e<br>RAIN  | p\<br>-43ba-b1<br>' TIME   | 39-2f589<br>RAIN  | TIME   | RAI    |
| TI  | <br>IME RAIN   | efdd<br>ts: 5Y12<br>  TIME | f5d6-df0e<br>RAIN  | p\<br>-43ba-b1<br>' TIME   | 39-2f589<br>RAIN  | TIME   | RAI    |
| TI  | <br>IME RAIN   | efdd<br>ts: 5Y12<br>  TIME | f5d6-df0e<br>RAIN  | p\<br>-43ba-b1<br>' TIME   | 39-2f589<br>RAIN  | TIME   | RAI    |
| T]  | <br>IME RAIN   | efdd<br>ts: 5Y12<br>  TIME | f5d6-df0e<br>RAIN  | p\<br>-43ba-b1<br>' TIME   | 39-2f589<br>RAIN  | TIME   | RAI    |
| T]  | <br>IME RAIN   | efdd<br>ts: 5Y12<br>  TIME | f5d6-df0e<br>RAIN  | p\<br>-43ba-b1<br>' TIME   | 39-2f589<br>RAIN  | TIME   | RAI    |
| TI  | <br>IME RAIN   | efdd<br>ts: 5Y12<br>  TIME | f5d6-df0e<br>RAIN  | p\<br>-43ba-b1<br>' TIME   | 39-2f589<br>RAIN  | TIME   | RAI    |
| T]  | <br>IME RAIN   | efdd<br>ts: 5Y12<br>  TIME | f5d6-df0e<br>RAIN  | p\<br>-43ba-b1<br>' TIME   | 39-2f589<br>RAIN  | TIME   | RAI    |
| T]  | <br>IME RAIN   | efdd<br>ts: 5Y12<br>  TIME | f5d6-df0e<br>RAIN  | p\<br>-43ba-b1<br>' TIME   | 39-2f589<br>RAIN  | TIME   | RAI    |
| T]  | <br>IME RAIN   | efdd<br>ts: 5Y12<br>  TIME | f5d6-df0e<br>RAIN  | p\<br>-43ba-b1<br>' TIME   | 39-2f589<br>RAIN  | TIME   | RAI    |
| TI<br>P<br>0.<br>0.<br>1.<br>1.<br>1.<br>2.<br>2.<br>2.<br>2.<br>3.<br>3. | <br>IME RAIN   | efdd<br>ts: 5Y12<br>  TIME | f5d6-df0e<br>RAIN  | p\<br>-43ba-b1<br>' TIME   | 39-2f589<br>RAIN  | TIME   | RAI    |
| T)  0.  0.  0.  1.  1.  2.  2.  2.  3.  3.                                | ME RAIN mm/hr 0.00 0.54 0.54 0.54 0.54 0.54 0.54 0.54    | efddts: 5Y12    TIME       | RAIN   mm/hr   9.25   9.25   9.25   9.25   9.25   25.02   25.02   25.02   7.07   7.07   7.07   7.07   3.81 | p\<br>-43ba-b1<br>' TIME   | 39-2f589<br>RAIN  | TIME   | RAI    |
| TI<br>P<br>0.<br>0.<br>1.<br>1.<br>1.<br>2.<br>2.<br>2.<br>2.<br>3.<br>3. | MIR RAIN mm/hr 25 0.05 0.54 0.54 0.54 0.54 0.54 0.54 0.5 | efdd: ts: 5Y12    TIME     | RAIN   mm/hr   9.25   9.25   9.25   9.25   9.25   25.02   25.02   25.02   7.07   7.07   7.07   7.07   3.81 | p\-43ba-b1  ' TIME ' hrs 6.75 7.00 7.25 7.50 8.00 8.25 8.50 8.75 9.00 9.25 9.50 9.75 | RAIN<br>mm/hr<br>3.81<br>3.81<br>2.18<br>2.18<br>2.18<br>2.18<br>1.09<br>1.09<br>1.09<br>1.09<br>0.54 | TIME<br>  hrs<br>  10.00<br>  10.25<br>  10.50<br>  11.75<br>  11.00<br>  11.25<br>  11.50<br>  12.00<br>  12.25 | RAI    |

1.12

0.51

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Surface Area

### LangstaffRd\_EA\_Proposed\_HumberWatershed

| Average Slope | (%)= | 1.00   | 2.00  |  |
|---------------|------|--------|-------|--|
| Length        | (m)= | 650.00 | 25.00 |  |
| Mannings n    | =    | 0.013  | 0.250 |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TRA   | ANSFORME | D HYETOGRA | APH   |       |       |
|-------|-------|-------|----------|------------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME     | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs      | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.26     | 6.250      | 7.07  | 9.33  | 0.54  |
| 0.167 | 0.00  | 3.250 | 3.26     | 6.333      | 3.81  | 9.42  | 0.54  |
| 0.250 | 0.00  | 3.333 | 9.25     | 6.417      | 3.81  | 9.50  | 0.54  |
| 0.333 | 0.54  | 3.417 | 9.25     | 6.500      | 3.81  | 9.58  | 0.54  |
| 0.417 | 0.54  | 3.500 | 9.25     | 6.583      | 3.81  | 9.67  | 0.54  |
| 0.500 | 0.54  | 3.583 | 9.25     | 6.667      | 3.81  | 9.75  | 0.54  |
| 0.583 | 0.54  | 3.667 | 9.25     | 6.750      | 3.81  | 9.83  | 0.54  |
| 0.667 | 0.54  | 3.750 | 9.25     | 6.833      | 3.81  | 9.92  | 0.54  |
| 0.750 | 0.54  | 3.833 | 9.25     | 6.917      | 3.81  | 10.00 | 0.54  |
| 0.833 | 0.54  | 3.917 | 9.25     | 7.000      | 3.81  | 10.08 | 0.54  |
| 0.917 | 0.54  | 4.000 | 9.25     | 7.083      | 3.81  | 10.17 | 0.54  |
| 1.000 | 0.54  | 4.083 | 9.25     | 7.167      | 3.81  | 10.25 | 0.54  |
| 1.083 | 0.54  | 4.167 | 9.25     | 7.250      | 3.81  | 10.33 | 0.54  |
| 1.167 | 0.54  | 4.250 | 9.25     | 7.333      | 2.18  | 10.42 | 0.54  |
| 1.250 | 0.54  | 4.333 | 25.02    | 7.417      | 2.18  | 10.50 | 0.54  |
| 1.333 | 0.54  | 4.417 | 25.02    | 7.500      | 2.18  | 10.58 | 0.54  |
| 1.417 | 0.54  | 4.500 | 25.02    | 7.583      | 2.18  | 10.67 | 0.54  |
| 1.500 | 0.54  | 4.583 | 25.02    | 7.667      | 2.18  | 10.75 | 0.54  |
| 1.583 | 0.54  | 4.667 | 25.02    | 7.750      | 2.18  | 10.83 | 0.54  |
| 1.667 | 0.54  | 4.750 | 25.02    | 7.833      | 2.18  | 10.92 | 0.54  |
| 1.750 | 0.54  | 4.833 | 25.02    | 7.917      | 2.18  | 11.00 | 0.54  |
| 1.833 | 0.54  | 4.917 | 25.02    | 8.000      | 2.18  | 11.08 | 0.54  |
| 1.917 | 0.54  | 5.000 | 25.02    | 8.083      | 2.18  | 11.17 | 0.54  |
| 2.000 | 0.54  | 5.083 | 25.02    | 8.167      | 2.18  | 11.25 | 0.54  |
| 2.083 | 0.54  | 5.167 | 25.02    | 8.250      | 2.18  | 11.33 | 0.54  |
| 2.167 | 0.54  | 5.250 | 25.02    | 8.333      | 1.09  | 11.42 | 0.54  |
| 2.250 | 0.54  | 5.333 | 7.07     | 8.417      | 1.09  | 11.50 | 0.54  |
| 2.333 | 3.26  | 5.417 | 7.07     | 8.500      | 1.09  | 11.58 | 0.54  |
| 2.417 | 3.26  | 5.500 | 7.07     | 8.583      | 1.09  | 11.67 | 0.54  |
| 2.500 | 3.26  | 5.583 | 7.07     | 8.667      | 1.09  | 11.75 | 0.54  |
| 2.583 | 3.26  | 5.667 | 7.07     | 8.750      | 1.09  | 11.83 | 0.54  |
| 2.667 | 3.26  | 5.750 | 7.07     | 8.833      | 1.09  | 11.92 | 0.54  |
| 2.750 | 3.26  | 5.833 | 7.07     | 8.917      | 1.09  | 12.00 | 0.54  |
| 2.833 | 3.26  | 5.917 | 7.07     | 9.000      | 1.09  | 12.08 | 0.54  |
| 2.917 | 3.26  | 6.000 | 7.07     | 9.083      | 1.09  | 12.17 | 0.54  |
| 3.000 | 3.26  | 6.083 | 7.07     | 9.167      | 1.09  | 12.25 | 0.54  |
| 3.083 | 3.26  | 6.167 | 7.07     | 9.250      | 1.09  |       |       |
|       |       |       |          |            |       |       |       |

Max.Eff.Inten.(mm/hr)= 16.71 over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 15.00 25.00 13.67 (ii) 24.56 (ii) 15.00 25.00 0.08 0.05

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|       | Langs | staffRd E | A Propos | ed Humber | rWatersh | ed    |      |
|-------|-------|-----------|----------|-----------|----------|-------|------|
| 0.083 | 0.00  | 3.167     | 3.26     | 6.250     | 7.07     | 9.33  | 0.54 |
| 0.167 | 0.00  | 3.250     | 3.26     | 6.333     | 3.81     | 9.42  | 0.54 |
| 0.250 | 0.00  | 3.333     | 9.25     | 6.417     | 3.81     | 9.50  | 0.54 |
| 0.333 | 0.54  | 3.417     | 9.25     | 6.500     | 3.81     | 9.58  | 0.54 |
| 0.417 | 0.54  | 3.500     | 9.25     | 6.583     | 3.81     | 9.67  | 0.54 |
| 0.500 | 0.54  | 3.583     | 9.25     | 6.667     | 3.81     | 9.75  | 0.54 |
| 0.583 | 0.54  | 3.667     | 9.25     | 6.750     | 3.81     | 9.83  | 0.54 |
| 0.667 | 0.54  | 3.750     | 9.25     | 6.833     | 3.81     | 9.92  | 0.54 |
| 0.750 | 0.54  | 3.833     | 9.25     | 6.917     | 3.81     | 10.00 | 0.54 |
| 0.833 | 0.54  | 3.917     | 9.25     | 7.000     | 3.81     | 10.08 | 0.54 |
| 0.917 | 0.54  | 4.000     | 9.25     | 7.083     | 3.81     | 10.17 | 0.54 |
| 1.000 | 0.54  | 4.083     | 9.25     | 7.167     | 3.81     | 10.25 | 0.54 |
| 1.083 | 0.54  | 4.167     | 9.25     | 7.250     | 3.81     | 10.33 | 0.54 |
| 1.167 | 0.54  | 4.250     | 9.25     | 7.333     | 2.18     | 10.42 | 0.54 |
| 1.250 | 0.54  | 4.333     | 25.02    | 7.417     | 2.18     | 10.50 | 0.54 |
| 1.333 | 0.54  | 4.417     | 25.02    | 7.500     | 2.18     | 10.58 | 0.54 |
| 1.417 | 0.54  | 4.500     | 25.02    | 7.583     | 2.18     | 10.67 | 0.54 |
| 1.500 | 0.54  | 4.583     | 25.02    | 7.667     | 2.18     | 10.75 | 0.54 |
| 1.583 | 0.54  | 4.667     | 25.02    | 7.750     | 2.18     | 10.83 | 0.54 |
| 1.667 | 0.54  | 4.750     | 25.02    | 7.833     | 2.18     | 10.92 | 0.54 |
| 1.750 | 0.54  | 4.833     | 25.02    | 7.917     | 2.18     | 11.00 | 0.54 |
| 1.833 | 0.54  | 4.917     | 25.02    | 8.000     | 2.18     | 11.08 | 0.54 |
| 1.917 | 0.54  | 5.000     | 25.02    | 8.083     | 2.18     | 11.17 | 0.54 |
| 2.000 | 0.54  | 5.083     | 25.02    | 8.167     | 2.18     | 11.25 | 0.54 |
| 2.083 | 0.54  | 5.167     | 25.02    | 8.250     | 2.18     | 11.33 | 0.54 |
| 2.167 | 0.54  | 5.250     | 25.02    | 8.333     | 1.09     | 11.42 | 0.54 |
| 2.250 | 0.54  | 5.333     | 7.07     | 8.417     | 1.09     | 11.50 | 0.54 |
| 2.333 | 3.26  | 5.417     | 7.07     | 8.500     | 1.09     | 11.58 | 0.54 |
| 2.417 | 3.26  | 5.500     | 7.07     | 8.583     | 1.09     | 11.67 | 0.54 |
| 2.500 | 3.26  | 5.583     | 7.07     | 8.667     | 1.09     | 11.75 | 0.54 |
| 2.583 | 3.26  | 5.667     | 7.07     | 8.750     | 1.09     | 11.83 | 0.54 |
| 2.667 | 3.26  | 5.750     | 7.07     | 8.833     | 1.09     | 11.92 | 0.54 |
| 2.750 | 3.26  | 5.833     | 7.07     | 8.917     | 1.09     | 12.00 | 0.54 |
| 2.833 | 3.26  | 5.917     | 7.07     | 9.000     | 1.09     | 12.08 | 0.54 |
| 2.917 | 3.26  | 6.000     | 7.07     | 9.083     | 1.09     | 12.17 | 0.54 |
| 3.000 | 3.26  | 6.083     | 7.07     | 9.167     | 1.09     | 12.25 | 0.54 |
| 3.083 | 3.26  | 6.167     | 7.07     | 9.250     | 1.09     | l     |      |

| Max.Eff.Inten.(r | nm/hr)= | 25.02      | 15.31      |             |
|------------------|---------|------------|------------|-------------|
| over             | (min)   | 15.00      | 20.00      |             |
| Storage Coeff.   | (min)=  | 15.48 (ii) | 19.90 (ii) |             |
| Unit Hyd. Tpeak  | (min)=  | 15.00      | 20.00      |             |
| Unit Hyd. peak   | (cms)=  | 0.07       | 0.06       |             |
|                  |         |            |            | *TOTALS*    |
| PEAK FLOW        | (cms)=  | 0.12       | 0.01       | 0.129 (iii) |
| TIME TO PEAK     | (hrs)=  | 5.25       | 5.33       | 5.25        |
| RUNOFF VOLUME    | (mm)=   | 52.38      | 24.05      | 47.28       |
| TOTAL RAINFALL   | (mm)=   | 54.38      | 54.38      | 54.38       |
| RUNOFF COEFFICIE | NT =    | 0.96       | 0.44       | 0.87        |
|                  |         |            |            |             |

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  $CN^* = 83.0$  Ia = Dep. Storage (Above)

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#### LangstaffRd\_EA\_Proposed\_HumberWatershed

|                    |            |       | *TOTALS*    |
|--------------------|------------|-------|-------------|
| PEAK FLOW (c       | ms)= 0.08  | 0.02  | 0.094 (iii) |
| TIME TO PEAK (h    | rs)= 5.25  | 5.42  | 5.25        |
| RUNOFF VOLUME (    | mm)= 52.38 | 26.88 | 44.47       |
| TOTAL RAINFALL (   | mm)= 54.38 | 54.38 | 54.38       |
| RUNOFF COEFFICIENT | = 0.96     | 0.49  | 0.82        |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: CN\* = 86.0 Ia = Dep. Storage (Above) (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT. (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| (iii) PEAK FLOW                  | DOES NOT INC | LUDE BASEFLO | W IF ANY.    |           |  |
|----------------------------------|--------------|--------------|--------------|-----------|--|
| RESERVOIR( 0520)                 | OVERFLOW     | IS OFF       |              |           |  |
| IN= 2> OUT= 1  <br>  DT= 5.0 min | OUTELOW      | STORAGE      | I OUTFLOW    | STORAGE   |  |
|                                  |              |              | (cms)        |           |  |
|                                  |              | 0.0000       |              |           |  |
|                                  |              | 0.0031       |              |           |  |
|                                  |              | 0.0031       |              |           |  |
|                                  |              |              | 0.0000       |           |  |
|                                  | 0.0133       | 0.0110       | 1 0.0000     | 0.0000    |  |
|                                  | Δ            | REA OPEA     | K TPEAK      | R V       |  |
|                                  | 7            | ha) (cms     | (hrs)        | (mm)      |  |
| INFLOW: ID= 2 (                  | 0105) 1      | 630 0        | 094 5 25     | 44 47     |  |
| OUTFLOW: ID= 1 (                 | 0520) 1      | .630 0.      | 075 5.50     | 44.41     |  |
| ,                                | ,            |              |              |           |  |
| PE                               | AK FLOW      | REDUCTION [  | out/Qin](%)= | 79.51     |  |
| TI                               | ME SHIFT OF  | PEAK FLOW    | (min)=       | 15.00     |  |
| MA                               | XIMUM STORA  | GE USED      | (ha.m.)=     | 0.0232    |  |
|                                  |              |              |              |           |  |
|                                  |              |              |              |           |  |
|                                  |              |              |              |           |  |
| CALIB                            |              |              |              |           |  |
| STANDHYD ( 0130)                 |              |              |              |           |  |
| ID= 1 DT= 5.0 min                | Total Imp(   | %)= 82.00    | Dir. Conn.(% | 5)= 82.00 |  |
|                                  |              |              |              |           |  |
|                                  |              | ERVIOUS F    |              |           |  |
| Surface Area                     |              |              |              |           |  |
| Dep. Storage                     | (mm)=        | 2.00         | 5.00         |           |  |
| Average Slope                    | (%)=         | 1.00         | 2.00         |           |  |
| Length<br>Mannings n             | (m)= 8       | 00.00        | 20.00        |           |  |
| Mannings n                       | =            | 0.013        | 0.250        |           |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ---TIME RAIN | TIME RAIN | TIME RAIN | TIME
hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs

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LangstaffRd\_EA\_Proposed\_HumberWatershed
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COFFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB | STANDHYD ( 0125) |ID= 1 DT= 5.0 min | Area (ha)= 2.27 Total Imp(%)= 77.00 Dir. Conn.(%)= 77.00 IMPERVIOUS PERVIOUS (i) 1.75 2.00 1.00 800.00 0.013 Surface Area (ha)= 0.52 5.00 2.00 20.00 0.250 Dep. Storage Average Slope Length Mannings n (mm)= (%)= (m)=

|       |       |       |       | HYETOGR. |       |       |       |
|-------|-------|-------|-------|----------|-------|-------|-------|
| TIME  | RAIN  |       | RAIN  | ' TIME   | RAIN  |       | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr | ' hrs    | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.26  | 6.250    | 7.07  |       | 0.54  |
| 0.167 | 0.00  | 3.250 | 3.26  | 6.333    | 3.81  | 9.42  | 0.54  |
| 0.250 | 0.00  | 3.333 | 9.25  | 6.417    | 3.81  | 9.50  | 0.54  |
| 0.333 | 0.54  | 3.417 | 9.25  |          | 3.81  |       | 0.54  |
| 0.417 | 0.54  | 3.500 | 9.25  |          | 3.81  |       | 0.54  |
| 0.500 | 0.54  |       | 9.25  |          | 3.81  |       | 0.54  |
| 0.583 | 0.54  | 3.667 | 9.25  | 6.750    | 3.81  | 9.83  | 0.54  |
| 0.667 | 0.54  | 3.750 | 9.25  | 6.833    | 3.81  | 9.92  | 0.54  |
| 0.750 | 0.54  | 3.833 | 9.25  | 6.917    | 3.81  | 10.00 | 0.54  |
| 0.833 | 0.54  | 3.917 | 9.25  | 7.000    | 3.81  | 10.08 | 0.54  |
| 0.917 | 0.54  | 4.000 | 9.25  | 7.083    | 3.81  | 10.17 | 0.54  |
| 1.000 | 0.54  | 4.083 | 9.25  | 7.167    | 3.81  | 10.25 | 0.54  |
| 1.083 | 0.54  | 4.167 | 9.25  | 7.250    | 3.81  | 10.33 | 0.54  |
| 1.167 | 0.54  | 4.250 | 9.25  | 7.333    | 2.18  | 10.42 | 0.54  |
| 1.250 | 0.54  | 4.333 | 25.02 | 7.417    | 2.18  | 10.50 | 0.54  |
| 1.333 | 0.54  | 4.417 | 25.02 | 7.500    | 2.18  | 10.58 | 0.54  |
| 1.417 | 0.54  | 4.500 | 25.02 | 7.583    | 2.18  | 10.67 | 0.54  |
| 1.500 | 0.54  | 4.583 | 25.02 | 7.667    | 2.18  | 10.75 | 0.54  |
| 1.583 | 0.54  | 4.667 | 25.02 | 7.750    | 2.18  | 10.83 | 0.54  |
| 1.667 | 0.54  | 4.750 | 25.02 | 7.833    | 2.18  | 10.92 | 0.54  |
| 1.750 | 0.54  | 4.833 | 25.02 | 7.917    | 2.18  | 11.00 | 0.54  |
| 1.833 | 0.54  | 4.917 | 25.02 | 8.000    | 2.18  | 11.08 | 0.54  |
| 1.917 | 0.54  | 5.000 | 25.02 | 8.083    | 2.18  | 11.17 | 0.54  |
| 2.000 | 0.54  | 5.083 | 25.02 | 8.167    | 2.18  | 11.25 | 0.54  |
| 2.083 | 0.54  | 5.167 | 25.02 | 8.250    | 2.18  | 11.33 | 0.54  |
| 2.167 | 0.54  | 5.250 | 25.02 | 8.333    | 1.09  | 11.42 | 0.54  |
| 2.250 | 0.54  | 5.333 | 7.07  | 8.417    | 1.09  | 11.50 | 0.54  |
| 2.333 | 3.26  | 5.417 | 7.07  | 8.500    | 1.09  | 11.58 | 0.54  |
| 2.417 | 3.26  | 5.500 | 7.07  | 8.583    | 1.09  | 11.67 | 0.54  |
| 2.500 | 3.26  | 5.583 | 7.07  | 8.667    | 1.09  | 11.75 | 0.54  |
|       |       |       |       |          |       |       |       |

|                  | Langs  | staffRd_E/ | _Propo | sed_HumberW | atersh | ed       |      |
|------------------|--------|------------|--------|-------------|--------|----------|------|
| 2.583            | 3.26   | 5.667      | 7.07   | 8.750       | 1.09   | 11.83    | 0.54 |
| 2.667            | 3.26   | 5.750      | 7.07   | 8.833       | 1.09   | 11.92    | 0.54 |
| 2.750            | 3.26   | 5.833      | 7.07   | 8.917       | 1.09   | 12.00    | 0.54 |
| 2.833            | 3.26   | 5.917      | 7.07   | 9.000       | 1.09   | 12.08    | 0.54 |
| 2.917            | 3.26   | 6.000      | 7.07   | 9.083       | 1.09   | 12.17    | 0.54 |
| 3.000            | 3.26   | 6.083      | 7.07   | 9.167       | 1.09   | 12.25    | 0.54 |
| 3.083            | 3.26   | 6.167      | 7.07   | 9.250       | 1.09   |          |      |
| Max.Eff.Inten.(m | m/hr)= | 25.02      |        | 15.31       |        |          |      |
|                  | (min)  | 15.00      |        | 25.00       |        |          |      |
| Storage Coeff.   |        |            |        | 20.48 (ii)  |        |          |      |
| Unit Hyd. Tpeak  |        |            |        | 25.00       |        |          |      |
| Unit Hyd. peak   |        | 0.07       |        | 0.05        |        |          |      |
|                  | ()     |            |        |             | *T0    | ΓALS*    |      |
| PEAK FLOW        | (cms)= | 0.12       |        | 0.02        | 0.     | 136 (iii | )    |
| TIME TO PEAK     | (hrs)= | 5.25       |        | 5.33        |        | 5.25     |      |
| RUNOFF VOLUME    | (mm)=  | 52.38      |        | 24.05       | 45     | .86      |      |
| TOTAL RAINFALL   | (mm)=  | 54.38      |        | 54.38       | 54     | 1.38     |      |
| RUNOFF COEFFICIE | NT =   | 0.96       |        | 0.44        | 6      | 9.84     |      |
|                  |        |            |        |             |        |          |      |
|                  |        |            |        |             |        |          |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0405) <br>  1 + 2 = 3  <br> | AREA<br>(ha)<br>2.27<br>2.08 | QPEAK<br>(cms)<br>0.136<br>0.129 | TPEAK<br>(hrs)<br>5.25<br>5.25 | R.V.<br>(mm)<br>45.86<br>47.28 |
|---------------------------------------|------------------------------|----------------------------------|--------------------------------|--------------------------------|
| ID = 3 ( 0405):                       | 4.35                         | 0.265                            | 5.25                           | 46.54                          |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| RESERVOIR( 0505) <br>  IN= 2> OUT= 1 | OVERFL | OW IS (      | OFF            |                |              |
|--------------------------------------|--------|--------------|----------------|----------------|--------------|
| DT= 5.0 min                          | OUTFLO | W S1         | ORAGE          | OUTFLOW        | STORAGE      |
| ii                                   | (cms)  | (h           | na.m.) İ       | (cms)          | (ha.m.)      |
|                                      | ò.000  | o e          | 9.0000 j       | 0.2110         | 0.0383       |
|                                      | 0.018  | 5 6          | 9.0030 j       | 0.2743         | 0.0515       |
|                                      | 0.030  | 2 6          | 9.0120 j       | 0.3250         | 0.0792       |
|                                      | 0.110  | 2 6          | 9.0251         | 0.0000         | 0.0000       |
|                                      |        | AREA<br>(ha) | QPEAK<br>(cms) | TPEAK<br>(hrs) | R.V.<br>(mm) |
| INFLOW : ID= 2 (                     | 0405)  | 4.350        | 0.26           | 5 5.25         | 46.54        |

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|                  | Langs   | taffRd E | A Propos | sed Humberw | latersh | ed         |      |
|------------------|---------|----------|----------|-------------|---------|------------|------|
| 2.417            |         | 5.500    | 7.07     | 8.583       | 1.09    | 11.67      | 0.54 |
| 2.500            | 3.26    | 5.583    | 7.07     | 8.667       | 1.09    | 11.75      | 0.54 |
| 2.583            | 3.26    | 5.667    | 7.07     | 8.750       | 1.09    | 11.83      | 0.54 |
| 2.667            | 7 3.26  | 5.750    | 7.07     | 8.833       | 1.09    | 11.92      | 0.54 |
| 2.756            | 3.26    | 5.833    | 7.07     | 8.917       | 1.09    | 12.00      | 0.54 |
| 2.833            | 3.26    | 5.917    | 7.07     | 9.000       | 1.09    | 12.08      | 0.54 |
| 2.917            | 7 3.26  | 6.000    | 7.07     | 9.083       | 1.09    | 12.17      | 0.54 |
| 3.000            | 3.26    | 6.083    | 7.07     | 9.167       | 1.09    | 12.25      | 0.54 |
| 3.083            | 3.26    | 6.167    | 7.07     | 9.250       | 1.09    | l          |      |
|                  |         |          |          |             |         |            |      |
| Max.Eff.Inten.(r | nm/hr)= | 25.02    |          | 15.31       |         |            |      |
|                  | (min)   | 10.00    |          | 20.00       |         |            |      |
| Storage Coeff.   |         | 11.33    | (ii)     | 16.26 (ii)  |         |            |      |
| Unit Hyd. Tpeak  | (min)=  | 10.00    |          | 20.00       |         |            |      |
| Unit Hyd. peak   | (cms)=  | 0.10     |          | 0.06        |         |            |      |
|                  |         |          |          |             | *T0     | TALS*      |      |
| PEAK FLOW        | (cms)=  | 0.06     |          | 0.01        | 0       | .074 (iii) |      |
| TIME TO PEAK     | (hrs)=  | 5.25     |          | 5.33        | !       | 5.25       |      |
| RUNOFF VOLUME    | (mm)=   | 52.38    |          | 24.05       | 4       | 4.72       |      |
| TOTAL RAINFALL   | (mm)=   | 54.38    |          | 54.38       | 54      | 4.38       |      |
| RUNOFF COEFFICIE | ENT =   | 0.96     |          | 0.44        | (       | 0.82       |      |
|                  |         |          |          |             |         |            |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ()                |       |               |                             |       |
|-------------------|-------|---------------|-----------------------------|-------|
|                   |       |               |                             |       |
|                   |       |               |                             |       |
|                   |       |               |                             |       |
| CALIB             |       |               |                             |       |
| STANDHYD ( 0115)  | Area  | (ha)= 1.0     | 0                           |       |
| ID= 1 DT= 5.0 min | Total | Imp(%) = 63.0 | <pre>0 Dir. Conn.(%)=</pre> | 63.00 |
|                   |       |               |                             |       |
|                   |       | IMPERVIOUS    | PERVIOUS (i)                |       |
| Surface Area      | (ha)= | 0.63          | 0.37                        |       |
| Dep. Storage      | (mm)= | 2.00          | 5.00                        |       |
| Average Slope     | (%)=  | 1.00          | 2.00                        |       |
| Length            | (m)=  | 475.00        | 17.00                       |       |
| Mannings n        | =     | 0.013         | 0.250                       |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TRANSFORMED HYETOGRAPH |       |       |       |        |       |      |       |  |  |
|------------------------|-------|-------|-------|--------|-------|------|-------|--|--|
| TIME                   | RAIN  | TIME  | RAIN  | ' TIME | RAIN  | TIME | RAIN  |  |  |
| hrs                    | mm/hr | hrs   | mm/hr | ' hrs  | mm/hr | hrs  | mm/hr |  |  |
| 0.083                  | 0.00  | 3.167 | 3.26  | 6.250  | 7.07  | 9.33 | 0.54  |  |  |
| 0.167                  | 0.00  | 3.250 | 3.26  | 6.333  | 3.81  | 9.42 | 0.54  |  |  |
| 0.250                  | 0.00  | 3.333 | 9.25  | 6.417  | 3.81  | 9.50 | 0.54  |  |  |
| 0.333                  | 0.54  | 3.417 | 9.25  | 6.500  | 3.81  | 9.58 | 0.54  |  |  |
| 0.417                  | 0.54  | 3.500 | 9.25  | 6.583  | 3.81  | 9.67 | 0.54  |  |  |

## LangstaffRd\_EA\_Proposed\_HumberWatershed OUTFLOW: ID= 1 ( 0505) 4.350 0.227 5.42 4

PEAK FLOW REDUCTION [Qout/Qin](%)= 85.84 TIME SHIFT OF PEAK FLOW (min)= 10.00 MAXIMUM STORAGE USED (ha.m.)= 0.0417

| CALIB | | STANDHYD ( 0120) |ID= 1 DT= 5.0 min | Area (ha)= 1.24 Total Imp(%)= 73.00 Dir. Conn.(%)= 73.00 IMPERVIOUS PERVIOUS (i)
0.91 0.33
2.00 5.00
1.00 2.00
475.00 17.00 Surface Area Dep. Storage Average Slope Length Mannings n (ha)= (mm)= (%)= (m)=

| TRANSFORMED HYETOGRAPH |       |       |       |        |       |       |       |  |  |  |
|------------------------|-------|-------|-------|--------|-------|-------|-------|--|--|--|
| TIME                   | RAIN  | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |  |  |
| hrs                    | mm/hr | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |  |  |
| 0.083                  | 0.00  | 3.167 | 3.26  | 6.250  | 7.07  | 9.33  | 0.54  |  |  |  |
| 0.167                  | 0.00  | 3.250 | 3.26  | 6.333  | 3.81  | 9.42  | 0.54  |  |  |  |
| 0.250                  | 0.00  | 3.333 | 9.25  | 6.417  | 3.81  | 9.50  | 0.54  |  |  |  |
| 0.333                  | 0.54  | 3.417 | 9.25  | 6.500  | 3.81  | 9.58  | 0.54  |  |  |  |
| 0.417                  | 0.54  | 3.500 | 9.25  | 6.583  | 3.81  | 9.67  | 0.54  |  |  |  |
| 0.500                  | 0.54  | 3.583 | 9.25  | 6.667  | 3.81  | 9.75  | 0.54  |  |  |  |
| 0.583                  | 0.54  | 3.667 | 9.25  | 6.750  | 3.81  | 9.83  | 0.54  |  |  |  |
| 0.667                  | 0.54  | 3.750 | 9.25  | 6.833  | 3.81  | 9.92  | 0.54  |  |  |  |
| 0.750                  | 0.54  | 3.833 | 9.25  | 6.917  | 3.81  | 10.00 | 0.54  |  |  |  |
| 0.833                  | 0.54  | 3.917 | 9.25  | 7.000  | 3.81  | 10.08 | 0.54  |  |  |  |
| 0.917                  | 0.54  | 4.000 | 9.25  | 7.083  | 3.81  | 10.17 | 0.54  |  |  |  |
| 1.000                  | 0.54  | 4.083 | 9.25  | 7.167  | 3.81  | 10.25 | 0.54  |  |  |  |
| 1.083                  | 0.54  | 4.167 | 9.25  | 7.250  | 3.81  | 10.33 | 0.54  |  |  |  |
| 1.167                  | 0.54  |       | 9.25  | 7.333  | 2.18  | 10.42 | 0.54  |  |  |  |
| 1.250                  | 0.54  | 4.333 | 25.02 | 7.417  | 2.18  |       | 0.54  |  |  |  |
| 1.333                  | 0.54  | 4.417 | 25.02 | 7.500  | 2.18  | 10.58 | 0.54  |  |  |  |
| 1.417                  | 0.54  | 4.500 | 25.02 | 7.583  | 2.18  |       | 0.54  |  |  |  |
| 1.500                  | 0.54  | 4.583 | 25.02 | 7.667  | 2.18  | 10.75 | 0.54  |  |  |  |
| 1.583                  | 0.54  | 4.667 | 25.02 | 7.750  | 2.18  | 10.83 | 0.54  |  |  |  |
| 1.667                  | 0.54  | 4.750 | 25.02 | 7.833  | 2.18  |       | 0.54  |  |  |  |
| 1.750                  | 0.54  | 4.833 | 25.02 | 7.917  | 2.18  | 11.00 | 0.54  |  |  |  |
| 1.833                  | 0.54  | 4.917 | 25.02 | 8.000  | 2.18  | 11.08 | 0.54  |  |  |  |
| 1.917                  | 0.54  | 5.000 | 25.02 | 8.083  | 2.18  |       | 0.54  |  |  |  |
| 2.000                  | 0.54  | 5.083 | 25.02 | 8.167  | 2.18  | 11.25 | 0.54  |  |  |  |
| 2.083                  | 0.54  | 5.167 | 25.02 | 8.250  | 2.18  | 11.33 | 0.54  |  |  |  |
| 2.167                  | 0.54  | 5.250 | 25.02 | 8.333  | 1.09  | 11.42 | 0.54  |  |  |  |
| 2.250                  | 0.54  | 5.333 | 7.07  | 8.417  | 1.09  | 11.50 | 0.54  |  |  |  |
| 2.333                  | 3.26  | 5.417 | 7.07  | 8.500  | 1.09  | 11.58 | 0.54  |  |  |  |

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|   |        | +- CCD4 = |                 | 4 10                   |      |            |      |
|---|--------|-----------|-----------------|------------------------|------|------------|------|
| 0.500                                   | 0.54   |           | A_Propo<br>9.25 | sed_HumberW<br>  6.667 | 3.81 |            | 0.54 |
| 0.583                                   | 0.54   |           | 9.25            |                        | 3.81 |            | 0.54 |
| 0.667                                   | 0.54   |           | 9.25            |                        | 3.81 |            | 0.54 |
| 0.750                                   |        | 3.833     | 9.25            |                        | 3.81 |            | 0.54 |
| 0.833                                   |        | 3.917     | 9.25            |                        | 3.81 |            | 0.54 |
| 0.917                                   |        | 4.000     |                 | 7.083                  | 3.81 |            | 0.54 |
| 1.000                                   |        | 4.083     | 9.25            |                        | 3.81 |            | 0.54 |
| 1.083                                   |        | 4.167     |                 | 7.250                  | 3.81 |            | 0.54 |
| 1.167                                   |        | 4.250     | 9.25            |                        | 2.18 |            | 0.54 |
| 1.250                                   |        | 4.333     |                 | 7.417                  | 2.18 |            | 0.54 |
| 1.333                                   |        | 4.417     | 25.02           |                        | 2.18 |            | 0.54 |
| 1.417                                   |        | 4.500     |                 | 7.583                  | 2.18 |            | 0.54 |
| 1.500                                   |        | 4.583     | 25.02           |                        | 2.18 |            | 0.54 |
| 1.583                                   |        | 4.667     |                 | 7.750                  | 2.18 |            | 0.54 |
| 1.667                                   |        | 4.750     |                 |                        | 2.18 |            | 0.54 |
| 1.750                                   |        | 4.833     |                 | 7.917                  | 2.18 |            | 0.54 |
| 1.833                                   |        | 4.917     |                 |                        | 2.18 |            | 0.54 |
| 1.917                                   |        | 5.000     |                 | 8.083                  | 2.18 |            | 0.54 |
| 2.000                                   | 0.54 İ | 5.083     | 25.02           | 8.167                  | 2.18 | 11.25      | 0.54 |
| 2.083                                   | 0.54 İ | 5.167     | 25.02           | 8.250                  | 2.18 | 11.33      | 0.54 |
| 2.167                                   |        | 5.250     | 25.02           |                        | 1.09 | 11.42      | 0.54 |
| 2.250                                   | 0.54 İ | 5.333     | 7.07            | 8.417                  | 1.09 | 11.50      | 0.54 |
| 2.333                                   | 3.26   | 5.417     | 7.07            | 8.500                  | 1.09 | 11.58      | 0.54 |
| 2.417                                   | 3.26 İ | 5.500     | 7.07            | 8.583                  | 1.09 | 11.67      | 0.54 |
| 2.500                                   | 3.26 İ | 5.583     | 7.07            | 8.667                  | 1.09 | 11.75      | 0.54 |
| 2.583                                   | 3.26 İ | 5.667     | 7.07            | 8.750                  | 1.09 | 11.83      | 0.54 |
| 2.667                                   | 3.26 İ | 5.750     | 7.07            | 8.833                  | 1.09 | 11.92      | 0.54 |
| 2.750                                   | 3.26   | 5.833     | 7.07            | 8.917                  | 1.09 | 12.00      | 0.54 |
| 2.833                                   | 3.26 İ | 5.917     | 7.07            | 9.000                  | 1.09 | 12.08      | 0.54 |
| 2.917                                   | 3.26   | 6.000     | 7.07            | 9.083                  | 1.09 | 12.17      | 0.54 |
| 3.000                                   | 3.26   | 6.083     | 7.07            | 9.167                  | 1.09 | 12.25      | 0.54 |
| 3.083                                   | 3.26   | 6.167     | 7.07            | 9.250                  | 1.09 |            |      |
| Max.Eff.Inten.(mm/hr                    | -)=    | 25.02     |                 | 15.31                  |      |            |      |
| over (mir                               |        | 10.00     |                 | 25.00                  |      |            |      |
| Storage Coeff. (mir                     | ı)=    | 11.33     | (ii)            | 20.27 (ii)             |      |            |      |
| Unit Hyd. Tpeak (mir                    | ı)=    | 10.00     | ` '             | 25.00                  |      |            |      |
| Unit Hyd. peak (cms                     |        | 0.10      |                 | 0.05                   |      |            |      |
| , | ,      |           |                 |                        | *T01 | TALS*      |      |
| PEAK FLOW (cms                          | s)=    | 0.04      |                 | 0.01                   |      | .055 (iii) |      |
| TIME TO PEAK (hrs                       |        | 5.25      |                 | 5.33                   |      | 5.25       |      |
|   | n)=    | 52.38     |                 | 24.05                  |      | 1.89       |      |
| TOTAL RAINFALL (mr                      | n)=    | 54.38     |                 | 54.38                  |      | 1.38       |      |
| RUNOFF COEFFICIENT                      | ´=     | 0.96      |                 | 0.44                   |      | 9.77       |      |
|   |        |           |                 |                        |      |            |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

#### LangstaffRd\_EA\_Proposed\_HumberWatershed

| ADD HYD ( 0410)   AREA QPEAK TPEAK R.V.   1 + 2 = 3   AREA QPEAK TPEAK R.V.   101=1 ( 0115): 1.00 0.055 5.25 41.89   1D2= 2 ( 0120): 1.24 0.074 5.25 44.72  |
|---|
| ID = 3 ( 0410): 2.24 0.130 5.25 43.46   |
| NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.   |
| RESERVOIR( 0510)  OVERFLOW IS OFF   |
| 0.0264 0.0024 0.0792 0.0414   |
| 0.0457 0.0099   0.0876 0.0666<br>0.0590 0.0204   0.0000 0.0000  |
| AREA QPEAK TPEAK R.V.  (ha) (cms) (hrs) (mm)  INFLOW: ID= 2 ( 0410) 2.240 0.130 5.25 43.46  OUTFLOW: ID= 1 ( 0510) 2.240 0.067 5.58 43.45  PEAK FLOW REDUCTION [Qout/Qin](%)= 51.77  TIME SHIFT OF PEAK FLOW (min)= 20.00  MAXIMUM STORAGE USED (ha.m.)= 0.0283 |
| ADD HYD ( 0420)   AREA QPEAK TPEAK R.V.     1 + 2 = 3   |
| ID = 3 ( 0420): 6.59 0.293 5.42 45.48   |
| NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.   |
| STANDHYD ( 0110)   Area (ha)= 1.58<br>  ID= 1 DT= 5.0 min   Total Imp(%)= 70.00 Dir. Conn.(%)= 70.00  |
| IMPERVIOUS PERVIOUS (i)  Surface Area (ha)= 1.11 0.47  Dep. Storage (mm)= 2.00 5.00  Average Slope (%)= 1.00 2.00   |

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(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 85.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COFFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| RESERVOIR( 0525)     | OVERFLOW IS OF  | F            |            |         |
|----------------------|-----------------|--------------|------------|---------|
| IN= 2> OUT= 1        |                 |              |            |         |
| DT= 5.0 min          | OUTFLOW STO     | RAGE   OU    | JTFLOW :   | STORAGE |
|                      | (cms) (ha       | .m.)   (     | cms)       | (ha.m.) |
|                      | 0.0000 0.       | 0000   e     | .0181      | 0.0161  |
|                      | 0.0081 0.       | 0031   0     | .0584      | 0.0204  |
|                      | 0.0123 0.       | 0074   0     | .0920      | 0.0259  |
|                      | 0.0155 0.       | 0118   0     | .0000      | 0.0000  |
|                      |                 |              |            |         |
|                      | AREA            | QPEAK        | TPEAK      | R.V.    |
|                      | (ha)            | (cms)        | (hrs)      | (mm)    |
| INFLOW : ID= 2 ( 01: | 1.580           | 0.091        | 5.25       | 44.42   |
| OUTFLOW: ID= 1 ( 052 | 25) 1.580       | 0.073        | 5.50       | 44.37   |
|                      |                 |              |            |         |
| PEAK                 | FLOW REDUCT     | ION [Qout/Qi | .n](%)= 79 | .32     |
| TIME                 | SHIFT OF PEAK F | LOW          | (min) = 15 | .00     |
| MAXIN                | NUM STORAGE U   | SED (h       | nà.m.)= 0  | .0228   |
|                      |                 | ,            | ,          |         |

Filename: C:\Users\ray.zhao\AppD ata\Local\Temp\ efddf5d6-df0e-43ba-b139-2f589a28109d\1f25e1d6 READ STORM Ptotal= 62.71 mm Comments: 10Y12 RAIN | TIME mm/hr | hrs 0.00 | 3.50 0.63 | 3.75 0.63 | 4.00 0.63 | 4.25 0.63 | 4.50 0.63 | 4.75 0.63 | 5.00 RAIN | TIME mm/hr | hrs 10.66 | 6.75 10.66 | 7.00 10.66 | 7.50 10.66 | 7.50 28.84 | 7.75 28.84 | 8.00 28.84 | 8.25 RAIN | TIME mm/hr | hrs 4.39 | 10.00 4.39 | 10.25 4.39 | 10.50 2.51 | 10.75 2.51 | 11.00 2.51 | 11.25 2.51 | 11.50 RAIN mm/hr 0.63 0.63 0.63 0.63 0.63 0.63 TIME hrs 0.25 0.50 0.75 1.00 1.25 1.50 1.75

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LangstaffRd\_EA\_Proposed\_HumberWatershed (m) = 650.00 25.00 = 0.013 0.250 Length Mannings n

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|                   |       | TR/   | NSEORM | ED HYETOGRA | он    |       |       |
|-------------------|-------|-------|--------|-------------|-------|-------|-------|
| TIME              | RAIN  |       | RAIN   |             | RAIN  |       | RAIN  |
| hrs               | mm/hr | hrs   | mm/hr  | l' hrs      | mm/hr |       | mm/hr |
| 0.083             | 0.00  | 3.167 | 3.26   | 6.250       | 7.07  |       | 0.54  |
| 0.167             |       | 3.250 | 3.26   |             | 3.81  |       | 0.54  |
| 0.250             | 0.00  |       | 9.25   |             | 3.81  | 9.50  | 0.54  |
| 0.333             |       | 3.417 | 9.25   |             | 3.81  | 9.58  | 0.54  |
| 0.417             | 0.54  |       | 9.25   |             | 3.81  | 9.67  | 0.54  |
| 0.500             |       | 3.583 |        | 6.667       | 3.81  |       | 0.54  |
| 0.583             |       | 3.667 | 9.25   |             | 3.81  |       | 0.54  |
| 0.667             | 0.54  | 3.750 | 9.25   | 6.833       | 3.81  | 9.92  | 0.54  |
| 0.750             | 0.54  | 3.833 | 9.25   | 6.917       | 3.81  | 10.00 | 0.54  |
| 0.833             | 0.54  | 3.917 | 9.25   | 7.000       | 3.81  | 10.08 | 0.54  |
| 0.917             | 0.54  | 4.000 | 9.25   | 7.083       | 3.81  |       | 0.54  |
| 1.000             | 0.54  | 4.083 | 9.25   | 7.167       | 3.81  | 10.25 | 0.54  |
| 1.083             | 0.54  | 4.167 | 9.25   | 7.250       | 3.81  | 10.33 | 0.54  |
| 1.167             | 0.54  | 4.250 | 9.25   | 7.333       | 2.18  | 10.42 | 0.54  |
| 1.250             |       | 4.333 | 25.02  | 7.417       | 2.18  |       | 0.54  |
| 1.333             |       | 4.417 | 25.02  |             | 2.18  |       | 0.54  |
| 1.417             |       | 4.500 | 25.02  |             | 2.18  |       | 0.54  |
| 1.500             |       | 4.583 |        | 7.667       | 2.18  |       | 0.54  |
| 1.583             |       | 4.667 | 25.02  |             | 2.18  |       | 0.54  |
| 1.667             |       | 4.750 |        | 7.833       | 2.18  |       | 0.54  |
| 1.750             |       | 4.833 | 25.02  |             | 2.18  |       | 0.54  |
| 1.833             |       | 4.917 | 25.02  |             | 2.18  |       | 0.54  |
| 1.917             |       | 5.000 | 25.02  |             | 2.18  |       | 0.54  |
| 2.000             |       | 5.083 | 25.02  |             | 2.18  |       | 0.54  |
| 2.083             |       | 5.167 |        | 8.250       | 2.18  |       | 0.54  |
| 2.167             | 0.54  |       | 25.02  |             | 1.09  |       | 0.54  |
| 2.250             |       | 5.333 |        | 8.417       | 1.09  |       | 0.54  |
| 2.333             | 3.26  |       | 7.07   |             | 1.09  |       | 0.54  |
| 2.417             |       | 5.500 |        | 8.583       | 1.09  |       | 0.54  |
| 2.500             |       | 5.583 |        | 8.667       | 1.09  |       | 0.54  |
| 2.583             |       | 5.667 | 7.07   |             | 1.09  |       | 0.54  |
| 2.667             |       | 5.750 |        | 8.833       | 1.09  |       | 0.54  |
| 2.750             |       | 5.833 | 7.07   |             | 1.09  |       | 0.54  |
| 2.833             |       | 5.917 |        | 9.000       | 1.09  |       | 0.54  |
| 2.917             | 3.26  |       | 7.07   |             | 1.09  |       | 0.54  |
| 3.000             |       | 6.083 | 7.07   |             | 1.09  |       | 0.54  |
| 3.083             | 3.26  | 6.167 | 7.07   | 9.250       | 1.09  |       |       |
| Max.Eff.Inten.(mm | /hr)= | 25.02 |        | 16.14       |       |       |       |
| over (i           | min)  | 15.00 |        | 25.00       |       |       |       |
|                   | min)= | 13.67 | (ii)   | 24.71 (ii)  |       |       |       |
| Unit Hyd. Tpeak ( |       | 15.00 |        | 25.00       |       |       |       |
| Unit Hyd. peak (  | cms)= | 0.08  |        | 0.05        |       |       |       |
|                   |       |       |        |             | *T01  | TALS* |       |

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\*TOTALS\*

| LangstaffRd_EA_Proposed_HumberWatershed |      |      |       |      |      |       |      |  |
|---|------|------|-------|------|------|-------|------|--|
| 2.00                                    | 0.63 | 5.25 | 28.84 | 8.50 | 1.25 | 11.75 | 0.63 |  |
| 2.25                                    | 0.63 | 5.50 | 8.15  | 8.75 | 1.25 | 12.00 | 0.63 |  |
| 2.50                                    | 3.76 | 5.75 | 8.15  | 9.00 | 1.25 | 12.25 | 0.63 |  |
| 2.75                                    | 3.76 | 6.00 | 8.15  | 9.25 | 1.25 |       |      |  |
| 3.00                                    | 3.76 | 6.25 | 8.15  | 9.50 | 0.63 |       |      |  |
| 3.25                                    | 3.76 | 6.50 | 4.39  | 9.75 | 0.63 |       |      |  |

| CALIB  <br>  STANDHYD ( 0105) <br> ID= 1 DT= 5.0 min | Area<br>Total | (ha)= 1.63<br>Imp(%)= 69.00 |              | 69.00 |
|--|---------------|-----------------------------|--------------|-------|
|  |               | IMPERVIOUS                  | PERVIOUS (i) |       |
| Surface Area   | (ha)=         | 1.12                        | 0.51         |       |
| Dep. Storage   | (mm)=         | 2.00                        | 5.00         |       |
| Average Slope  | (%)=          | 1.00                        | 2.00         |       |
| Length   | (m)=          | 650.00                      | 25.00        |       |
| Mannings n   | =             | 0.013                       | 0.250        |       |

|       |      | TP     | ANS EORME | D HYETOGR | ADH   |       |       |
|-------|------|--------|-----------|-----------|-------|-------|-------|
| TIME  | RAIN | l TIME | RAIN      | l' TIME   | RAIN  | TIME  | RAIN  |
| hrs   |      | hrs    | mm/hr     | ' hrs     | mm/hr | hrs   | mm/hr |
| 0.083 |      | 3.167  | 3.76      | 6.250     | 8.15  | 9.33  | 0.63  |
| 0.167 |      | 3.250  | 3.76      | 6.333     | 4.39  | 9.42  | 0.63  |
| 0.256 |      | 3.333  | 10.66     | 6.417     | 4.39  | 9.50  | 0.63  |
| 0.333 |      | 3.417  | 10.66     | 6.500     | 4.39  | 9.58  | 0.63  |
| 0.417 |      | 3.500  | 10.66     | 6.583     | 4.39  | 9.67  | 0.63  |
| 0.500 |      | 3.583  | 10.66     | 6.667     | 4.39  | 9.75  | 0.63  |
| 0.583 |      | 3.667  | 10.66     | 6.750     | 4.39  | 9.83  | 0.63  |
| 0.667 | 0.63 | 3.750  | 10.66     | 6.833     | 4.39  | 9.92  | 0.63  |
| 0.750 | 0.63 | 3.833  | 10.66     | 6.917     | 4.39  | 10.00 | 0.63  |
| 0.833 | 0.63 | 3.917  | 10.66     | 7.000     | 4.39  | 10.08 | 0.63  |
| 0.917 | 0.63 | 4.000  | 10.66     | 7.083     | 4.39  | 10.17 | 0.63  |
| 1.000 | 0.63 | 4.083  | 10.66     | 7.167     | 4.39  | 10.25 | 0.63  |
| 1.083 | 0.63 | 4.167  | 10.66     | 7.250     | 4.39  | 10.33 | 0.63  |
| 1.167 | 0.63 | 4.250  | 10.66     | 7.333     | 2.51  | 10.42 | 0.63  |
| 1.250 | 0.63 | 4.333  | 28.84     | 7.417     | 2.51  | 10.50 | 0.63  |
| 1.333 | 0.63 | 4.417  | 28.84     | 7.500     | 2.51  | 10.58 | 0.63  |
| 1.417 | 0.63 | 4.500  | 28.84     | 7.583     | 2.51  | 10.67 | 0.63  |
| 1.500 | 0.63 | 4.583  | 28.84     | 7.667     | 2.51  | 10.75 | 0.63  |
| 1.583 | 0.63 | 4.667  | 28.84     | 7.750     | 2.51  | 10.83 | 0.63  |
| 1.667 | 0.63 | 4.750  | 28.84     | 7.833     | 2.51  | 10.92 | 0.63  |
| 1.750 | 0.63 | 4.833  | 28.84     | 7.917     | 2.51  | 11.00 | 0.63  |
| 1.833 | 0.63 | 4.917  | 28.84     | 8.000     | 2.51  | 11.08 | 0.63  |
| 1.917 | 0.63 | 5.000  | 28.84     | 8.083     | 2.51  | 11.17 | 0.63  |
| 2.000 | 0.63 | 5.083  | 28.84     | 8.167     | 2.51  | 11.25 | 0.63  |
| 2.083 | 0.63 | 5.167  | 28.84     | 8.250     | 2.51  | 11.33 | 0.63  |
| 2.167 | 0.63 | 5.250  | 28.84     | 8.333     | 1.25  | 11.42 | 0.63  |
|       |      |        |           |           |       |       |       |

|                  | Lang    | staffRd_E | A_Propo | sed_HumberW | latersh | ed       |      |
|------------------|---------|-----------|---------|-------------|---------|----------|------|
| 2.256            | 0.63    | 5.333     | 8.15    | 8.417       | 1.25    | 11.50    | 0.63 |
| 2.333            | 3 3.76  | 5.417     | 8.15    | 8.500       | 1.25    | 11.58    | 0.63 |
| 2.417            | 7 3.76  | 5.500     | 8.15    | 8.583       | 1.25    | 11.67    | 0.63 |
| 2.500            | 3.76    | 5.583     | 8.15    | 8.667       | 1.25    | 11.75    | 0.63 |
| 2.583            | 3 3.76  | 5.667     | 8.15    | 8.750       | 1.25    | 11.83    | 0.63 |
| 2.667            | 7 3.76  | 5.750     | 8.15    | 8.833       | 1.25    | 11.92    | 0.63 |
| 2.756            | 3.76    | 5.833     | 8.15    | 8.917       | 1.25    | 12.00    | 0.63 |
| 2.833            | 3 3.76  | 5.917     | 8.15    | 9.000       | 1.25    | 12.08    | 0.63 |
| 2.917            | 7 3.76  | 6.000     | 8.15    | 9.083       | 1.25    | 12.17    | 0.63 |
| 3.000            | 3.76    | 6.083     | 8.15    | 9.167       | 1.25    | 12.25    | 0.63 |
| 3.083            | 3.76    | 6.167     | 8.15    | 9.250       | 1.25    |          |      |
| Max.Eff.Inten.(r | nm/hr)- | 28.84     |         | 20.82       |         |          |      |
|                  | (min)   | 15.00     |         | 25.00       |         |          |      |
| Storage Coeff.   |         |           | (ii)    | 22.89 (ii)  |         |          |      |
| Unit Hyd. Tpeak  |         | 15.00     | (11)    | 25.00       |         |          |      |
|                  |         |           |         |             |         |          |      |
| Unit Hyd. peak   | (cms)=  | 0.08      |         | 0.05        | *****   |          |      |
|                  |         |           |         |             |         | TALS*    |      |
| PEAK FLOW        | (cms)=  | 0.09      |         | 0.02        |         | .111 (ii | li)  |
| TIME TO PEAK     | (hrs)=  | 5.25      |         | 5.33        | 5       | 5.25     |      |
| RUNOFF VOLUME    | (mm)=   | 60.71     |         | 33.62       | 52      | 2.30     |      |
| TOTAL RAINFALL   | (mm)=   | 62.71     |         | 62.71       | 62      | 2.71     |      |
| RUNOFF COEFFICIE | ENT =   | 0.97      |         | 0.54        | 6       | 3.83     |      |
|                  |         |           |         |             |         |          |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 86.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| RESERVOIR( 0520)   | OVERFLOW 1    | S OFF        |               |         |  |
|--------------------|---------------|--------------|---------------|---------|--|
| IN= 2> OUT= 1      |               |              |               |         |  |
| DT= 5.0 min        | OUTFLOW       | STORAGE      | OUTFLOW       | STORAGE |  |
|                    | (cms)         | (ha.m.)      | (cms)         | (ha.m.) |  |
|                    | 0.0000        | 0.0000       | 0.0181        | 0.0161  |  |
|                    | 0.0081        | 0.0031       | 0.0584        | 0.0204  |  |
|                    | 0.0123        | 0.0074       | 0.0920        | 0.0259  |  |
|                    | 0.0155        | 0.0118       | 0.0000        | 0.0000  |  |
|                    |               |              |               |         |  |
|                    | ARE           | A QPEAK      | TPEAK         | R.V.    |  |
|                    | (ha           | a) (cms)     | (hrs)         | (mm)    |  |
| INFLOW : ID= 2 ( 0 | 105) Ì.6      | 30 0.11      | 11 5.25       | 52,30   |  |
|                    | 520) 1.6      |              |               | 52.25   |  |
| •                  | •             |              |               |         |  |
| PFA                | K FLOW RE     | DUCTTON [Ooi | ut/Qin](%)= 8 | 81.20   |  |
| TTM                | E SHIFT OF PE |              |               |         |  |
|                    | IMUM STORAGE  |              | (ha.m.)=      |         |  |
| 1000               |               |              | ()-           |         |  |
|                    |               |              |               |         |  |
|                    |               |              |               |         |  |

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| LangstaffRd_EA_Proposed_HumberWatershed |         |           |              |             |  |  |  |  |
|---|---------|-----------|--------------|-------------|--|--|--|--|
| 3.08                                    | 3 3.76  | 6.167 8   | .15   9.250  | 1.25        |  |  |  |  |
|   |         |           |              |             |  |  |  |  |
| Max.Eff.Inten.(                         | mm/hr)= | 28.84     | 19.01        |             |  |  |  |  |
| over                                    | (min)   | 15.00     | 20.00        |             |  |  |  |  |
| Storage Coeff.                          | (min)=  | 14.63 (ii | ) 18.80 (ii) |             |  |  |  |  |
| Unit Hyd. Tpeak                         | (min)=  | 15.00     | 20.00        |             |  |  |  |  |
| Unit Hyd. peak                          | (cms)=  | 0.08      | 0.06         |             |  |  |  |  |
|   |         |           |              | *TOTALS*    |  |  |  |  |
| PEAK FLOW                               | (cms)=  | 0.13      | 0.02         | 0.151 (iii) |  |  |  |  |
| TIME TO PEAK                            | (hrs)=  | 5.25      | 5.33         | 5.25        |  |  |  |  |
| RUNOFF VOLUME                           | (mm)=   | 60.71     | 30.35        | 55.24       |  |  |  |  |
| TOTAL RAINFALL                          | (mm)=   | 62.71     | 62.71        | 62.71       |  |  |  |  |
| RUNOFF COFFETCT                         | FNT =   | 0.97      | 0.48         | 0.88        |  |  |  |  |

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 83.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COFFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB<br>  STANDHYD ( 0125)<br> ID= 1 DT= 5.0 min                     | Area<br>Total                  | (ha)= 2.27<br>Imp(%)= 77.00                           |  | 77.00 |
|---|--------------------------------|---|--|-------|
| Surface Area<br>Dep. Storage<br>Average Slope<br>Length<br>Mannings n | (ha)=<br>(mm)=<br>(%)=<br>(m)= | IMPERVIOUS<br>1.75<br>2.00<br>1.00<br>800.00<br>0.013 | PERVIOUS (i)<br>0.52<br>5.00<br>2.00<br>20.00<br>0.250 |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TRANSFORMED HYETOGRAPH |       |       |       |        |       |       |       |  |
|------------------------|-------|-------|-------|--------|-------|-------|-------|--|
| TIME                   | RAIN  | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |
| hrs                    | mm/hr | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |
| 0.083                  | 0.00  | 3.167 | 3.76  | 6.250  | 8.15  | 9.33  | 0.63  |  |
| 0.167                  | 0.00  | 3.250 | 3.76  | 6.333  | 4.39  | 9.42  | 0.63  |  |
| 0.250                  | 0.00  | 3.333 | 10.66 | 6.417  | 4.39  | 9.50  | 0.63  |  |
| 0.333                  | 0.63  | 3.417 | 10.66 | 6.500  | 4.39  | 9.58  | 0.63  |  |
| 0.417                  | 0.63  | 3.500 | 10.66 | 6.583  | 4.39  | 9.67  | 0.63  |  |
| 0.500                  | 0.63  | 3.583 | 10.66 | 6.667  | 4.39  | 9.75  | 0.63  |  |
| 0.583                  | 0.63  | 3.667 | 10.66 | 6.750  | 4.39  | 9.83  | 0.63  |  |
| 0.667                  | 0.63  | 3.750 | 10.66 | 6.833  | 4.39  | 9.92  | 0.63  |  |
| 0.750                  | 0.63  | 3.833 | 10.66 | 6.917  | 4.39  | 10.00 | 0.63  |  |
| 0.833                  | 0.63  | 3.917 | 10.66 | 7.000  | 4.39  | 10.08 | 0.63  |  |
| 0.917                  | 0.63  | 4.000 | 10.66 | 7.083  | 4.39  | 10.17 | 0.63  |  |
| 1.000                  | 0.63  | 4.083 | 10.66 | 7.167  | 4.39  | 10.25 | 0.63  |  |
| 1.083                  | 0.63  | 4.167 | 10.66 | 7.250  | 4.39  | 10.33 | 0.63  |  |
|                        |       |       |       |        |       |       |       |  |

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#### LangstaffRd\_EA\_Proposed\_HumberWatershed

| CALIB             |       |         |       |                |       |
|-------------------|-------|---------|-------|----------------|-------|
| STANDHYD ( 0130)  | Area  | (ha)=   | 2.08  |                |       |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 82.00 | Dir. Conn.(%)= | 82.00 |
|                   |       |         |       |                |       |
|                   |       | IMPERVI | OUS   | PERVIOUS (i)   |       |
| Surface Area      | (ha)= | 1.7     | 1     | 0.37           |       |
| Dep. Storage      | (mm)= | 2.0     | 0     | 5.00           |       |
| Average Slope     | (%)=  | 1.0     | 0     | 2.00           |       |
| Length            | (m)=  | 800.0   | 0     | 20.00          |       |
| Mannings n        | =     | 0.01    | 3     | 0.250          |       |
|                   |       |         |       |                |       |

|       |       | TR    | ANSFORME | HYETOGR. | APH   |       |       |
|-------|-------|-------|----------|----------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME   | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs    | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.76     | 6.250    | 8.15  | 9.33  | 0.63  |
| 0.167 | 0.00  | 3.250 | 3.76     | 6.333    | 4.39  | 9.42  | 0.63  |
| 0.250 | 0.00  | 3.333 | 10.66    | 6.417    | 4.39  | 9.50  | 0.63  |
| 0.333 | 0.63  | 3.417 | 10.66    | 6.500    | 4.39  | 9.58  | 0.63  |
| 0.417 | 0.63  | 3.500 | 10.66    | 6.583    | 4.39  | 9.67  | 0.63  |
| 0.500 | 0.63  | 3.583 | 10.66    | 6.667    | 4.39  | 9.75  | 0.63  |
| 0.583 | 0.63  | 3.667 | 10.66    | 6.750    | 4.39  | 9.83  | 0.63  |
| 0.667 | 0.63  | 3.750 | 10.66    | 6.833    | 4.39  | 9.92  | 0.63  |
| 0.750 | 0.63  | 3.833 | 10.66    | 6.917    | 4.39  | 10.00 | 0.63  |
| 0.833 | 0.63  | 3.917 | 10.66    | 7.000    | 4.39  | 10.08 | 0.63  |
| 0.917 | 0.63  | 4.000 | 10.66    | 7.083    | 4.39  | 10.17 | 0.63  |
| 1.000 | 0.63  | 4.083 | 10.66    | 7.167    | 4.39  | 10.25 | 0.63  |
| 1.083 | 0.63  | 4.167 | 10.66    | 7.250    | 4.39  | 10.33 | 0.63  |
| 1.167 | 0.63  | 4.250 | 10.66    | 7.333    | 2.51  | 10.42 | 0.63  |
| 1.250 | 0.63  | 4.333 | 28.84    | 7.417    | 2.51  | 10.50 | 0.63  |
| 1.333 | 0.63  | 4.417 | 28.84    | 7.500    | 2.51  | 10.58 | 0.63  |
| 1.417 | 0.63  | 4.500 | 28.84    | 7.583    | 2.51  | 10.67 | 0.63  |
| 1.500 | 0.63  | 4.583 | 28.84    | 7.667    | 2.51  | 10.75 | 0.63  |
| 1.583 | 0.63  | 4.667 | 28.84    | 7.750    | 2.51  | 10.83 | 0.63  |
| 1.667 | 0.63  | 4.750 | 28.84    | 7.833    | 2.51  | 10.92 | 0.63  |
| 1.750 | 0.63  | 4.833 | 28.84    | 7.917    | 2.51  | 11.00 | 0.63  |
| 1.833 | 0.63  | 4.917 | 28.84    | 8.000    | 2.51  | 11.08 | 0.63  |
| 1.917 | 0.63  | 5.000 | 28.84    | 8.083    | 2.51  | 11.17 | 0.63  |
| 2.000 | 0.63  | 5.083 | 28.84    | 8.167    | 2.51  | 11.25 | 0.63  |
| 2.083 | 0.63  | 5.167 | 28.84    | 8.250    | 2.51  | 11.33 | 0.63  |
| 2.167 | 0.63  | 5.250 | 28.84    | 8.333    | 1.25  | 11.42 | 0.63  |
| 2.250 | 0.63  | 5.333 | 8.15     | 8.417    | 1.25  | 11.50 | 0.63  |
| 2.333 | 3.76  | 5.417 | 8.15     | 8.500    | 1.25  | 11.58 | 0.63  |
| 2.417 | 3.76  | 5.500 | 8.15     | 8.583    | 1.25  | 11.67 | 0.63  |
| 2.500 | 3.76  | 5.583 | 8.15     | 8.667    | 1.25  | 11.75 | 0.63  |
| 2.583 | 3.76  | 5.667 | 8.15     | 8.750    | 1.25  | 11.83 | 0.63  |
| 2.667 | 3.76  | 5.750 | 8.15     | 8.833    | 1.25  | 11.92 | 0.63  |
| 2.750 | 3.76  | 5.833 | 8.15     | 8.917    | 1.25  | 12.00 | 0.63  |
| 2.833 | 3.76  | 5.917 | 8.15     | 9.000    | 1.25  | 12.08 | 0.63  |
| 2.917 | 3.76  | 6.000 | 8.15     | 9.083    | 1.25  | 12.17 | 0.63  |
| 3.000 | 3.76  | 6.083 | 8.15     | 9.167    | 1.25  | 12.25 | 0.63  |

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|       |      |       |       | ed_Humber |      |       |      |
|-------|------|-------|-------|-----------|------|-------|------|
| 1.167 | 0.63 | 4.250 | 10.66 | 7.333     | 2.51 | 10.42 | 0.63 |
| 1.250 | 0.63 | 4.333 | 28.84 | 7.417     | 2.51 | 10.50 | 0.63 |
| 1.333 | 0.63 | 4.417 | 28.84 | 7.500     | 2.51 | 10.58 | 0.63 |
| 1.417 | 0.63 | 4.500 | 28.84 | 7.583     | 2.51 | 10.67 | 0.63 |
| 1.500 | 0.63 | 4.583 | 28.84 | 7.667     | 2.51 | 10.75 | 0.63 |
| 1.583 | 0.63 | 4.667 | 28.84 | 7.750     | 2.51 | 10.83 | 0.63 |
| 1.667 | 0.63 | 4.750 | 28.84 | 7.833     | 2.51 | 10.92 | 0.63 |
| 1.750 | 0.63 | 4.833 | 28.84 | 7.917     | 2.51 | 11.00 | 0.63 |
| 1.833 | 0.63 | 4.917 | 28.84 | 8.000     | 2.51 | 11.08 | 0.63 |
| 1.917 | 0.63 | 5.000 | 28.84 | 8.083     | 2.51 | 11.17 | 0.63 |
| 2.000 | 0.63 | 5.083 | 28.84 | 8.167     | 2.51 | 11.25 | 0.63 |
| 2.083 | 0.63 | 5.167 | 28.84 | 8.250     | 2.51 | 11.33 | 0.63 |
| 2.167 | 0.63 | 5.250 | 28.84 | 8.333     | 1.25 | 11.42 | 0.63 |
| 2.250 | 0.63 | 5.333 | 8.15  | 8.417     | 1.25 | 11.50 | 0.63 |
| 2.333 | 3.76 | 5.417 | 8.15  | 8.500     | 1.25 | 11.58 | 0.63 |
| 2.417 | 3.76 | 5.500 | 8.15  | 8.583     | 1.25 | 11.67 | 0.63 |
| 2.500 | 3.76 | 5.583 | 8.15  | 8.667     | 1.25 | 11.75 | 0.63 |
| 2.583 | 3.76 | 5.667 | 8.15  | 8.750     | 1.25 | 11.83 | 0.63 |
| 2.667 | 3.76 | 5.750 | 8.15  | 8.833     | 1.25 | 11.92 | 0.63 |
| 2.750 | 3.76 | 5.833 | 8.15  | 8.917     | 1.25 | 12.00 | 0.63 |
| 2.833 | 3.76 | 5.917 | 8.15  | 9.000     | 1.25 | 12.08 | 0.63 |
| 2.917 | 3.76 | 6.000 | 8.15  | 9.083     | 1.25 | 12.17 | 0.63 |
| 3.000 | 3.76 | 6.083 | 8.15  | 9.167     | 1.25 | 12.25 | 0.63 |
| 3.083 | 3.76 | 6.167 | 8.15  | 9.250     | 1.25 | i     |      |
|       |      |       |       |           |      | •     |      |

| Max.Eff.Inten.( | mm/hr)= | 28.84      | 19.01      |             |
|-----------------|---------|------------|------------|-------------|
| over            | (min)   | 15.00      | 20.00      |             |
| Storage Coeff.  | (min)=  | 14.63 (ii) | 19.35 (ii) |             |
| Unit Hyd. Tpeak | (min)=  | 15.00      | 20.00      |             |
| Unit Hyd. peak  | (cms)=  | 0.08       | 0.06       |             |
|                 |         |            |            | *TOTALS*    |
| PEAK FLOW       | (cms)=  | 0.14       | 0.02       | 0.160 (iii) |
| TIME TO PEAK    | (hrs)=  | 5.25       | 5.33       | 5.25        |
| RUNOFF VOLUME   | (mm)=   | 60.71      | 30.35      | 53.72       |
| TOTAL RAINFALL  | (mm)=   | 62.71      | 62.71      | 62.71       |
| RUNOFF COEFFICI | ENT =   | 0.97       | 0.48       | 0.86        |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0405)   |      |       |       |       |
|-------------------|------|-------|-------|-------|
| 1 + 2 = 3         | AREA | QPEAK | TPEAK | R.V.  |
|                   | (ha) | (cms) | (hrs) | (mm)  |
| ID1= 1 ( 0125):   | 2.27 | 0.160 | 5.25  | 53.72 |
| + ID2= 2 ( 0130): | 2.08 | 0.151 | 5.25  | 55.24 |
|                   |      |       |       |       |

## $\label{eq:loss_loss} LangstaffRd\_EA\_Proposed\_HumberWatershed \\ ID = 3 ( 0405): 4.35 0.311 5.25 54.45$

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| SERVOIR( 0505)   | OVERFLOW                           | IS OFF    |       |                                     |         |
|------------------|------------------------------------|-----------|-------|-------------------------------------|---------|
| I= 2> OUT= 1     |                                    |           |       |                                     |         |
| 5.0 min          | OUTFLOW                            | STORAG    |       | OUTFLOW                             | STORAGE |
|                  | (cms)                              | (ha.m.    | )     | (cms)                               | (ha.m.) |
|                  | 0.0000                             | 0.000     | 0     | 0.2110                              | 0.0383  |
|                  | 0.0185                             | 0.003     | 0 İ   | 0.2743                              | 0.0515  |
|                  | 0.0302                             | 0.012     | ø i   | 0.3250                              | 0.0792  |
|                  | 0.1102                             | 0.025     | 1 İ   | 0.0000                              | 0.0000  |
|                  | А                                  | REA O     | PEAK  | TPEAK                               | R.V.    |
|                  | (                                  | ha) (     | cms)  | (hrs)                               | (mm)    |
| FLOW : ID= 2 ( 0 |                                    |           |       |                                     |         |
| TFLOW: ID= 1 ( 0 |                                    |           | 0.261 |                                     |         |
|                  | K FLOW<br>E SHIFT OF<br>IMUM STORA | PEAK FLOW |       | 'Qin](%)= 8<br>(min)= 1<br>(ha.m.)= | 0.00    |

LOUTE

| CALIB             |       |           |       |                |       |
|-------------------|-------|-----------|-------|----------------|-------|
| STANDHYD ( 0120)  | Area  | (ha)=     | 1.24  |                |       |
| ID= 1 DT= 5.0 min | Total | Imp(%)= 7 | 73.00 | Dir. Conn.(%)= | 73.00 |
|                   |       |           |       |                |       |
|                   |       | IMPERVIOL | JS    | PERVIOUS (i)   |       |
| Surface Area      | (ha)= | 0.91      |       | 0.33           |       |
| Dep. Storage      | (mm)= | 2.00      |       | 5.00           |       |
| Average Slope     | (%)=  | 1.00      |       | 2.00           |       |
| Length            | (m)=  | 475.00    |       | 17.00          |       |
| Mannings n        | =     | 0.013     |       | 0.250          |       |
|                   |       |           |       |                |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | D HYETOGRA | APH   |       |       |
|-------|-------|-------|----------|------------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME     | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs      | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.76     | 6.250      | 8.15  | 9.33  | 0.63  |
| 0.167 | 0.00  | 3.250 | 3.76     | 6.333      | 4.39  | 9.42  | 0.63  |
| 0.250 | 0.00  | 3.333 | 10.66    | 6.417      | 4.39  | 9.50  | 0.63  |
| 0.333 | 0.63  | 3.417 | 10.66    | 6.500      | 4.39  | 9.58  | 0.63  |
| 0.417 | 0.63  | 3.500 | 10.66    | 6.583      | 4.39  | 9.67  | 0.63  |
| 0.500 | 0.63  | 3.583 | 10.66    | 6.667      | 4.39  | 9.75  | 0.63  |
| 0.583 | 0.63  | 3.667 | 10.66    | 6.750      | 4.39  | 9.83  | 0.63  |
| 0.667 | 0.63  | 3.750 | 10.66    | 6.833      | 4.39  | 9.92  | 0.63  |
| 0.750 | 0.63  | 3.833 | 10.66    | 6.917      | 4.39  | 10.00 | 0.63  |
| 0.833 | 0.63  | 3.917 | 10.66    | 7.000      | 4.39  | 10.08 | 0.63  |
| 0.917 | 0.63  | 4.000 | 10.66    | 7.083      | 4.39  | 10.17 | 0.63  |

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|               | Lang  | staffRd EA P | roposed Humberl | Watershed |
|---------------|-------|--------------|-----------------|-----------|
| Surface Area  | (ha)= | 0.63         | 0.37            |           |
| Dep. Storage  | (mm)= | 2.00         | 5.00            |           |
| Average Slope | (%)=  | 1.00         | 2.00            |           |
| Length        | (m)=  | 475.00       | 17.00           |           |
| Mannings n    | =     | 0.013        | 0.250           |           |
|               |       |              |                 |           |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TRA   | ANSFORMFI | HYETOGR | ΔPH   |        |       |
|-------|-------|-------|-----------|---------|-------|--------|-------|
| TIME  | RAIN  | TIME  | RAIN      | l' TIME | RAIN  | I TIME | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr     | ' hrs   | mm/hr | hrs    | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.76      | 6.250   | 8.15  | 9.33   | 0.63  |
| 0.167 | 0.00  | 3.250 | 3.76      | 6.333   | 4.39  | 9.42   | 0.63  |
| 0.250 | 0.00  | 3.333 | 10.66     | 6.417   | 4.39  | 9.50   | 0.63  |
| 0.333 | 0.63  | 3.417 | 10.66     | 6.500   | 4.39  | 9.58   | 0.63  |
| 0.417 | 0.63  | 3.500 | 10.66     | 6.583   | 4.39  | 9.67   | 0.63  |
| 0.500 | 0.63  | 3.583 | 10.66     | 6.667   | 4.39  | 9.75   | 0.63  |
| 0.583 | 0.63  | 3.667 | 10.66     | 6.750   | 4.39  | 9.83   | 0.63  |
| 0.667 | 0.63  | 3.750 | 10.66     | 6.833   | 4.39  | 9.92   | 0.63  |
| 0.750 | 0.63  | 3.833 | 10.66     | 6.917   | 4.39  | 10.00  | 0.63  |
| 0.833 | 0.63  | 3.917 | 10.66     | 7.000   | 4.39  | 10.08  | 0.63  |
| 0.917 | 0.63  | 4.000 | 10.66     | 7.083   | 4.39  | 10.17  | 0.63  |
| 1.000 | 0.63  |       | 10.66     | 7.167   | 4.39  | 10.25  | 0.63  |
| 1.083 | 0.63  | 4.167 | 10.66     | 7.250   | 4.39  | 10.33  | 0.63  |
| 1.167 | 0.63  | 4.250 | 10.66     | 7.333   | 2.51  | 10.42  | 0.63  |
| 1.250 | 0.63  | 4.333 | 28.84     | 7.417   | 2.51  | 10.50  | 0.63  |
| 1.333 | 0.63  | 4.417 | 28.84     | 7.500   | 2.51  | 10.58  | 0.63  |
| 1.417 | 0.63  | 4.500 | 28.84     | 7.583   | 2.51  | 10.67  | 0.63  |
| 1.500 | 0.63  | 4.583 | 28.84     | 7.667   | 2.51  | 10.75  | 0.63  |
| 1.583 | 0.63  | 4.667 | 28.84     | 7.750   | 2.51  | 10.83  | 0.63  |
| 1.667 | 0.63  | 4.750 | 28.84     | 7.833   | 2.51  | 10.92  | 0.63  |
| 1.750 | 0.63  | 4.833 | 28.84     | 7.917   | 2.51  | 11.00  | 0.63  |
| 1.833 | 0.63  | 4.917 | 28.84     | 8.000   | 2.51  | 11.08  | 0.63  |
| 1.917 | 0.63  | 5.000 | 28.84     | 8.083   | 2.51  | 11.17  | 0.63  |
| 2.000 | 0.63  | 5.083 | 28.84     | 8.167   | 2.51  | 11.25  | 0.63  |
| 2.083 | 0.63  | 5.167 | 28.84     | 8.250   | 2.51  | 11.33  | 0.63  |
| 2.167 | 0.63  | 5.250 | 28.84     | 8.333   | 1.25  | 11.42  | 0.63  |
| 2.250 | 0.63  | 5.333 | 8.15      | 8.417   | 1.25  | 11.50  | 0.63  |
| 2.333 | 3.76  | 5.417 | 8.15      | 8.500   | 1.25  | 11.58  | 0.63  |
| 2.417 | 3.76  | 5.500 | 8.15      | 8.583   | 1.25  | 11.67  | 0.63  |
| 2.500 | 3.76  | 5.583 | 8.15      | 8.667   | 1.25  | 11.75  | 0.63  |
| 2.583 | 3.76  | 5.667 | 8.15      | 8.750   | 1.25  | 11.83  | 0.63  |
| 2.667 | 3.76  | 5.750 | 8.15      | 8.833   | 1.25  | 11.92  | 0.63  |
| 2.750 | 3.76  | 5.833 | 8.15      | 8.917   | 1.25  | 12.00  | 0.63  |
| 2.833 | 3.76  | 5.917 | 8.15      | 9.000   | 1.25  | 12.08  | 0.63  |
| 2.917 | 3.76  | 6.000 | 8.15      | 9.083   | 1.25  | 12.17  | 0.63  |
| 3.000 | 3.76  | 6.083 | 8.15      | 9.167   | 1.25  | 12.25  | 0.63  |
| 3.083 | 3.76  | 6.167 | 8.15      | 9.250   | 1.25  |        |       |

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LangstaffRd_EA_Proposed_HumberWatershed

0.63 | 4.083 | 10.66 | 7.167 | 4.39 | 18

0.63 | 4.167 | 10.66 | 7.259 | 4.39 | 18

0.63 | 4.250 | 10.66 | 7.333 | 2.51 | 18

0.63 | 4.333 | 28.84 | 7.417 | 2.51 | 19

0.63 | 4.333 | 28.84 | 7.580 | 2.51 | 18

0.63 | 4.500 | 28.84 | 7.580 | 2.51 | 18

0.63 | 4.500 | 28.84 | 7.567 | 2.51 | 18

0.63 | 4.567 | 28.84 | 7.750 | 2.51 | 18

0.63 | 4.583 | 28.84 | 7.750 | 2.51 | 18

0.63 | 4.667 | 28.84 | 7.750 | 2.51 | 18

0.63 | 4.672 | 28.84 | 7.750 | 2.51 | 18

0.63 | 4.750 | 28.84 | 7.833 | 2.51 | 18

0.63 | 4.833 | 28.84 | 7.917 | 2.51 | 11

0.63 | 5.808 | 28.84 | 8.883 | 2.51 | 11

0.63 | 5.500 | 28.84 | 8.893 | 2.51 | 11

0.63 | 5.55 | 28.84 | 8.250 | 2.51 | 12

0.63 | 5.55 | 28.84 | 8.250 | 2.51 | 12

0.63 | 5.583 | 28.84 | 8.333 | 2.51 | 12

0.63 | 5.583 | 28.84 | 8.333 | 2.51 | 12

0.63 | 5.583 | 8.15 | 8.417 | 1.25 | 12

0.63 | 5.588 | 8.15 | 8.590 | 1.25 | 12

0.76 | 5.590 | 8.15 | 8.590 | 1.25 | 12

0.76 | 5.583 | 8.15 | 8.667 | 1.25 | 12

0.76 | 5.667 | 8.15 | 8.750 | 1.25 | 12

0.76 | 5.833 | 8.15 | 8.833 | 1.25 | 12

0.76 | 5.833 | 8.15 | 8.831 | 1.25 | 12

0.76 | 5.600 | 8.15 | 8.833 | 1.25 | 12

0.76 | 5.600 | 8.15 | 8.833 | 1.25 | 12

0.76 | 5.600 | 8.15 | 8.833 | 1.25 | 12

0.76 | 5.600 | 8.15 | 8.833 | 1.25 | 12

0.76 | 5.600 | 8.15 | 8.833 | 1.25 | 12

0.76 | 5.600 | 8.15 | 9.000 | 1.25 | 12

0.76 | 6.083 | 8.15 | 9.017 | 1.25 | 12

0.76 | 6.608 | 8.15 | 9.017 | 1.25 | 12

0.77 | 1.25 | 12

0.78 | 1.25 | 12

0.79 | 1.25 | 12

0.70 | 1.25 | 12

0.70 | 1.25 | 12

0.70 | 1.25 | 12

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0.70 | 1.25 | 12

                                                                                                   1.000
                                                                                                                                                                                                                                                                                                                                                                           4.39 | 10.25
4.39 | 10.33
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  0.63
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  0.63
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                0.63
0.63
0.63
0.63
0.63
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1.167
1.250
1.333
1.417
1.500
1.583
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10.50
10.58
10.67
10.75
10.83
10.92
11.00
11.08
11.17
11.25
11.33
11.42
11.50
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                                                                                                   1.667
1.750
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    0.63
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    0.63
                                                                                                   1.833
1.917
2.000
2.083
2.167
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0.63
0.63
0.63
0.63
                                                                                                   2,250
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                                                                                                                                                                                                                                                                                                                                                                       1.25 | 11.50

1.25 | 11.58

1.25 | 11.67

1.25 | 11.75

1.25 | 11.83

1.25 | 11.92

1.25 | 12.00

1.25 | 12.08

1.25 | 12.17

1.25 | 12.25

1.25 | 12.25
                                                                                                   2.333
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  0.63
0.63
                                                                                                   2.417
2.500
2.583
2.667
2.750
2.833
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                0.63
0.63
0.63
0.63
                                                                                                   2.917
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    0.63
                                                                                                   3.000
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  0.63
                           Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                                                                                                                                                                               28.84 19.01
10.00 20.00
10.70 (ii) 15.37 (ii)
                                                                                                                                                                                                                 10.00
                                                                                                                                                                                                                                                                                                      20.00
0.07
                                                                                                                                                                                                                       0.11
                                                                                                                                                                                                                                                                                                                                                                                           *TOTALS*
                           PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                                                                                                                                                                                 0.07
5.25
60.71
62.71
0.97
                                                                                                                                                                                                                                                                                                                                                                                                  TOTALS*
0.087 (iii)
5.25
52.51
62.71
0.84
                                                                                                                                                                                                                                                                                                    0.02
5.33
30.35
62.71
0.48
                                         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
                            (1) CN* PROCEDURE SELECTED FOR FEXTURES USED SELECTED FOR FEXTURE STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
| CALIB
| STANDHYD ( 0115) | Area (ha)= 1.00
|ID= 1 DT= 5.0 min | Total Imp(%)= 63.00 Dir. Conn.(%)= 63.00
                                                                                                                                                                                            IMPERVIOUS PERVIOUS (i)
                                                                                                                                                                                                                                                                       Page 30
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|  |           | ffRd_EA_     |         |           | rWate | rshed          |
|--|-----------|--------------|---------|-----------|-------|----------------|
| Unit Hyd. Tpeak (m   | in)=      | 10.00        | 26      | 0.00      |       |                |
| Unit Hyd. peak (c  | ms)=      | 0.11         | (       | 0.06      |       | TOTALS*        |
| BEAK ELON (6   | mc ) -    | 0.05         |         | 2 02      | -     | 0.066 (iii)    |
| PEAK FLOW (C<br>TIME TO PEAK (H<br>RUNOFF VOLUME (<br>TOTAL RAINFALL ( | ms)=      | 0.05<br>E 2E | ,       | 2.02      |       | 0.000 (111)    |
| PLINGE VOLUME (  | mm)-      | 60 71        | 30      | 3.33      |       | 19 17          |
| TOTAL PATNEALL (   | mm) =     | 62 71        | 61      | 71        |       | 62 71          |
| RUNOFF COEFFICIENT   |           | 0 97         |         | 2 48      |       | 0.79           |
| NONOTT COLTTELLA   |           | 0.57         | •       | 31.40     |       | 0175           |
| (i) CN PROCEDURE   | SELECTED  | EOR DER      | TOUS 10 | necec.    |       |                |
| CN* = 83.  |           |              |         |           |       |                |
| (ii) TIME STEP (D  |           |              |         |           |       |                |
| THAN THE STO   |           |              |         | LQUAL     |       |                |
| (iii) PEAK FLOW DO   |           |              |         | TF ANY.   |       |                |
| (,   |           |              |         |           |       |                |
|  |           |              |         |           |       |                |
|  |           |              |         |           |       |                |
|  |           |              |         |           |       |                |
| ADD HYD ( 0410)  |           |              |         |           |       |                |
| 1 + 2 = 3  | AREA      | A QPE        | AK TI   | PEAK      | R.V.  |                |
| ADD HYD ( 0410) <br>  1 + 2 = 3  | (ha)      | (cm          | s) (1   | nrs)      | (mm)  |                |
| ID1= 1 ( 0115)   | : 1.06    | 0.06         | b 5.    | . 25 4    | 19.4/ |                |
| + 1D2= 2 ( 0120)   | : 1.24    | 0.08         | / 5.    | . 25      | 2.51  |                |
| ID = 3 ( 0410)   |           |              |         |           |       |                |
| (/   |           |              |         |           |       |                |
| NOTE: PEAK FLOWS   |           |              |         |           |       |                |
|  |           |              |         |           |       |                |
|  | OVEREI ON | I TS OFF     |         |           |       |                |
| IN= 2> OUT= 1  |           |              |         |           |       |                |
| DT= 5.0 min  | OUTFLOW   | STOR         | AGE     | OUTFLO    | W     | STORAGE        |
| ·  | (cms)     | (ha.ı        | n.) j   | (cms)     | )     | (ha.m.)        |
|  | 0.0000    | 0.0          | 900 j   | 0.069     | 99    | 0.0309         |
|  | 0.0264    | 0.0          | 924 j   | 0.079     | 92    | 0.0414         |
|  | 0.0457    | 0.0          | 999     | 0.087     | 76    | 0.0666         |
| RESERVOIR( 0510)<br>  IN= 2> OUT= 1<br>  DT= 5.0 min                   | 0.0590    | 0.0          | 204     | 0.000     | 90    | 0.0000         |
|  |           | RFA          | OPFAK   | TPF       | ıĸ    | R.V.           |
|  | ,         | ha)          | (cms)   | (hrs      | :)    | (mm)           |
| INFLOW: ID= 2 ( 04   | 10)       | .240         | 0.154   | 4         | .25   | 51.15          |
| INFLOW : ID= 2 ( 04<br>OUTFLOW: ID= 1 ( 05                             | 10) 2     | 2.240        | 0.074   | 4 5       | .58   | 51.15<br>51.14 |
|  | FLOW      |              |         |           |       |                |
|  | SHIFT OF  |              |         |           |       |                |
|  | MUM STORA |              |         |           |       |                |
| PIAXI  | 31000     | 03           |         | (110.111. | ,- 6  | .0501          |
|  |           |              |         |           |       |                |
|  |           |              |         |           |       |                |

AREA OPEAK TPEAK

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ADD HYD ( 0420)

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB<br>  STANDHYD ( 0110) <br> ID= 1 DT= 5.0 min | Area<br>Total | (ha)=<br>Imp(%)= | 1.58<br>70.00 | Dir. Conn.(%)= | 70.00 |
|--|---------------|------------------|---------------|----------------|-------|
|  |               | IMPERVI          | ous           | PERVIOUS (i)   |       |
| Surface Area                                       | (ha)=         | 1.1              | 1             | 0.47           |       |
| Dep. Storage                                       | (mm)=         | 2.0              | 0             | 5.00           |       |
| Average Slope                                      | (%)=          | 1.0              | 0             | 2.00           |       |
| Length   | (m)=          | 650.0            | 0             | 25.00          |       |
| Mannings n   | =             | 0.01             | 3             | 0.250          |       |
|  |               |                  |               |                |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.76     | 6.250   | 8.15  | 9.33  | 0.63  |
| 0.167 | 0.00  | 3.250 | 3.76     | 6.333   | 4.39  | 9.42  | 0.63  |
| 0.250 | 0.00  | 3.333 | 10.66    | 6.417   | 4.39  | 9.50  | 0.63  |
| 0.333 | 0.63  | 3.417 | 10.66    | 6.500   | 4.39  | 9.58  | 0.63  |
| 0.417 | 0.63  | 3.500 | 10.66    | 6.583   | 4.39  | 9.67  | 0.63  |
| 0.500 | 0.63  | 3.583 | 10.66    | 6.667   | 4.39  | 9.75  | 0.63  |
| 0.583 | 0.63  | 3.667 | 10.66    | 6.750   | 4.39  | 9.83  | 0.63  |
| 0.667 | 0.63  | 3.750 | 10.66    | 6.833   | 4.39  | 9.92  | 0.63  |
| 0.750 | 0.63  | 3.833 | 10.66    | 6.917   | 4.39  | 10.00 | 0.63  |
| 0.833 | 0.63  | 3.917 | 10.66    | 7.000   | 4.39  | 10.08 | 0.63  |
| 0.917 | 0.63  | 4.000 | 10.66    | 7.083   | 4.39  | 10.17 | 0.63  |
| 1.000 | 0.63  | 4.083 | 10.66    | 7.167   | 4.39  | 10.25 | 0.63  |
| 1.083 | 0.63  | 4.167 | 10.66    | 7.250   | 4.39  | 10.33 | 0.63  |
| 1.167 | 0.63  | 4.250 | 10.66    | 7.333   | 2.51  | 10.42 | 0.63  |
| 1.250 | 0.63  | 4.333 | 28.84    | 7.417   | 2.51  | 10.50 | 0.63  |
| 1.333 | 0.63  | 4.417 | 28.84    | 7.500   | 2.51  | 10.58 | 0.63  |
| 1.417 | 0.63  | 4.500 | 28.84    | 7.583   | 2.51  | 10.67 | 0.63  |
| 1.500 | 0.63  | 4.583 | 28.84    | 7.667   | 2.51  | 10.75 | 0.63  |
| 1.583 | 0.63  | 4.667 | 28.84    | 7.750   | 2.51  | 10.83 | 0.63  |
| 1.667 | 0.63  | 4.750 | 28.84    | 7.833   | 2.51  | 10.92 | 0.63  |
| 1.750 | 0.63  | 4.833 | 28.84    | 7.917   | 2.51  | 11.00 | 0.63  |
| 1.833 | 0.63  | 4.917 | 28.84    | 8.000   | 2.51  | 11.08 | 0.63  |
| 1.917 | 0.63  | 5.000 | 28.84    | 8.083   | 2.51  | 11.17 | 0.63  |
| 2.000 | 0.63  | 5.083 | 28.84    | 8.167   | 2.51  | 11.25 | 0.63  |
| 2.083 | 0.63  | 5.167 | 28.84    | 8.250   | 2.51  | 11.33 | 0.63  |
| 2.167 | 0.63  | 5.250 | 28.84    | 8.333   | 1.25  | 11.42 | 0.63  |
| 2.250 | 0.63  | 5.333 | 8.15     | 8.417   | 1.25  | 11.50 | 0.63  |

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## LangstaffRd\_EA\_Proposed\_HumberWatershed

| READ STORM  | ata   | Users\ray.zhao\App<br>\Local\Temp\<br>df5d6-df0e-43ba-b1<br>12   |   | a28109d\4  | 4f82851c  |
|---|---|--|---|--|---|
| TIME hrs 0.25 0.59 0.59 0.75 1.00 1.25 1.50 2.00 2.25 2.59 2.75 3.00 3.25 | RAIN   TIME mmm/hr   hrs 0.00   3.50   0.73   3.75   0.73   4.00   0.73   4.50   0.73   4.55   0.73   5.25   0.73 | mm/hr ' hrs<br>12.43   6.79<br>12.43   7.90<br>12.43   7.50<br>33.63   7.55<br>33.63   8.25<br>33.63   8.25<br>33.63   8.25<br>9.50   9.90<br>9.50   9.25<br>9.50   9.95 | RAIN mm/hr 5.12   5.12   5.12   2.92   2.92   2.92   1.46   1.46   1.46   0.73   0.73 | TIME   hrs 10.00 10.25 10.50 11.75 11.00 11.25 11.25 11.25 12.00 12.25 | RAIN<br>mm/hr<br>0.73<br>0.73<br>0.73<br>0.73<br>0.73<br>0.73<br>0.73<br>0.73 |

| CALIB             |       |         |       |      |           |       |
|-------------------|-------|---------|-------|------|-----------|-------|
| STANDHYD ( 0105)  | Area  | (ha)=   | 1.63  |      |           |       |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 69.00 | Dir. | Conn.(%)= | 69.00 |

| - 1 01- 3.0 11111 | IOCAL | Imp(%)- 05.00 | D11. COIII.() |
|-------------------|-------|---------------|---------------|
|                   |       |               |               |
|                   |       | IMPERVIOUS    | PERVIOUS (i)  |
| Surface Area      | (ha)= | 1.12          | 0.51          |
| Dep. Storage      | (mm)= | 2.00          | 5.00          |
| Average Slope     | (%)=  | 1.00          | 2.00          |
| Length            | (m)=  | 650.00        | 25.00         |
| Mannings n        | =     | 0.013         | 0.250         |
| =                 |       |               |               |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|         | TRANSFORMED HYETOGRAPH |       |       |        |       |       |       |  |  |  |  |
|---------|------------------------|-------|-------|--------|-------|-------|-------|--|--|--|--|
| TIME    | RAIN                   | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |  |  |  |
| hrs     | mm/hr                  | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |  |  |  |
| 0.083   | 0.00                   | 3.167 | 4.39  | 6.250  | 9.50  | 9.33  | 0.73  |  |  |  |  |
| 0.167   | 0.00                   | 3.250 | 4.39  | 6.333  | 5.12  | 9.42  | 0.73  |  |  |  |  |
| 0.250   | 0.00                   | 3.333 | 12.43 | 6.417  | 5.12  | 9.50  | 0.73  |  |  |  |  |
| 0.333   | 0.73                   | 3.417 | 12.43 | 6.500  | 5.12  | 9.58  | 0.73  |  |  |  |  |
| 0.417   | 0.73                   | 3.500 | 12.43 | 6.583  | 5.12  | 9.67  | 0.73  |  |  |  |  |
| 0.500   | 0.73                   | 3.583 | 12.43 | 6.667  | 5.12  | 9.75  | 0.73  |  |  |  |  |
| 0.583   | 0.73                   | 3.667 | 12.43 | 6.750  | 5.12  | 9.83  | 0.73  |  |  |  |  |
| 0.667   | 0.73                   | 3.750 | 12.43 | 6.833  | 5.12  | 9.92  | 0.73  |  |  |  |  |
| 0.750   | 0.73                   | 3.833 | 12.43 | 6.917  | 5.12  | 10.00 | 0.73  |  |  |  |  |
| Page 35 |                        |       |       |        |       |       |       |  |  |  |  |

| RESERVOIR( 0525<br>IN= 2> OUT= 1<br>DT= 5.0 min  INFLOW: ID= 2<br>OUTFLOW: ID= 1 | ( 0110)                            | ERFLOW IS ( TFLOW S TFLOW S TMS) ( .0000 .0081 .0123 .0155 .0144 . | TORAGE ha.m.) 0.0000 0.0031 0.0074 0.0118  QPEAR (cms)   | OUTFLOW (cms)  | 25                    | RAGE<br>.m.)<br>.0161<br>.0204<br>.0259<br>.0000<br>R.V.<br>(mm)<br>52.23 |     |
|--|------------------------------------|--|--|--|-----------------------|---|-----|
| (iii) PEAK FL  RESERVOIR( 0525 IN= 2> OUT= 1 DT= 5.0 min                         | OVI                                | ERFLOW IS (COME) (10000) (10000 (10000 (10000 (10000) (10000 (10000) (10000 (10000) (10000 (10000) (10000 (10000) (10000 (10000) | TORAGE<br>ha.m.)<br>0.0000<br>0.0031<br>0.0074<br>0.0118 | OUTFLOW (cms) 0.0181 0.0584 0.0920 0.0000  | 0                     | R.V.<br>(mm)  |     |
| (iii) PEAK FL  RESERVOIR( 0525 IN= 2> OUT= 1 DT= 5.0 min                         | OVI                                | ERFLOW IS (COME) (10000) (10000 (10000 (10000 (10000) (10000 (10000) (10000 (10000) (10000 (10000) (10000 (10000) (10000 (10000) | TORAGE<br>ha.m.)<br>0.0000<br>0.0031<br>0.0074<br>0.0118 | OUTFLOW (cms) 0.0181 0.0584 0.0920 0.0000  | 0                     | .0000   |     |
| (iii) PEAK FL  | 0)  OVI                            | ERFLOW IS  TFLOW S  cms) (( .0000 .0081 .0123  | TORAGE<br>ha.m.)<br>0.0000<br>0.0031<br>0.0074           | OUTFLOW (cms) 0.0181 0.0584 0.0920   | STOI<br>(ha<br>0<br>0 | RAGE<br>.m.)<br>.0161<br>.0204<br>.0259                                   |     |
| (iii) PEAK FL  |                                    | ERFLOW IS  |  |  | STOI<br>(ha<br>0      | RAGE<br>.m.)<br>.0161<br>.0204  |     |
| (iii) PEAK FL  |                                    | ERFLOW IS  |  |  | STOI<br>(ha           | RAGE<br>.m.)<br>.0161   |     |
| (iii) PEAK FL  |                                    | ERFLOW IS  |  |  | STOI<br>(ha           | RAGE<br>.m.)  |     |
| (iii) PEAK FL  |                                    | ERFLOW IS  |  |  | STO                   | RAGE  |     |
| (iii) PEAK FL  |                                    |  |  |  |                       |   |     |
|  | .OW DUES N                         |  |  |  |                       |   |     |
| (ii) TIME ST   | : 85.0<br>EP (DT) SI<br>IE STORAGE | Ia = Dep.<br>HOULD BE SI<br>COEFFICIE  | Storage<br>MALLER OF<br>NT.                              | (Above)<br>R EQUAL   |                       |   |     |
| TIME TO PEAK<br>RUNOFF VOLUME<br>TOTAL RAINFAL<br>RUNOFF COEFFI                  | CIENT =                            | 0.9  | 7  | 0.52   | 0                     | .83   |     |
| TOTAL RAINFAL  | .L (mm)=                           | 62.7   | 1  | 62.71  | 62                    |   |     |
| RUNOFF VOLUME  | (mm)=                              | 60.7   | 1  | 32.48  | 52                    |   |     |
| PEAK FLOW<br>TIME TO PEAK  | (cms)=<br>(hrs)=                   | 5.2  | 5  | 5.33   |                       | 108 (iii<br>.25   | )   |
| DEAK ELON  | (cmc)                              | 0.0  | 0  | 0.02   | *T0T                  |   | ١.  |
| Unit Hyd. pea  | ık (cms)=                          | 0.0  | 8  | 0.05   |                       |   |     |
| Unit Hyd. Tpe<br>Unit Hyd. pea   | ak (min)=                          | 15.0   | 0  | 25.00  |                       |   |     |
| Storage Coeff  | . (min)=                           | 12.9   | 1 (ii)   | 23.06 (ii)   |                       |   |     |
| Max.Eff.Inten<br>ov<br>Storage Coeff<br>Unit Hyd. Tpe                            | er (min)                           | 15.0   | 9  | 25.00  |                       |   |     |
|  |                                    |  |  |  |                       |   |     |
| 3.   | 083 3.                             | 76   6.167   | 8.15   | 8.667<br>  8.750<br>  8.833<br>  8.917<br>  9.000<br>  9.083<br>  9.167<br>  9.250 | 1.25                  |   |     |
| 3.   | 000 3.                             | 76   6.083   | 8.15   | 9.167  | 1.25                  | 12.25   | 0.6 |
| 2.   | 917 3.                             | 76   6.000   | 8.15   | 9.083  | 1.25                  | 12.17   | 0.6 |
| 2.   | 833 3.                             | 76   5.917   | 8.15   | 9.000  | 1.25                  | 12.08   | 0.6 |
| 2.   | 750 3.                             | 76   5.833   | 8.15   | 8.917  | 1.25                  | 12.00   | 0.6 |
| 2.   | 667 3.                             | 76   5.750   | 8.15   | 8.833  | 1.25                  | 11.92   | 0.6 |
|  | 583 3                              | 76   5.565<br>76   5.667   | 8 15   | 8.007  | 1 25                  | 11 83   | 0.0 |
| ۷.   | EGG 2 '                            | 76   5.500<br>76   E E05   | 0.15   | 8.583  | 1 25                  | 11.0/   | 0.0 |
| 2.   | 41/ 3.                             |  |  | 0 500  | 1 25 1                | 11.58   | 0.6 |

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|                      | LangstaffRd                  |          | sed_HumberV | Natersh | ed         |      |
|----------------------|------------------------------|----------|-------------|---------|------------|------|
|                      | 0.73   3.917                 |          |             | 5.12    |            | 0.73 |
|                      | 0.73   4.000                 |          | 7.083       | 5.12    |            | 0.73 |
|                      | 0.73   4.083                 |          |             | 5.12    |            | 0.73 |
|                      | 0.73   4.167                 |          |             | 5.12    |            | 0.73 |
|                      | 0.73   4.250                 |          |             | 2.92    |            | 0.73 |
|                      | 0.73   4.333<br>0.73   4.417 |          |             | 2.92    |            | 0.73 |
|                      | 0.73   4.417<br>0.73   4.500 |          |             | 2.92    |            | 0.73 |
|                      | 0.73   4.500<br>0.73   4.583 |          |             | 2.92    |            | 0.73 |
|                      | 0.73   4.567                 |          |             | 2.92    |            | 0.73 |
|                      | 0.73   4.750                 |          |             | 2.92    |            | 0.73 |
|                      | 0.73   4.833                 |          |             |         | 11.00      | 0.73 |
|                      | 0.73   4.917                 |          |             | 2.92    |            | 0.73 |
|                      | 0.73   5.000                 |          |             |         | 11.17      | 0.73 |
|                      | 0.73   5.083                 |          |             | 2.92    |            | 0.73 |
|                      | 0.73   5.167                 |          |             | 2.92    |            | 0.73 |
| 2.167                | 0.73   5.250                 | 33.63    | 8.333       | 1.46    | 11.42      | 0.73 |
|                      | 0.73   5.333                 |          |             | 1.46    | 11.50      | 0.73 |
| 2.333                | 4.39   5.417                 | 9.50     | 8.500       | 1.46    | 11.58      | 0.73 |
| 2.417                | 4.39   5.500                 | 9.50     | 8.583       | 1.46    | 11.67      | 0.73 |
| 2.500                | 4.39   5.583                 | 9.50     | 8.667       | 1.46    | 11.75      | 0.73 |
|                      | 4.39   5.667                 | 9.50     | 8.750       | 1.46    | 11.83      | 0.73 |
|                      | 4.39   5.750                 |          |             | 1.46    |            | 0.73 |
|                      | 4.39   5.833                 |          |             |         | 12.00      | 0.73 |
|                      | 4.39   5.917                 |          |             | 1.46    |            | 0.73 |
|                      | 4.39   6.000                 |          |             |         | 12.17      | 0.73 |
|                      | 4.39   6.083                 |          |             |         | 12.25      | 0.73 |
| 3.083                | 4.39   6.167                 | 9.50     | 9.250       | 1.46    | l          |      |
| Max.Eff.Inten.(mm/hr | )= 33.6                      | 3        | 25.75       |         |            |      |
| over (min            |                              |          | 25.00       |         |            |      |
| Storage Coeff. (min  | )= 12.1                      | 4 (ii)   | 21.31 (ii)  |         |            |      |
| Unit Hyd. Tpeak (min | )= 10.0                      | 10       | 25.00       |         |            |      |
| Unit Hyd. peak (cms  | )= 0.1                       | .0       | 0.05        |         |            |      |
|                      |                              |          |             |         | TALS*      |      |
| PEAK FLOW (cms       |                              |          | 0.03        |         | .133 (iii) | )    |
| TIME TO PEAK (hrs    |                              |          | 5.33        |         | 5.25       |      |
| RUNOFF VOLUME (mm    |                              |          | 42.37       |         | 2.19       |      |
| TOTAL RAINFALL (mm   |                              |          | 73.10       |         | 3.10       |      |
| RUNOFF COEFFICIENT   | = 0.9                        | 17       | 0.58        | ,       | 0.85       |      |
|                      |                              |          |             |         |            |      |
| (i) CN PROCEDURE S   |                              |          |             |         |            |      |
| CN* = 86.0           |                              | Storage  |             |         |            |      |
| (ii) TIME STEP (DT)  |                              |          | EQUAL       |         |            |      |
| THAN THE STORA       |                              |          |             |         |            |      |
| (iii) PEAK FLOW DOES | NOT INCLUDE                  | BASEFLOW | IF ANY.     |         |            |      |

| **** WARNING : STOR | LangstaffRd_E<br>(cms) (ha<br>0.0000 0.<br>0.0081 0.<br>0.0123 0.<br>0.0155 0.<br>AGE-DISCHARGE | 0000   0<br>0001   0<br>0074   0<br>0118   0              | (cms) (<br>0.0181<br>0.0584<br>0.0920<br>0.0000   | ha.m.)<br>0.0161<br>0.0204<br>0.0259 |
|---------------------|---|---|---|--------------------------------------|
| TIME                | (ha)<br>5) 1.630  | 0.110<br>TION [Qout/Qi<br>LOW                             | (hrs)<br>5.25<br>5.42<br>n](%)= 82.<br>(min)= 10. | (mm)<br>62.19<br>62.13               |
|                     | IMPERVIOL a)= 1.71 m)= 2.00   | 32.00 Dir.<br>JS PERVIOU<br>0.37<br>5.00<br>2.00<br>20.00 | US (i)  | 82.00                                |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       |       |       | D HYETOGRA |       |       |       |
|-------|-------|-------|-------|------------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN  | ' TIME     | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr | ' hrs      | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 4.39  | 6.250      | 9.50  | 9.33  | 0.73  |
| 0.167 | 0.00  | 3.250 | 4.39  | 6.333      | 5.12  | 9.42  | 0.73  |
| 0.250 | 0.00  | 3.333 | 12.43 | 6.417      | 5.12  | 9.50  | 0.73  |
| 0.333 | 0.73  | 3.417 | 12.43 | 6.500      | 5.12  | 9.58  | 0.73  |
| 0.417 | 0.73  | 3.500 | 12.43 | 6.583      | 5.12  | 9.67  | 0.73  |
| 0.500 | 0.73  | 3.583 | 12.43 | 6.667      | 5.12  | 9.75  | 0.73  |
| 0.583 | 0.73  | 3.667 | 12.43 | 6.750      | 5.12  | 9.83  | 0.73  |
| 0.667 | 0.73  | 3.750 | 12.43 | 6.833      | 5.12  | 9.92  | 0.73  |
| 0.750 | 0.73  | 3.833 | 12.43 | 6.917      | 5.12  | 10.00 | 0.73  |
| 0.833 | 0.73  | 3.917 | 12.43 | 7.000      | 5.12  | 10.08 | 0.73  |
| 0.917 | 0.73  | 4.000 | 12.43 | 7.083      | 5.12  | 10.17 | 0.73  |
| 1.000 | 0.73  | 4.083 | 12.43 | 7.167      | 5.12  | 10.25 | 0.73  |
| 1.083 | 0.73  | 4.167 | 12.43 | 7.250      | 5.12  | 10.33 | 0.73  |
| 1.167 | 0.73  | 4.250 | 12.43 | 7.333      | 2.92  | 10.42 | 0.73  |
| 1.250 | 0.73  | 4.333 | 33.63 | 7.417      | 2.92  | 10.50 | 0.73  |
| 1.333 | 0.73  | 4.417 | 33.63 | 7.500      | 2.92  | 10.58 | 0.73  |
| 1.417 | 0.73  | 4.500 | 33.63 | 7.583      | 2.92  | 10.67 | 0.73  |
| 1.500 | 0.73  | 4.583 | 33.63 | 7.667      | 2.92  | 10.75 | 0.73  |

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#### LangstaffRd\_EA\_Proposed\_HumberWatershed

|                 |   | TR    | ANSFORM | D HYETOGRA     | PH    | _                |              |
|-----------------|---|-------|---------|----------------|-------|------------------|--------------|
| TIM             | E RAIN                                  |       | RAIN    |                | RAIN  |                  | RAIN         |
| hr:             | s mm/hr                                 | hrs   | mm/hr   | ' hrs          | mm/hr | hrs              | mm/hr        |
| 0.08            | 3 0.00                                  | 3.167 | 4.39    | 6.250          | 9.50  | 9.33             | 0.73         |
| 0.16            | 7 0.00                                  | 3.250 | 4.39    | 6.333          | 5.12  | 9.42             | 0.73         |
| 0.25            |   | 3.333 |         | 6.417          | 5.12  | 9.50             | 0.73         |
| 0.33            | 3 0.73                                  | 3.417 | 12.43   | 6.500          | 5.12  | 9.58             | 0.73         |
| 0.41            |   | 3.500 |         | 6.583          | 5.12  | 9.67             | 0.73         |
| 0.50            | 0.73                                    | 3.583 | 12.43   | 6.667          | 5.12  | 9.75             | 0.73         |
| 0.58            |   |       |         |                | 5.12  |                  | 0.73         |
| 0.66            |   | 3.750 |         | 6.833          | 5.12  |                  | 0.73         |
| 0.75            | 0.73                                    | 3.833 | 12.43   | 6.917          | 5.12  | 10.00            | 0.73         |
| 0.83            |   | 3.917 |         | 7.000          |       | 10.08            | 0.73         |
| 0.91            |   |       |         | 7.083          |       | 10.17            | 0.73         |
| 1.00            |   |       |         | 7.167          |       | 10.25            | 0.73         |
| 1.08            |   | 4.167 |         |                |       | 10.33            | 0.73         |
| 1.16            |   | 4.250 |         | 7.333          |       | 10.42            | 0.73         |
| 1.25            | 0.73                                    | 4.333 | 33.63   | 7.417          |       | 10.50            | 0.73         |
| 1.33            |   |       |         |                |       | 10.58            | 0.73         |
| 1.41            | 7 0.73                                  | 4.500 | 33.63   | 7.583          |       | 10.67            | 0.73         |
| 1.50            |   |       |         | 7.667          |       | 10.75            | 0.73         |
| 1.58            | 3 0.73                                  | 4.667 | 33.63   | 7.750          |       | 10.83            | 0.73         |
| 1.66            |   |       |         |                |       | 10.92            | 0.73         |
| 1.75            |   | 4.833 |         | 7.917          |       | 11.00            | 0.73         |
| 1.83            |   | 4.917 |         |                |       | 11.08            | 0.73         |
| 1.91            | 7 0.73                                  | 5.000 | 33.63   | 8.083          |       | 11.17            | 0.73         |
| 2.00            | 0.73                                    | 5.083 | 33.63   | 8.167          |       | 11.25            | 0.73         |
| 2.08            | 3 0.73                                  | 5.16/ | 33.63   | 8.250          |       | 11.33            | 0.73         |
| 2.16            |   |       |         | 8.333          |       | 11.42            | 0.73         |
| 2.25            |   | 5.333 |         | 8.417          |       | 11.50            | 0.73         |
| 2.33            |   | 5.417 |         | 8.500          |       | 11.58            | 0.73         |
| 2.41            |   | 5.500 |         | 8.583          |       | 11.67            | 0.73         |
| 2.50            |   | 5.583 |         | 8.667          |       | 11.75<br>  11.83 | 0.73         |
| 2.58            |   | 5.667 |         | 8.750          |       |                  | 0.73         |
| 2.66            |   | 5.750 |         | 8.833          |       | 11.92            | 0.73         |
| 2.75            |   | 5.833 | 9.50    | 8.917<br>9.000 |       | 12.00            | 0.73         |
| 2.83            |   | 5.917 |         | 9.000          |       | 12.08<br>  12.17 | 0.73<br>0.73 |
| 2.91            |   | 6.083 |         | 9.065          |       | 12.17            | 0.73         |
| 3.00            |   | 6.167 |         | 9.167          | 1.46  |                  | 0.75         |
| 3.00            | 3 4.39                                  | 0.10/ | 9.50    | 9.250          | 1.40  | ı                |              |
| Max.Eff.Inten.( | mm/hr)-                                 | 33.63 |         | 23.77          |       |                  |              |
|                 | (min)                                   | 15.00 |         | 20.00          |       |                  |              |
| Storage Coeff.  | (min)=                                  | 13.76 |         | 18.20 (ii)     |       |                  |              |
| Unit Hyd. Tpeak |   | 15.00 | (11)    | 20.00          |       |                  |              |
| Unit Hyd. peak  |   | 0.08  |         | 0.06           |       |                  |              |
| onize nyu. peak | (====================================== | 0.00  |         | 0.00           | *T0   | TALS*            |              |
| PEAK FLOW       | (cms)=                                  | 0.16  |         | 0.03           |       | .190 (iii)       |              |
| TIME TO PEAK    | (hrs)=                                  | 5.25  |         | 5.33           |       | 5.25             |              |
| RUNOFF VOLUME   | (mm)=                                   | 71.10 |         | 38.61          | 6     | 3.62             |              |
| TOTAL RAINFALL  | (mm)=                                   | 73.10 |         | 73.10          | 7     | 3.10             |              |

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LangstaffRd_EA_Proposed_Humber

0.73 | 4.667 | 33.63 | 7.759

0.73 | 4.750 | 33.63 | 7.833

0.73 | 4.833 | 33.63 | 8.080

0.73 | 4.834 | 33.63 | 8.080

0.73 | 5.080 | 33.63 | 8.167

0.73 | 5.167 | 33.63 | 8.167

0.73 | 5.265 | 33.63 | 8.157

0.73 | 5.255 | 33.63 | 8.157

0.73 | 5.255 | 33.63 | 8.259

0.73 | 5.255 | 33.63 | 8.333

0.73 | 5.333 | 9.50 | 8.417

4.39 | 5.417 | 9.50 | 8.580

4.39 | 5.583 | 9.50 | 8.759

4.39 | 5.583 | 9.50 | 8.759

4.39 | 5.583 | 9.50 | 8.831

4.39 | 5.583 | 9.50 | 8.831

4.39 | 5.583 | 9.50 | 8.817

4.39 | 6.080 | 9.50 | 9.083

4.39 | 6.080 | 9.50 | 9.083

4.39 | 6.080 | 9.50 | 9.083

4.39 | 6.080 | 9.50 | 9.083

4.39 | 6.080 | 9.50 | 9.083

4.39 | 6.080 | 9.50 | 9.083

4.39 | 6.080 | 9.50 | 9.083

4.39 | 6.080 | 9.50 | 9.083
                                                1.583
                                                                                                                                                                                  2.92 | 10.83
2.92 | 10.92
                                                 1.667
                                                                                                                                                                                                                                     0.73
                                                                                                                                                                                                       10.92
11.00
11.08
11.17
11.25
11.33
11.42
11.50
                                                1.750
1.833
1.917
2.000
2.083
                                                                                                                                                                                  2.92
2.92
2.92
2.92
2.92
                                                                                                                                                                                                                                    0.73
0.73
0.73
0.73
                                                                                                                                                                                  2.92
                                                                                                                                                                                                                                     0.73
                                                2.167
                                                                                                                                                                                  1.46
                                                                                                                                                                                                                                     0.73
                                                2.250
                                                                                                                                                                                  1.46
                                                                                                                                                                                                                                     0.73
                                                 2.333
                                                                            4.39 |
4.39 |
4.39 |
4.39 |
4.39 |
4.39 |
4.39 |
4.39 |
4.39 |
                                                                                                                                                                                  1.46
                                                                                                                                                                                                                                     0.73
                                                2.333
2.417
2.500
2.583
2.667
2.750
                                                                                                                                                                                                       11.58
11.67
11.75
11.83
11.92
12.00
                                                                                                                                                                                  1.46
1.46
1.46
1.46
1.46
                                                                                                                                                                                                                                    0.73
0.73
0.73
0.73
                                                                                                                                                                                                                                    0.73
                                                                                                                                                                                  1.46
                                                 2.833
                                                                                                                                                                                                                                    0.73
                                                2.917
                                                                                                                                                                                  1.46
                                                                                                                                                                                                       12.17
12.25
                                                                                                                                                                                                                                    0.73
                                                                                                                                                                                  1.46
                                                 3.083
                                                                                                                                                                                  1.46
               Max.Eff.Inten.(mm/hr)=
                                                                                                      33.63
                                                                                                                                               23.77
              over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                                                                       15.00
13.76 (ii)
                                                                                                                                              20.00
17.68 (ii)
                                                                                                       15.00
                                                                                                                                                20.00
                                                                                                         0.08
                                                                                                                                                   0.06
                                                                                                                                                                                          *TOTALS*
             PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                                                                       0.16
5.25
71.10
73.10
                                                                                                                                                                                              0.178 (iii)
5.25
65.25
73.10
                                                                                                                                                  0.02
                                                                                                                                               5.33
38.61
73.10
                                                                                                         0.97
                                                                                                                                                   0.53
                                                                                                                                                                                                 0.89
             (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN* = 83.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COFFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
   CAL TB
| CALIB
| STANDHYD ( 0125)|
|ID= 1 DT= 5.0 min |
                                                                      Area (ha)= 2.27
Total Imp(%)= 77.00 Dir. Conn.(%)= 77.00
                                                                                                                                         PERVIOUS (i)
                                                                                             IMPERVIOUS
               Surface Area
                                                                                                       1.75
2.00
1.00
                                                                                                                                                 0.52
5.00
              Dep. Storage
Average Slope
Length
Mannings n
                                                                     (mm)=
(%)=
(m)=
                                                                                                                                                   2.00
                                                                                                                                                0.250
                          NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.
                                                                                                                                  Page 38
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 $\label{eq:loss_loss} \begin{array}{lll} & LangstaffRd\_EA\_Proposed\_HumberWatershed \\ RUNOFF \ COEFFICIENT & = \ 0.97 & 0.53 & 0.8 \end{array}$ 

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

(1) CN\* = 83.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0405)| | 1 + 2 = 3 | QPEAK (cms) 0.190 0.178 R.V. (mm) 63.62 65.25 ΔRFΔ TPFΔK (ha) 2.27 2.08 (hrs) 5.25 5.25 ID1= 1 ( 0125): + ID2= 2 ( 0130): ID = 3 ( 0405): 4.35 0.368 5.25 64.40

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR( 0505)| IN= 2---> OUT= 1 | DT= 5.0 min | OUTFLOW STORAGE OUTFLOW (ha.m.) 0.0000 0.0030 0.0120 (ha.m.) 0.0383 0.0515 0.0792 (cms) 0.0000 (cms) 0.2110 0.0185 0.2743 0.3250 AREA QPEAK TPEAK (hrs) 5.25 5.42 (ha) 4.350 (cms) (mm) 64.40 INFLOW : ID= 2 ( 0405) OUTFLOW: ID= 1 ( 0505) 0.368 0.288 4.350 64.39

CALIB | CALIB | STANDHYD ( 0120)| |ID= 1 DT= 5.0 min | Area (ha)= 1.24 Total Imp(%)= 73.00 Dir. Conn.(%)= 73.00 IMPERVIOUS PERVIOUS (i) Surface Area (ha)= 0.91 2.00 1.00 475.00 0.33 5.00 2.00 Dep. Storage Average Slope Length Mannings n (mm)= (%)= (m)= 17 00 0.013 0.250

#### LangstaffRd\_EA\_Proposed\_HumberWatershed

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

L WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

\*\*TRANSFORMED HYETOGRAPH ---RAIN | TIME RAIN | TIME mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr hrs 9.33 9.42 mm/hr 0.73 0.73 hrs 0.083 0.167 0.250 0.250 0.333 0.417 0.500 0.583 0.667 0.750 0.73 0.73 0.73 0.73 0.73 0.73 0.833 0.73 0.73 0.917 1.000 1.083 1.167 1.250 1.333 1.417 0.73 0.73 0.73 0.73 0.73 0.73 0.73 0.73 1.417 1.500 1.583 1.667 1.750 1.833 1.917 2.000 2.083 2.083 2.167 2.250 2.333 2.417 2.500 2.583 2.667 2.750 0.73 2.833 2.917 Max.Eff.Inten.(mm/hr)= 10.00 15.00 10.06 (ii) 14.45 (ii) 10.00 15.00 over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 0.11 0.08 \*TOTALS\* 0.104 (iii) 5.25 PEAK FLOW (cms)= TIME TO PEAK (hrs)= Page 41

|                  | Lange    | taffRd F | A Propo | sed Humberw | latarch | od         |      |
|------------------|----------|----------|---------|-------------|---------|------------|------|
| 2.000            |          | 5.083    | 33.63   | 8.167       | 2.92    |            | 0.73 |
| 2.083            |          | 5.167    | 33.63   |             | 2.92    |            | 0.73 |
| 2.167            |          | 5.250    | 33.63   |             | 1.46    |            | 0.73 |
| 2.256            |          | 5.333    | 9.50    | 8.417       | 1.46    | 11.50      | 0.73 |
| 2.333            |          |          | 9.50    |             | 1.46    |            | 0.73 |
| 2.417            | 7 4.39   | 5.500    | 9.50    | 8.583       | 1.46    | 11.67      | 0.73 |
| 2.506            |          | 5.583    | 9.50    | 8.667       | 1.46    | 11.75      | 0.73 |
| 2.583            | 3 4.39   | 5.667    | 9.50    | 8.750       | 1.46    | 11.83      | 0.73 |
| 2.667            | 7 4.39   | 5.750    | 9.50    | 8.833       | 1.46    | 11.92      | 0.73 |
| 2.756            | 4.39     | 5.833    | 9.50    | 8.917       | 1.46    | 12.00      | 0.73 |
| 2.833            | 3 4.39   | 5.917    | 9.50    | 9.000       | 1.46    | 12.08      | 0.73 |
| 2.917            | 7 4.39   | 6.000    | 9.50    | 9.083       | 1.46    | 12.17      | 0.73 |
| 3.000            | 4.39     | 6.083    | 9.50    | 9.167       | 1.46    | 12.25      | 0.73 |
| 3.083            | 3 4.39   | 6.167    | 9.50    | 9.250       | 1.46    | ĺ          |      |
| Max.Eff.Inten.(r | mm/hm)_  | 33.63    |         | 23.77       |         |            |      |
|                  | (min)    | 10.00    |         | 20.00       |         |            |      |
| Storage Coeff.   |          | 10.06    | (44)    | 17.57 (ii)  |         |            |      |
| Unit Hyd. Tpeak  |          | 10.00    | (11)    | 20.00       |         |            |      |
| Unit Hyd. peak   |          | 0.11     |         | 0.06        |         |            |      |
| onit nyu. peak   | (CIIIS)- | 0.11     |         | 0.00        | ****    | TALS*      |      |
| PEAK FLOW        | (cms)=   | 0.06     |         | 0.02        |         | .079 (iii) |      |
| TIME TO PEAK     | (hrs)=   | 5.25     |         | 5.33        |         | 5.25       |      |
| RUNOFF VOLUME    | (mm)=    | 71.10    |         | 38.61       |         | 9.07       |      |
| TOTAL RAINFALL   | (mm)=    | 73.10    |         | 73.10       |         | 3.10       |      |
| RUNOFF COEFFICIE |          | 0.97     |         | 0.53        |         | 0.81       |      |
| MONOTT COLTTELL  |          | 0.57     |         | 0.55        |         | 0.01       |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0410) <br>  1 + 2 = 3  <br>  ID1= 1 ( 0115): | AREA<br>(ha)<br>1.00 | QPEAK<br>(cms)<br>0.079 | TPEAK<br>(hrs)<br>5.25 | R.V.<br>(mm)<br>59.07 |
|--|----------------------|-------------------------|------------------------|-----------------------|
| + ID2= 2 ( 0120):                                      | 1.24                 | 0.104                   | 5.25                   | 62.32                 |
| ID = 3 ( 0410):  | 2.24                 | 0.183                   | 5.25                   | 60.87                 |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| RESERVOIR( 0510) | OVERFLOW | IS OFF  |         |         |
|------------------|----------|---------|---------|---------|
| IN= 2> OUT= 1    |          |         |         |         |
| DT= 5.0 min      | OUTFLOW  | STORAGE | OUTFLOW | STORAGE |
|                  | (cms)    | (ha.m.) | (cms)   | (ha.m.) |
|                  | 0.0000   | 0.0000  | 0.0699  | 0.0309  |

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#### LangstaffRd\_EA\_Proposed\_HumberWatershed

| RUNOFF VOLUME   | (mm)= | 71.10 | 38.61 | 62.32 |
|-----------------|-------|-------|-------|-------|
| TOTAL RAINFALL  | (mm)= | 73.10 | 73.10 | 73.10 |
| RUNOFF COEFFICI | ENT = | 0.97  | 0.53  | 0.85  |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
- CN\* = 83.0 Ia = Dep. Storage (Above)
  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
  THAN THE STORAGE COEFFICIENT.
  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |         |       |         |           |       |
|-------------------|-------|---------|-------|---------|-----------|-------|
| STANDHYD ( 0115)  | Area  | (ha)=   | 1.00  |         |           |       |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 63.00 | Dir.    | Conn.(%)= | 63.00 |
|                   |       |         |       |         |           |       |
|                   |       | IMPERVI | OUS   | PERVIOL | JS (i)    |       |
| Surface Area      | (ha)= | 0.6     | 3     | 0.37    | 7         |       |
| Dep. Storage      | (mm)= | 2.0     | 0     | 5.00    | )         |       |
| Average Slope     | (%)=  | 1.0     | 0     | 2.00    | )         |       |
| Length            | (m)=  | 475.0   | 0     | 17.00   | )         |       |
| Mannings n        | ` ′=  | 0.01    | 3     | 0.256   | )         |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | ) HYETOGR | APH   |       |       |
|-------|-------|-------|----------|-----------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME    | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs     | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 4.39     | 6.250     | 9.50  | 9.33  | 0.73  |
| 0.167 | 0.00  | 3.250 | 4.39     | 6.333     | 5.12  | 9.42  | 0.73  |
| 0.250 | 0.00  | 3.333 | 12.43    | 6.417     | 5.12  | 9.50  | 0.73  |
| 0.333 | 0.73  | 3.417 | 12.43    | 6.500     | 5.12  | 9.58  | 0.73  |
| 0.417 | 0.73  | 3.500 | 12.43    | 6.583     | 5.12  | 9.67  | 0.73  |
| 0.500 | 0.73  | 3.583 | 12.43    | 6.667     | 5.12  | 9.75  | 0.73  |
| 0.583 | 0.73  | 3.667 | 12.43    | 6.750     | 5.12  | 9.83  | 0.73  |
| 0.667 | 0.73  | 3.750 | 12.43    | 6.833     | 5.12  | 9.92  | 0.73  |
| 0.750 | 0.73  | 3.833 | 12.43    | 6.917     | 5.12  | 10.00 | 0.73  |
| 0.833 | 0.73  | 3.917 | 12.43    | 7.000     | 5.12  | 10.08 | 0.73  |
| 0.917 | 0.73  | 4.000 | 12.43    | 7.083     | 5.12  | 10.17 | 0.73  |
| 1.000 | 0.73  | 4.083 | 12.43    | 7.167     | 5.12  | 10.25 | 0.73  |
| 1.083 | 0.73  | 4.167 | 12.43    | 7.250     | 5.12  | 10.33 | 0.73  |
| 1.167 | 0.73  | 4.250 | 12.43    | 7.333     | 2.92  | 10.42 | 0.73  |
| 1.250 | 0.73  | 4.333 | 33.63    | 7.417     | 2.92  | 10.50 | 0.73  |
| 1.333 | 0.73  | 4.417 | 33.63    | 7.500     | 2.92  | 10.58 | 0.73  |
| 1.417 | 0.73  | 4.500 | 33.63    | 7.583     | 2.92  | 10.67 | 0.73  |
| 1.500 | 0.73  | 4.583 | 33.63    | 7.667     | 2.92  | 10.75 | 0.73  |
| 1.583 | 0.73  | 4.667 | 33.63    | 7.750     | 2.92  | 10.83 | 0.73  |
| 1.667 | 0.73  | 4.750 | 33.63    | 7.833     | 2.92  | 10.92 | 0.73  |
| 1.750 | 0.73  | 4.833 | 33.63    | 7.917     | 2.92  | 11.00 | 0.73  |
| 1.833 | 0.73  | 4.917 | 33.63    | 8.000     | 2.92  | 11.08 | 0.73  |
| 1.917 | 0.73  | 5.000 | 33.63    | 8.083     | 2.92  | 11.17 | 0.73  |

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| 1  | angetaff  | d EA Bros | posed Hum | honklaton | -hod   |  |
|--|-----------|-----------|-----------|-----------|--------|--|
|  |           |           | 0.0       |           |        |  |
| e  | .0457     | 0.0024    | 0.0       | 9876      | 0.0666 |  |
|  |           |           | 0.0       |           |        |  |
|  |           |           |           |           |        |  |
|  |           |           | AK TI     |           |        |  |
|  | (ha       | ) (cm     | ıs) (I    | nrs)      | (mm)   |  |
| INFLOW : ID= 2 ( 0410)<br>OUTFLOW: ID= 1 ( 0510) |           |           |           |           |        |  |
| OUTFLOW: ID= 1 ( 0510)                           | 2.2       | +6 6      | .001      | 5.0/      | 00.00  |  |
| PEAK F   | LOW REI   | OUCTION [ | Qout/Qin  | 1(%)= 44. | 09     |  |
|  |           |           | (1        |           |        |  |
| MAXIMUM  | STORAGE   | USED      | (ha       | .m.)= 0.  | 0465   |  |
|  |           |           |           |           |        |  |
|  |           |           |           |           |        |  |
|  |           |           |           |           |        |  |
| ADD HYD ( 0420)                                  |           |           |           |           |        |  |
| i 1 ± 2 = 3 i                                    | AREA      | QPEAK     | TPEAK     | R.V.      |        |  |
| ID1= 1 ( 0505):<br>+ ID2= 2 ( 0510):             | (ha)      | (cms)     | (hrs)     | (mm)      |        |  |
| ID1= 1 ( 0505):                                  | 4.35      | 0.288     | 5.42      | 64.39     |        |  |
|  |           |           |           |           |        |  |
| =======================================          |           |           |           |           |        |  |
| ID = 3 ( 0420):                                  | 6.59      | 0.369     | 5.50      | 63.19     |        |  |
| NOTE: PEAK FLOWS DO N                            | OT THELLI | DE DACEEL | OUC TE M  | IV        |        |  |
| NOTE: TEAK TEOMS DO N                            |           |           |           | ···.      |        |  |
|  |           |           |           |           |        |  |
| CALIB  |           |           |           |           |        |  |
|  |           |           |           |           |        |  |
| STANDHYD ( 0110) Area                            |           |           |           |           |        |  |
| STANDHYD ( 0110)   Area<br> ID= 1 DT= 5.0 min    |           |           |           | onn.(%)=  | 70.00  |  |

| - I DI- 310 IIIII | 1000  | Imp (70) - 70100 | D111 COMM1(70)- |  |
|-------------------|-------|------------------|-----------------|--|
|                   |       |                  |                 |  |
|                   |       | IMPERVIOUS       | PERVIOUS (i)    |  |
| Surface Area      | (ha)= | 1.11             | 0.47            |  |
| Dep. Storage      | (mm)= | 2.00             | 5.00            |  |
| Average Slope     | (%)=  | 1.00             | 2.00            |  |
| Length            | (m)=  | 650.00           | 25.00           |  |
| Mannings n        | =     | 0.013            | 0.250           |  |
|                   |       |                  |                 |  |
|                   |       |                  |                 |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | ) HYETOGR | APH   | -     |       |
|-------|-------|-------|----------|-----------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME    | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs     | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 4.39     | 6.250     | 9.50  | 9.33  | 0.73  |
| 0.167 | 0.00  | 3.250 | 4.39     | 6.333     | 5.12  | 9.42  | 0.73  |
| 0.250 | 0.00  | 3.333 | 12.43    | 6.417     | 5.12  | 9.50  | 0.73  |
| 0.333 | 0.73  | 3.417 | 12.43    | 6.500     | 5.12  | 9.58  | 0.73  |
| 0.417 | 0.73  | 3.500 | 12.43    | 6.583     | 5.12  | 9.67  | 0.73  |
| 0.500 | 0.73  | 3.583 | 12.43    | 6.667     | 5.12  | 9.75  | 0.73  |
| 0.583 | 0.73  | 3.667 | 12.43    | 6.750     | 5.12  | 9.83  | 0.73  |
| 0.667 | 0.73  | 3.750 | 12.43    | 6.833     | 5.12  | 9.92  | 0.73  |
| 0.750 | 0.73  | 3.833 | 12.43    | 6.917     | 5.12  | 10.00 | 0.73  |

| 1.000 0.73   4.083   12.43   7.167   5.12   1   1.083   0.73   4.167   12.43   7.167   5.12   1   1.167   0.73   4.250   12.43   7.333   2.92   1   1.150   0.73   4.250   12.43   7.333   2.92   1   1.250   0.73   4.4250   33.63   7.417   2.92   1   1.333   0.73   4.417   33.63   7.500   2.92   1   1.417   0.73   4.500   33.63   7.500   2.92   1   1.500   0.73   4.500   33.63   7.500   2.92   1   1.500   0.73   4.500   33.63   7.500   2.92   1   1.500   0.73   4.500   33.63   7.750   2.92   1   1.500   0.73   4.500   33.63   7.750   2.92   1   1.500   0.73   4.833   33.63   7.750   2.92   1   1.750   0.73   4.750   33.63   7.750   2.92   1   1.917   0.73   5.000   33.63   8.000   2.92   1   1.917   0.73   5.000   33.63   8.000   2.92   1   2.000   0.73   5.167   33.63   8.167   2.92   1   2.083   0.73   5.167   33.63   8.167   2.92   1   2.083   0.73   5.167   33.63   8.250   2.92   1   2.167   0.73   5.250   33.63   8.250   2.92   1   2.167   0.73   5.250   33.63   8.250   2.92   1   2.167   0.73   5.533   9.50   8.417   1.46   1   2.133   4.39   5.5417   9.50   8.500   1.46   1   2.133   4.39   5.563   9.50   8.667   1.46   1   2.500   4.39   5.583   9.50   8.675   1.46   1   2.500   4.39   5.750   9.50   8.833   1.46   1   2.500   4.39   5.750   9.50   8.8750   1.46   1   2.1750   4.39   5.750   9.50   8.8750   1.46   1   2.1750   4.39   5.600   9.50   8.833   1.46   1   2.1750   4.39   5.750   9.50   8.8750   1.46   1   2.1750   4.39   6.000   9.50   9.003   1.46   1   2.1750   4.39   6.000   9.50   9.003   1.46   1   2.500   4.39   6.000   9.50   9.003   1.46   1   2.1750   4.39   6.000   9.50   9.003   1.46   1   2.1750   4.39   6.000   9.50   9.500   1.46   1   2.1750   4.39   6.000   9.50   9.003   1.46   1   2.1750   4.39   6.000   9.50   9.003   1.46   1   2.1750   4.39   6.000   9.50   9.000   1.46   1   2.1750   4.39   6.000   9.50   9.000   1.46   1   2.1750   4.39   6.000   9.50   9.000   1.46   1   2.1750   4.39   6.000   9.50   9.000   1.46   1   2.1750   4.39   6.000   9.50   9.000   1.46   1    |        |              |        |       |      | 4 . 10     |      |            |      |
|--|--------|--------------|--------|-------|------|------------|------|------------|------|
| 0.917   0.73   4.000   12.43   7.083   5.12   1   1   1.000   0.73   4.000   12.43   7.167   5.12   1   1.003   0.73   4.003   12.43   7.250   5.12   1   1.003   0.73   4.167   12.43   7.250   5.12   1   1.167   0.73   4.250   12.43   7.333   2.92   1   1.250   0.73   4.250   12.43   7.333   2.92   1   1.333   0.73   4.417   33.63   7.500   2.92   1   1.417   0.73   4.500   33.63   7.417   2.92   1   1.500   0.73   4.503   33.63   7.657   2.92   1   1.500   0.73   4.503   33.63   7.657   2.92   1   1.503   0.73   4.676   33.63   7.750   2.92   1   1.503   0.73   4.676   33.63   7.750   2.92   1   1.667   0.73   4.750   33.63   7.750   2.92   1   1.667   0.73   4.750   33.63   7.750   2.92   1   1.833   0.73   4.917   33.63   8.000   2.92   1   1.917   0.73   5.000   33.63   8.000   2.92   1   1.917   0.73   5.000   33.63   8.000   2.92   1   2.000   0.73   5.083   33.63   8.167   2.92   1   2.167   0.73   5.250   33.63   8.250   2.92   1   2.167   0.73   5.250   33.63   8.250   2.92   1   2.167   0.73   5.250   33.63   8.250   2.92   1   2.250   0.73   5.500   9.50   8.583   1.46   1   2.333   4.39   5.417   9.50   8.583   1.46   1   2.500   4.39   5.583   9.50   8.667   1.46   1   2.500   4.39   5.583   9.50   8.667   1.46   1   2.500   4.39   5.833   9.50   8.675   1.46   1   2.500   4.39   5.833   9.50   8.8750   1.46   1   2.177   4.39   5.607   9.50   8.833   1.46   1   2.177   4.39   5.607   9.50   8.833   1.46   1   2.177   4.39   5.600   9.50   8.833   1.46   1   2.177   4.39   5.600   9.50   8.833   1.46   1   2.177   4.39   5.600   9.50   8.833   1.46   1   2.177   4.39   5.600   9.50   8.833   1.46   1   2.177   4.39   6.000   9.50   9.000   1.46   1   2.177   4.39   6.000   9.50   9.000   1.46   1   2.177   4.39   6.000   9.50   9.000   1.46   1   2.177   4.39   6.000   9.50   9.000   1.46   1   2.177   4.39   6.000   9.50   9.000   1.46   1   2.177   4.39   6.000   9.50   9.000   1.46   1   2.177   4.39   6.000   9.50   9.000   1.46   1   2.177   4.39   6.000   9.50   9.000   1.46   1   2.177   4   |        | 0.022        |        |       |      |            |      |            | 0.70 |
| 1.000 0.73   4.083   12.43   7.167   5.12   1   1   1.083   0.73   4.167   12.43   7.167   5.12   1   1   1.167   0.73   4.250   12.43   7.333   2.92   1   1.157   0.73   4.250   12.43   7.333   2.92   1   1.250   0.73   4.433   33.63   7.4417   2.92   1   1.1417   0.73   4.450   33.63   7.580   2.92   1   1.417   0.73   4.500   33.63   7.580   2.92   1   1.500   0.73   4.500   33.63   7.580   2.92   1   1.500   0.73   4.500   33.63   7.750   2.92   1   1.500   0.73   4.500   33.63   7.750   2.92   1   1.533   0.73   4.467   33.63   7.750   2.92   1   1.833   0.73   4.467   33.63   7.750   2.92   1   1.833   0.73   4.917   33.63   8.000   2.92   1   1.917   0.73   5.000   33.63   8.000   2.92   1   1.917   0.73   5.000   33.63   8.000   2.92   1   2.000   0.73   5.167   33.63   8.167   2.92   1   2.083   0.73   5.167   33.63   8.167   2.92   1   2.083   0.73   5.167   33.63   8.250   2.92   1   2.167   0.73   5.250   33.63   8.333   1.46   1   2.150   0.73   5.250   33.63   8.333   1.46   1   2.150   0.73   5.500   5.90   8.500   1.46   1   2.147   4.39   5.500   9.50   8.583   1.46   1   2.500   4.39   5.583   9.50   8.667   1.46   1   2.500   4.39   5.750   9.50   8.8750   1.46   1   2.503   4.39   5.750   9.50   8.750   1.46   1   2.153   4.39   5.750   9.50   8.750   1.46   1   2.153   4.39   5.750   9.50   8.833   1.46   1   2.175   4.39   5.600   9.50   9.000   1.46   1   2.175   4.39   5.600   9.50   9.000   1.46   1   2.500   0.70 |        |              |        |       |      |            |      |            | 0.73 |
| 1.083 0.73   4.167   12.43   7.250   5.12   1   1   1.167   0.73   4.250   12.43   7.250   5.12   1   1.250   0.73   4.250   12.43   7.250   2.92   1   1.250   0.73   4.333   3.63   7.417   2.92   1   1.250   0.73   4.417   33.63   7.500   2.92   1   1.417   0.73   4.500   33.63   7.500   2.92   1   1.500   0.73   4.650   33.63   7.583   2.92   1   1.583   0.73   4.650   33.63   7.583   2.92   1   1.667   0.73   4.583   33.63   7.667   2.92   1   1.667   0.73   4.750   33.63   7.750   2.92   1   1.667   0.73   4.833   33.63   7.750   2.92   1   1.833   0.73   4.917   33.63   8.000   2.92   1   1.833   0.73   4.917   33.63   8.000   2.92   1   1.917   0.73   5.000   33.63   8.083   2.92   1   2.000   0.73   5.083   33.63   8.167   2.92   1   2.083   0.73   5.167   33.63   8.250   2.92   1   2.167   0.73   5.250   33.63   8.250   2.92   1   2.167   0.73   5.250   33.63   8.250   2.92   1   2.167   0.73   5.500   3.63   8.333   1.46   1   2.333   4.39   5.417   9.50   8.500   1.46   1   2.500   4.39   5.583   9.50   8.503   1.46   1   2.500   4.39   5.583   9.50   8.667   1.46   1   2.500   4.39   5.833   9.50   8.667   1.46   1   2.833   4.39   5.667   9.50   8.833   1.46   1   2.500   4.39   5.833   9.50   8.677   1.46   1   2.833   4.39   5.667   9.50   8.833   1.46   1   2.17   4.39   5.600   9.50   8.833   1.46   1   2.17   4.39   5.600   9.50   8.833   1.46   1   2.17   4.39   5.600   9.50   8.833   1.46   1   2.17   4.39   6.000   9.50   9.000   1.46   1   2.17   4.39   6.000   9.50   9.000   1.46   1   2.17   4.39   6.000   9.50   9.000   1.46   1   2.17   4.50   4.5 |        |              |        |       |      |            |      |            | 0.73 |
| 1.167  |        |              |        |       |      |            |      |            | 0.73 |
| 1.250  |        |              |        |       |      |            |      |            | 0.73 |
| 1.333  |        |              |        |       |      |            |      |            | 0.73 |
| 1.417  |        |              |        |       |      |            |      |            | 0.73 |
| 1.590  |        |              |        |       |      |            |      |            | 0.73 |
| 1.583  |        |              |        |       |      |            |      |            | 0.73 |
| 1.667  |        |              |        |       |      |            |      |            | 0.73 |
| 1.750  |        |              |        |       |      |            |      |            | 0.73 |
| 1.833  |        |              |        |       |      |            |      |            | 0.73 |
| 1.917   0.73   5.000   33.63   8.083   2.92   1  |        |              |        |       |      |            |      |            | 0.73 |
| 2.000  |        |              |        |       |      |            |      |            | 0.73 |
| 2.083 0.73   5.167 33.63   8.250 2.92   1 2.167 0.73   5.259 33.63   8.333 1.45   1 2.250 0.73   5.333 9.50   8.417 1.46   1 2.233 4.39   5.417 9.50   8.590 1.46   1 2.417 4.39   5.500 9.50   8.583 1.46   1 2.500 4.39   5.583 9.50   8.667 1.46   1 2.667 4.39   5.570 9.50   8.750 1.46   1 2.667 4.39   5.750 9.50   8.8750 1.46   1 2.667 4.39   5.750 9.50   8.833 1.46   1 2.233 4.39   5.670 9.50   8.833 1.46   1 2.231 4.39   6.000 9.50   9.80   1.46   1 2.917 4.39   6.000 9.50   9.80   1.46   1 3.000 4.39   6.833 9.50   9.167 1.46   1 3.000 4.39   6.000 9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.50   9.250   1.46   1 3.000 4.39   6.000 9.50   9.50   9.250   1.46   1 3.000 4.30   6.000 9 |        |              |        |       |      |            |      |            | 0.73 |
| 2.167   0.73   5.250   33.63   8.333   1.46   1   1   2.250   0.73   5.333   9.50   8.417   1.46   1   2.333   4.39   5.417   9.50   8.500   1.46   1   2.417   4.39   5.500   9.50   8.583   1.46   1   2.500   4.39   5.533   9.50   8.667   1.46   1   2.500   4.39   5.533   9.50   8.667   1.46   1   2.567   4.39   5.567   9.50   8.750   1.46   1   2.567   4.39   5.533   9.50   8.917   1.46   1   2.750   4.39   5.833   9.50   8.917   1.46   1   2.833   4.39   5.750   9.50   8.833   1.46   1   2.917   4.39   6.000   9.50   9.000   1.46   1   2.917   4.39   6.000   9.50   9.000   1.46   1   3.000   4.39   6.003   9.50   9.167   1.46   1   3.003   4.39   6.167   9.50   9.250   1.46   1   3.003   4.39   6.167   9.50   9.250   1.46   1   4.67   4.   |        |              |        |       |      |            |      |            | 0.73 |
| 2.550 0.73   S.333 9.50   8.417 1.46   1 2.333 4.39   S.417 9.59   8.590 1.46   1 2.417 4.39   S.500 9.50   8.583 1.46   1 2.590 4.39   S.583 9.50   8.667 1.46   1 2.583 4.39   S.67 9.50   8.756 1.46   1 2.667 4.39   S.750 9.50   8.756 1.46   1 2.667 4.39   S.750 9.50   8.833 1.46   1 2.833 4.39   S.67 9.50   8.833 1.46   1 2.833 4.39   S.917 9.50   9.80   1.46   1 2.917 4.39   6.000 9.50   9.801 1.46   1 3.000 4.39   6.083 9.50   9.167 1.46   1 3.083 4.39   6.167 9.50   9.250   1.46   1 3.083 4.39   6.167 9.50   9.250   1.46   1  Max.Eff.Inten.(mm/hr) = 33.63 25.08 Storage Coeff. (min) = 10.00 25.00 Unit Hyd. Tpeak (min) = 10.00 25.00 Unit Hyd. Tpeak (min) = 10.00 25.00 Unit Hyd. Tpeak (min) = 10.00 0.55 00 TIME TO PEAK (frs) = 0.10 0.05  TIME TO PEAK (frs) = 5.25 5.33 5.2  RUNOFF VOLUME (mm) = 71.10 41.07 62.0  |        |              |        |       |      |            |      |            | 0.73 |
| 2.333 4.39   5.417 9.50   8.500 1.46   1 2.417 4.39   5.500 9.50   8.583 1.46   1 2.500 4.39   5.583 9.50   8.667 1.46   1 2.583 4.39   5.583 9.50   8.750 1.46   1 2.575 4.39   5.750 9.50   8.750 1.46   1 2.750 4.39   5.750 9.50   8.833 1.46   1 2.833 4.39   5.917 9.50   9.000 1.46   1 2.917 4.39   6.000 9.50   9.003 1.46   1 3.000 4.39   6.003 9.50   9.167 1.46   1 3.003 4.39   6.167 9.50   9.250 1.46   1 3.083 4.39   6.167 9.50   9.250 1.46   1 3.083 4.39   6.167 9.50   9.250 1.46   1  Max.Eff.Inten.(mm/hr)= 33.63 25.08 over (min) 10.00 25.00 Storage Coeff. (min)= 12.14 (ii) 21.48 (ii) Unit Hyd. Tpeak (min)= 10.00 25.00 Unit Hyd. peak (min)= 10.00 0.55  PEAK FLOW (cms)= 0.10 0.05 4.17  PEAK FLOW (cms)= 0.10 0.03 0.12  TIME TO PEAK (hrs)= 5.25 5.33 5.2  RUNOFF VOLUME (mm)= 71.10 41.07 62.60   |        |              |        |       |      |            |      |            | 0.73 |
| 2.417   4.39   5.500   9.50   8.583   1.46   1     2.500   4.39   5.5667   9.50   8.750   1.46   1     2.583   4.39   5.667   9.50   8.750   1.46   1     2.567   4.39   5.750   9.50   8.833   1.46   1     2.750   4.39   5.833   9.50   8.833   1.46   1     2.833   4.39   5.917   9.50   9.000   1.46   1     2.917   4.39   6.000   9.50   9.000   1.46   1     3.000   4.39   6.083   9.50   9.167   1.46   1     3.000   4.39   6.083   9.50   9.167   1.46   1     3.083   4.39   6.167   9.50   9.250   1.46   1     Max.Eff.Inten.(mm/hr) =   |        |              |        |       |      |            |      |            | 0.73 |
| 2.500 4.39   5.583 9.50   8.667 1.46   1   |        |              |        |       |      |            | 1.46 |            | 0.73 |
| 2.583   4.39   5.667   9.50   8.750   1.46   1   |        | 2.417        | 4.39   | 5.500 | 9.50 | 8.583      | 1.46 | 11.67      | 0.73 |
| 2.667   4.39   5.750   9.50   8.833   1.46   1   |        | 2.500        | 4.39   | 5.583 | 9.50 | 8.667      | 1.46 | 11.75      | 0.73 |
| 2.750   4.39   5.833   9.56   8.917   1.46   1   |        | 2.583        | 4.39   | 5.667 | 9.50 | 8.750      | 1.46 | 11.83      | 0.73 |
| 2.833 4.39   5.917 9.58   9.000 1.46   1 2.917 4.39   6.000 9.59   9.083 1.46   1 3.000 4.39   6.083 9.50   9.167 1.46   1 3.003 4.39   6.167 9.50   9.250 1.46   1  Max.Eff.Inten.(mm/hr)= 33.63 25.08 cver (min) 10.00 25.00 Storage Coeff. (min)= 12.14 (ii) 21.40 (ii) Unit Hyd. Tpeak (min)= 10.00 25.00 Unit Hyd. Tpeak (min)= 0.10 0.05  PEAK FLOW (cms)= 0.10 0.05 TIME TO PEAK (hrs)= 5.25 5.33 5.2 RUNOFF VOLUME (mm)= 71.10 41.07 62.0  |        | 2.667        | 4.39   | 5.750 | 9.50 | 8.833      | 1.46 | 11.92      | 0.73 |
| 2.917   4.39   6.000   9.50   9.083   1.46   1     3.000   4.39   6.083   9.50   9.167   1.46   1     3.083   4.39   6.167   9.50   9.250   1.46   1     3.083   4.39   6.167   9.50   9.250   1.46   1     Max.Eff.Inten.(mm/hr)  |        | 2.750        | 4.39   | 5.833 | 9.50 | 8.917      | 1.46 | 12.00      | 0.73 |
| 3.000 4.39   6.083   9.50   9.167   1.46   1 3.083   4.39   6.167   9.50   9.250   1.46   1  Max.Eff.Inten.(mm/hr)= 33.63   25.08 Storage Coeff. (min)= 10.00   25.00 Unit Hyd. Tpeak (min)= 10.00   25.00 Unit Hyd. Tpeak (cms)= 0.10   0.05  PEAK FLOW (cms)= 0.10   0.03   0.12 TIME TO PEAK (hrs)= 5.25   5.33   5.2 RUNOFF VOLUME (mm)= 71.10   41.07   62.0  |        | 2.833        | 4.39   | 5.917 | 9.50 | 9.000      | 1.46 | 12.08      | 0.73 |
| Max.Eff.Inten.(mm/hr)  |        | 2.917        | 4.39   | 6.000 | 9.50 | 9.083      | 1.46 | 12.17      | 0.73 |
| Max.Eff.Inten.(mm/hr)= 33.63 25.08 over (min) 10.00 25.00 Storage Coeff. (min)= 12.14 (i1) 21.40 (i1) Unit Hyd. Tpeak (min)= 10.00 25.00 Unit Hyd. peak (cms)= 0.10 0.05 **TOTAL PEAK FLOW (cms)= 0.10 0.03 0.12 TIME TO PEAK (hrs)= 5.25 5.33 5.2 RUNOFF VOLUME (mm)= 71.10 41.07 62.0  |        | 3.000        | 4.39   | 6.083 | 9.50 | 9.167      | 1.46 | 12.25      | 0.73 |
| over (min)         10.00         25.00           Storage Coeff: (min)=         12.14 (ii)         21.40 (ii)           Unit Hyd. Tpeak (min)=         10.00         25.00           Unit Hyd. peak (cms)=         0.10         0.05           *TOTAL           PEAK FLOW (cms)=         0.10         0.03         0.12           TIME TO PEAK (hrs)=         5.25         5.33         5.2           RUNDFF VOLUME (mm)=         71.10         41.07         62.0  |        | 3.083        | 4.39   | 6.167 | 9.50 | 9.250      | 1.46 | İ          |      |
| Storage Coeff. (min)= 12.14 (ii) 21.40 (ii) Unit Hyd. Tpeak (min)= 10.00 25.00 Unit Hyd. peak (cms)= 0.10 0.05 **TOTAL PEAK FLOW (cms)= 0.10 0.03 0.12 TIME TO PEAK (hrs)= 5.25 5.33 5.2 RUNOFF VOLUME (mm)= 71.10 41.07 6.20  | Max.Ef | Eff.Inten.(m | m/hr)= | 33.63 |      | 25.08      |      |            |      |
| Unit Hyd. Tpeak (min)= 10.00 25.00 Unit Hyd. peak (cms)= 0.10 0.05  *TOTAL PEAK FLOM (cms)= 0.10 0.03 0.12 TIME TO PEAK (hrs)= 5.25 5.33 5.2 RUNOFF VOLUME (mm)= 71.10 41.07 62.0  |        | over         | (min)  | 10.00 |      | 25.00      |      |            |      |
| Unit Hyd. Tpeak (min)= 10.00 25.00 Unit Hyd. peak (cms)= 0.10 0.05  *TOTAL PEAK FLOM (cms)= 0.10 0.03 0.12 TIME TO PEAK (hrs)= 5.25 5.33 5.2 RUNOFF VOLUME (mm)= 71.10 41.07 62.0  | Storag | age Coeff.   | (min)= | 12.14 | (ii) | 21.40 (ii) |      |            |      |
| PEAK FLOW (cms)= 0.10 0.03 0.12<br>TIME TO PEAK (hrs)= 5.25 5.33 5.2<br>RUNOFF VOLUME (mm)= 71.10 41.07 62.0   |        |              |        | 10.00 |      | 25.00      |      |            |      |
| PEAK FLOW (cms)= 0.10 0.03 0.12<br>TIME TO PEAK (hrs)= 5.25 5.33 5.2<br>RUNOFF VOLUME (mm)= 71.10 41.07 62.0   | Unit H | Hyd. peak    | (cms)= | 0.10  |      | 0.05       |      |            |      |
| TIME TO PEAK (hrs)= 5.25 5.33 5.2<br>RUNOFF VOLUME (mm)= 71.10 41.07 62.0  |        |              |        |       |      |            |      |            |      |
| RUNOFF VOLUME (mm)= 71.10 41.07 62.0   |        |              |        |       |      |            |      | .129 (iii) | ,    |
|  |        |              |        |       |      |            |      | 5.25       |      |
| TOTAL RATNEAU (mm)= 73 10 73 10 73 1   |        |              |        |       |      |            |      |            |      |
|  |        |              | (mm)=  | 73.10 |      | 73.10      |      | 3.10       |      |
| RUNOFF COEFFICIENT = 0.97 0.56 0.8   | RUNOFF | FF COEFFICIE | NT =   | 0.97  |      | 0.56       |      | 0.85       |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 85.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| RESERVOIR( 0525)| | IN= 2---> OUT= 1 | DT= 5.0 min OVERFLOW IS OFF

Max.Eff.Inten.(mm/hr)=

over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=

OUTFLOW STORAGE | OUTFLOW STORAGE

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LangstaffRd\_EA\_Proposed\_HumberWatershed (m) = 650.00 25.00 = 0.013 0.250 Mannings n

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TRANSFORMED HYFTOGRAPH -VSFORMED HY RAIN | ' 4.85 | 6. 4.85 | 6. 4.85 | 6. 13.74 | 6 13.74 | 6 13.74 | 6 13.74 | 6 13.74 | 6 13.74 | 6 13.74 | 7 13.74 | 7 RAIN | TIME mm/hr | hrs 0.00 | 3.167 0.00 | 3.250 0.00 | 3.333 TIME hrs 0.083 TIME
hrs
6.250
6.333
6.417
6.500
6.583
6.676
6.750
6.833
6.917
7.000
7.083
7.167
7.250
7.333
7.417
7.550
7.583 RAIN | TIME mm/hr | hrs 10.50 | 9.33 RAIN mm/hr 0.81 hrs 9.33 9.42 0.167 5.66 0.81 0.250 9.50 0.81 0.81 0.81 0.81 0.81 0.81 9.50 9.58 9.67 9.75 9.83 9.92 10.00 0.333 3.417 5.66 5.66 5.66 5.66 5.66 5.66 5.66 0.81 0.333 0.417 0.500 0.583 0.667 0.750 3.583 3.667 3.750 3.833 0.833 0.81 0.81 3.917 10.08 0.81 4.000 4.083 4.167 4.250 4.333 4.417 4.500 4.583 13.74 | 13.74 | 13.74 | 13.74 | 13.74 | 37.17 | 37.17 | 0.917 10.17 0.81 0.81 0.81 0.81 0.81 0.81 0.81 5.66 5.66 3.23 3.23 3.23 3.23 1.000 10.25 0.81 1 083 1.167 1.250 1.333 10.33 10.42 10.50 10.58 0.81 0.81 0.81 0.81 1.417 10.67 0.81 1.500 0.81 0.81 37.17 7.667 3.23 10.75 0.81 7.750 7.833 7.917 8.000 8.083 8.167 8.250 1.583 4,667 37.17 10.83 0.81 0.81 0.81 0.81 0.81 37.17 37.17 37.17 37.17 37.17 3.23 3.23 3.23 3.23 3.23 1.667 1.750 4.750 10.92 0.81 4.833 4.917 5.000 5.083 1.833 1.917 2.000 0.81 3.23 11.25 2.083 0.81 5.167 37.17 | 8.250 37.17 | 8.333 10.50 | 8.417 10.50 | 8.583 10.50 | 8.583 10.50 | 8.667 10.50 | 8.750 10.50 | 8.917 10.50 | 9.083 10.50 | 9.083 10.50 | 9.167 10.50 | 9.250 37.17 3.23 11.33 0.81 2.167 0.81 5.250 1.62 11.42 0.81 2.250 0.81 5.333 1.62 11.50 0.81 4.85 4.85 4.85 4.85 4.85 4.85 4.85 4.85 5.333 5.417 5.500 5.583 5.667 5.750 5.833 1.62 1.62 1.62 1.62 1.62 2.333 11.58 0.81 11.92 2.667 0.81 2.750 1.62 12.00 0.81 2.833 5.917 1.62 12.08 0.81 2.917 4.85 6.000 1.62 12.17 0.81 4.85 6.083 1.62 12.25

10.00 25.00 11.67 (ii) 20.35 (ii)

25.00

0 05

10.00

0 10

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\*TOTALS\*

```
LangstaffRd_EA_Proposed_HumberWatershed
                                          (cms)
                                                          (ha.m.)
0.0000
                                                                                (cms)
0.0181
                                                                                                (ha.m.)
                                          0.0000
                                                                                                    0.0161
0.0204
                                          0.0081
                                                           0.0031
                                                                                0.0584
                                                   AREA
                                                                 QPEAK
                                                                                  TPEAK
                                                                                 (hrs)
5.25
5.42
                                                   (ha)
1.580
                                                                 (cms)
    INFLOW : ID= 2 ( 0110)
OUTFLOW: ID= 1 ( 0525)
                                                                 0.129
0.106
                                                                                                       `62.08
                                                  1.580
                                                                                                      62.03
                             PEAK FLOW REDUCTION [Qout/Qin](%)= 82.30
TIME SHIFT OF PEAK FLOW (min)= 10.00
MAXIMUM STORAGE USED (ha.m.)= 0.0283
READ STORM
                                     Filename: C:\Users\ray.zhao\AppD
                                        ata\Local\Temp\
efddf5d6-df0e-43ba-b139-2f589a28109d\5040be70
  Ptotal= 80.82 mm
                                     Comments: 50Y12
                                                                                            RAIN |
mm/hr |
5.66 | 1
5.66 | 1
                           TTMF
                                      RATN I
                                                    TTMF
                                                                  RATN
                                                                               TTME
                                                                                                                       PATN
                          hrs
0.25
0.50
                                      mm/hr
0.00
0.81
                                                               mm/hr
13.74
13.74
13.74
                                                                              hrs
6.75
7.00
7.25
                                                                                                      hrs
10.00
10.25
10.50
                                                    hrs
3.50
3.75
4.00
4.25
4.50
4.75
5.00
5.25
5.50
5.75
6.00
                                                                                                                     mm/hi
0.81
                                                                                                                      0.81
                           0.75
                                       0.81
                                                                                            5.66
                                                                                                                      0.81
                           1.00
                                       0.81
                                                                13.74
                                                                              7.50
                                                                                            3.23
                                                                                                      10.75
                                                                                                                      0.81
                                                                                                      10.75
11.00
11.25
11.50
11.75
12.00
12.25
                                       0.81
0.81
0.81
0.81
0.81
4.85
4.85
                                                               37.17
37.17
37.17
37.17
10.50
10.50
                                                                                           3.23
3.23
3.23
1.62
1.62
1.62
                           1.25
1.50
1.75
2.00
2.25
2.50
2.75
                                                                              7.75
8.00
8.25
8.50
8.75
9.00
9.25
9.50
9.75
                                                                                                                      0.81
                                                                                                                     0.81
0.81
0.81
0.81
0.81
                                                                                            1.62
                           3.00
                                       4.85
                                                    6.25
                                                               10.50
                                                                                            0.81
                           3.25
                                       4.85 İ
                                                                  5.66 İ
  CALIB |
STANDHYD ( 0105)|
                                    Area (ha)= 1.63
Total Imp(%)= 69.00 Dir. Conn.(%)= 69.00
ID= 1 DT= 5.0 min |
                                                IMPERVIOUS PERVIOUS (i)
                                   (ha)=
(mm)=
(%)=
                                                     1.12
2.00
1.00
                                                                      0.51
5.00
2.00
       Surface Area
       Dep. Storage
Average Slope
                                                                   Page 46
```

0.149 (iii) 5.25 69.59 80.82

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 86.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COFFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR( 0520)| IN= 2---> OUT= 1 | DT= 5.0 min | OVERFLOW IS OFF OUTFLOW STORAGE | 'ha.m.) OUTFLOW STORAGE (ha.m.) 0.0000 0.0031 0.0074 (cms) 0.0000 (cms) 0.0181 (ha.m.) 0.0161 0.0081 0.0204 0 0123 0 0259

0.0584 0.0920 0.0000 0.0155 0 \*\*\*\* WARNING : STORAGE-DISCHARGE QPEAK (ha) (cms) (hrs) (mm) 69.59

(ha) (cms)
INFLOW: ID= 2 ( 0105) 1.630 0.149
OUTFLOW: ID= 1 ( 0520) 1.630 0.124 5.42 69.53

CAL TB Area (ha)= 2.08 Total Imp(%)= 82.00 Dir. Conn.(%)= 82.00 IMPERVIOUS PERVIOUS (i) Surface Area 1.71 0.37 Dep. Storage Average Slope Length Mannings n (mm) = (%) = (m) = 5.00 1.00 2.00 800.00 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYFTOGRAPH ----TIME RAIN | TIME RAIN | TIME RAIN | TIME hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs

|                  | Langs  | taffRd F | A Prono | sed Humber | Watersh | ed           |      |
|------------------|--------|----------|---------|------------|---------|--------------|------|
| 0.083            |        | 3.167    |         | 6.250      | 10.50   |              | 0.81 |
| 0.167            |        | 3.250    |         | 6.333      | 5.66    |              | 0.81 |
| 0.250            |        | 3.333    |         | 6.417      | 5.66    |              | 0.81 |
| 0.333            |        | 3.417    |         | 6.500      | 5.66    |              | 0.81 |
| 0.417            |        | 3.500    |         | 6.583      | 5.66    |              | 0.81 |
| 0.500            |        | 3.583    |         | 6.667      | 5.66    |              | 0.81 |
| 0.583            |        | 3.667    |         | 6.750      | 5.66    |              | 0.81 |
| 0.667            |        | 3.750    |         | 6.833      | 5.66    |              | 0.81 |
| 0.750            |        | 3.833    |         | 6.917      | 5.66    |              | 0.81 |
| 0.833            |        | 3.917    |         | 7.000      | 5.66    |              | 0.81 |
| 0.917            |        | 4.000    |         | 7.083      | 5.66    |              | 0.81 |
| 1.000            |        | 4.083    |         | 7.167      | 5.66    |              | 0.81 |
| 1.083            |        | 4.167    |         | 7.250      | 5.66    |              | 0.81 |
| 1.167            |        | 4.250    |         | 7.333      | 3.23    |              | 0.81 |
| 1.250            |        | 4.333    |         | 7.417      | 3.23    |              | 0.81 |
| 1.333            |        | 4.417    | 37.17   |            | 3.23    |              | 0.81 |
| 1.417            |        | 4.500    |         | 7.583      | 3.23    |              | 0.81 |
| 1.500            |        | 4.583    |         | 7.667      | 3.23    |              | 0.81 |
| 1.583            |        | 4.667    |         | 7.750      | 3.23    |              | 0.81 |
| 1.667            |        | 4.750    |         | 7.833      | 3.23    |              | 0.81 |
| 1.750            |        | 4.833    |         | 7.917      | 3.23    |              | 0.81 |
| 1.833            |        | 4.917    |         | 8.000      | 3.23    |              | 0.81 |
| 1.917            |        | 5.000    |         | 8.083      | 3.23    |              | 0.81 |
| 2.000            |        | 5.083    |         | 8.167      | 3.23    |              | 0.81 |
| 2.083            |        | 5.167    |         | 8.250      | 3.23    |              | 0.81 |
| 2.167            |        | 5.250    |         | 8.333      | 1.62    |              | 0.81 |
| 2.250            |        | 5.333    |         | 8.417      | 1.62    |              | 0.81 |
| 2.333            |        | 5.417    |         | 8.500      | 1.62    |              | 0.81 |
| 2.417            |        | 5.500    |         | 8.583      | 1.62    |              | 0.81 |
| 2.500            |        | 5.583    |         | 8.667      | 1.62    |              | 0.81 |
| 2.583            |        | 5.667    |         | 8.750      | 1.62    |              | 0.81 |
| 2.667            |        | 5.750    |         | 8.833      | 1.62    |              | 0.81 |
| 2.750            |        | 5.833    |         | 8.917      | 1.62    |              | 0.81 |
| 2.833            |        | 5.917    |         | 9.000      | 1.62    |              | 0.81 |
| 2.917            |        |          |         | 9.083      | 1.62    |              | 0.81 |
| 3.000            |        |          |         | 9.167      | 1.62    |              | 0.81 |
| 3.083            |        |          |         | 9.250      | 1.62    |              | 0.01 |
| 5.005            | 4.05   | 0.107    | 10.50   | 1 3.230    | 1.02    | '            |      |
| Max.Eff.Inten.(m | m/hr)- | 37.17    |         | 27.36      |         |              |      |
|                  | (min)  | 15.00    |         | 20.00      |         |              |      |
|                  | (min)= | 13.22    | (11)    | 16.99 (ii  | ١       |              |      |
| Unit Hyd. Tpeak  |        | 15.00    | (11)    | 20.00      | ,       |              |      |
|                  | (cms)= | 0.08     |         | 0.06       |         |              |      |
| onize nyu. peak  | (СШЗ)- | 0.00     |         | 0.00       | ****    | TALS*        |      |
| PEAK FLOW        | (cms)= | 0.17     |         | 0.02       |         | .199 (iii    | )    |
|                  | (hrs)= | 5.25     |         | 5.33       |         | 5.25         | .,   |
| RUNOFF VOLUME    | (mm)=  | 78.82    |         | 44.97      |         | 2.72         |      |
| TOTAL RAINFALL   | (mm)=  | 80.82    |         | 80.82      |         | 2.72         |      |
| RUNOFF COEFFICIE |        | 0.98     |         | 0.56       |         | 0.82<br>0.90 |      |
| COLITICIE        |        | 0.30     |         | 3.30       | ,       |              |      |
|                  |        |          |         |            |         |              |      |
|                  |        |          |         |            |         |              |      |

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  $CN^* = 83.0$  Ia = Dep. Storage (Above)

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|                  | Langs   | taffRd_E | A_Propos | sed_HumberW | latershed |          |
|------------------|---------|----------|----------|-------------|-----------|----------|
| 2.583            | 4.85    | 5.667    | 10.50    | 8.750       | 1.62   11 | .83 0.81 |
| 2.667            | 7 4.85  | 5.750    | 10.50    | 8.833       | 1.62   11 | .92 0.81 |
| 2.756            | 4.85    | 5.833    | 10.50    | 8.917       | 1.62   12 | .00 0.81 |
| 2.833            | 4.85    | 5.917    | 10.50    | 9.000       | 1.62   12 | .08 0.81 |
| 2.917            | 7 4.85  | 6.000    | 10.50    | 9.083       | 1.62   12 | .17 0.81 |
| 3.000            | 4.85    | 6.083    | 10.50    | 9.167       | 1.62   12 | .25 0.81 |
| 3.083            | 4.85    | 6.167    | 10.50    | 9.250       | 1.62      |          |
|                  |         |          |          |             |           |          |
| Max.Eff.Inten.(r | nm/hr)= | 37.17    |          | 27.36       |           |          |
| over             | (min)   | 15.00    |          | 20.00       |           |          |
| Storage Coeff.   | (min)=  | 13.22    | (ii)     | 17.48 (ii)  |           |          |
| Unit Hyd. Tpeak  | (min)=  | 15.00    |          | 20.00       |           |          |
| Unit Hyd. peak   | (cms)=  | 0.08     |          | 0.06        |           |          |
|                  |         |          |          |             | *TOTALS   | *        |
| PEAK FLOW        | (cms)=  | 0.18     |          | 0.03        | 0.212     | (iii)    |
| TIME TO PEAK     | (hrs)=  | 5.25     |          | 5.33        | 5.25      |          |
| RUNOFF VOLUME    | (mm)=   | 78.82    |          | 44.97       | 71.03     |          |
| TOTAL RAINFALL   | (mm)=   | 80.82    |          | 80.82       | 80.82     |          |
| RUNOFF COEFFICIE | NT =    | 0.98     |          | 0.56        | 0.88      |          |
|                  |         |          |          |             |           |          |

INFLOW : ID= 2 ( 0405)

| (iii) PEAK FLOW DOE              | ES NOT INCL | UDE BASEFL | OW IF AN | Υ.    |         |
|----------------------------------|-------------|------------|----------|-------|---------|
|                                  |             |            |          |       |         |
|                                  |             |            |          |       |         |
| ADD HYD ( 0405)                  |             |            |          |       |         |
| 1 + 2 = 3                        |             | QPEAK      |          |       |         |
|                                  |             |            |          |       | )       |
| ID1= 1 ( 0125):                  |             |            |          |       |         |
| + ID2= 2 ( 0130):                | : 2.08      | 0.199      | 5.25     | 72.72 |         |
| ID = 3 ( 0405):                  |             | 0.411      |          |       | =       |
| NOTE: PEAK FLOWS [               | OO NOT INCL | UDE BASEFL | OWS IF A | NY.   |         |
|                                  |             |            |          |       |         |
|                                  |             |            |          |       |         |
| RESERVOIR( 0505)                 | OVERFLOW    | IS OFF     |          |       |         |
| IN= 2> OUT= 1  <br>  DT= 5.0 min | OUTEL OU    | CTODACE    | LOUT     |       | CTORACE |
| DI= 5.0 min                      |             |            |          | FLOW  | STORAGE |
|                                  | (cms)       | 0.0000     |          |       |         |
|                                  |             | 0.0030     |          |       |         |
|                                  |             | 0.0120     |          |       |         |
|                                  | 0.0302      |            |          |       | 0.0000  |
|                                  | 0.1102      | 0.0231     | , 0.     | 0000  | 0.0000  |

(cms) 0.411 Page 51

QPEAK

AREA (ha) 4.350 TPEAK

(hrs) 5.25

R.V. (mm) 71.84

LangstaffRd\_EA\_Proposed\_HumberWatershed
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COFFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |          |       |         |           |       |  |
|-------------------|-------|----------|-------|---------|-----------|-------|--|
| STANDHYD ( 0125)  | Area  | (ha)=    | 2.27  |         |           |       |  |
| ID= 1 DT= 5.0 min | Total | Imp(%)=  | 77.00 | Dir.    | Conn.(%)= | 77.00 |  |
|                   |       |          |       |         |           |       |  |
|                   |       | IMPERVIO | OUS   | PERVIOL | IS (i)    |       |  |
| Surface Area      | (ha)= | 1.75     | 5     | 0.52    |           |       |  |
| Dep. Storage      | (mm)= | 2.00     | )     | 5.00    | )         |       |  |
| Average Slope     | (%)=  | 1.00     | )     | 2.00    | )         |       |  |
| Length            | (m)=  | 800.00   | )     | 20.00   | )         |       |  |
| Mannings n        | ` ′=  | 0.013    | 3     | 0.250   | )         |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    |       | ) HYETOGR | APH   |       |       |
|-------|-------|-------|-------|-----------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN  | ' TIME    | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr | ' hrs     | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 4.85  | 6.250     | 10.50 | 9.33  | 0.81  |
| 0.167 | 0.00  | 3.250 | 4.85  | 6.333     | 5.66  | 9.42  | 0.81  |
| 0.250 | 0.00  | 3.333 | 13.74 | 6.417     | 5.66  | 9.50  | 0.81  |
| 0.333 | 0.81  | 3.417 | 13.74 | 6.500     | 5.66  | 9.58  | 0.81  |
| 0.417 | 0.81  | 3.500 | 13.74 | 6.583     | 5.66  | 9.67  | 0.81  |
| 0.500 | 0.81  | 3.583 | 13.74 | 6.667     | 5.66  | 9.75  | 0.81  |
| 0.583 | 0.81  | 3.667 | 13.74 | 6.750     | 5.66  | 9.83  | 0.81  |
| 0.667 | 0.81  | 3.750 | 13.74 | 6.833     | 5.66  | 9.92  | 0.81  |
| 0.750 | 0.81  | 3.833 | 13.74 | 6.917     | 5.66  | 10.00 | 0.81  |
| 0.833 | 0.81  | 3.917 | 13.74 | 7.000     | 5.66  | 10.08 | 0.81  |
| 0.917 | 0.81  | 4.000 | 13.74 | 7.083     | 5.66  | 10.17 | 0.81  |
| 1.000 | 0.81  | 4.083 | 13.74 | 7.167     | 5.66  | 10.25 | 0.81  |
| 1.083 | 0.81  | 4.167 | 13.74 | 7.250     | 5.66  | 10.33 | 0.81  |
| 1.167 | 0.81  | 4.250 | 13.74 | 7.333     | 3.23  | 10.42 | 0.81  |
| 1.250 | 0.81  | 4.333 | 37.17 | 7.417     | 3.23  | 10.50 | 0.81  |
| 1.333 | 0.81  | 4.417 | 37.17 | 7.500     | 3.23  | 10.58 | 0.81  |
| 1.417 | 0.81  | 4.500 | 37.17 | 7.583     | 3.23  | 10.67 | 0.81  |
| 1.500 | 0.81  | 4.583 | 37.17 | 7.667     | 3.23  | 10.75 | 0.81  |
| 1.583 | 0.81  | 4.667 | 37.17 | 7.750     | 3.23  | 10.83 | 0.81  |
| 1.667 | 0.81  | 4.750 | 37.17 | 7.833     | 3.23  | 10.92 | 0.81  |
| 1.750 | 0.81  | 4.833 | 37.17 | 7.917     | 3.23  | 11.00 | 0.81  |
| 1.833 | 0.81  | 4.917 | 37.17 | 8.000     | 3.23  | 11.08 | 0.81  |
| 1.917 | 0.81  | 5.000 | 37.17 | 8.083     | 3.23  | 11.17 | 0.81  |
| 2.000 | 0.81  | 5.083 | 37.17 | 8.167     | 3.23  | 11.25 | 0.81  |
| 2.083 | 0.81  | 5.167 | 37.17 | 8.250     | 3.23  | 11.33 | 0.81  |
| 2.167 | 0.81  | 5.250 | 37.17 | 8.333     | 1.62  | 11.42 | 0.81  |
| 2.250 | 0.81  | 5.333 | 10.50 | 8.417     | 1.62  | 11.50 | 0.81  |
| 2.333 | 4.85  | 5.417 | 10.50 | 8.500     | 1.62  | 11.58 | 0.81  |
| 2.417 | 4.85  | 5.500 | 10.50 | 8.583     | 1.62  | 11.67 | 0.81  |
| 2.500 | 4.85  | 5.583 | 10.50 | 8.667     | 1.62  | 11.75 | 0.81  |

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 \begin{array}{c} LangstaffRd\_EA\_Proposed\_HumberWatershed \\ \text{OUTFLOW: ID= 1 ( 0505) } 4.350 & 0.306 & 5.50 & 71.83 \end{array}
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PEAK FLOW REDUCTION [Qout/Qin](%)= 74.38 TIME SHIFT OF PEAK FLOW (min)= 15.00 MAXIMUM STORAGE USED (ha.m.)= 0.0689

| CALIB         | Area<br>Total | (ha)= 1.24<br>Imp(%)= 73.00 |              | 73.00 |
|---------------|---------------|-----------------------------|--------------|-------|
|               |               | IMPERVIOUS                  | PERVIOUS (i) |       |
| Surface Area  | (ha)=         | 0.91                        | 0.33         |       |
| Dep. Storage  | (mm)=         | 2.00                        | 5.00         |       |
| Average Slope | (%)=          | 1.00                        | 2.00         |       |
| Length        | (m)=          | 475.00                      | 17.00        |       |
| Mannings n    | =             | 0.013                       | 0.250        |       |

| • | KAINFAL | L WAS I | KANSFURM | .0 10 . | J. O PILIN. | TIPL STE | .г.   |       |
|---|---------|---------|----------|---------|-------------|----------|-------|-------|
|   |         |         |          |         |             |          |       |       |
|   |         |         |          |         | HYETOGR     |          |       |       |
|   | TIME    | RAIN    | TIME     | RAIN    | ' TIME      | RAIN     | TIME  | RAIN  |
|   | hrs     | mm/hr   | hrs      | mm/hr   | ' hrs       | mm/hr    | hrs   | mm/hr |
|   | 0.083   | 0.00    | 3.167    | 4.85    | 6.250       | 10.50    | 9.33  | 0.81  |
|   | 0.167   | 0.00    | 3.250    | 4.85    | 6.333       | 5.66     | 9.42  | 0.81  |
|   | 0.250   | 0.00    |          |         |             | 5.66     |       | 0.81  |
|   | 0.333   | 0.81    |          | 13.74   |             | 5.66     |       | 0.81  |
|   | 0.417   |         | 3.500    | 13.74   |             | 5.66     |       | 0.81  |
|   | 0.500   | 0.81    | 3.583    | 13.74   |             | 5.66     |       | 0.81  |
|   | 0.583   | 0.81    | 3.667    | 13.74   | 6.750       | 5.66     | 9.83  | 0.81  |
|   | 0.667   | 0.81    | 3.750    | 13.74   | 6.833       | 5.66     | 9.92  | 0.81  |
|   | 0.750   | 0.81    | 3.833    | 13.74   |             | 5.66     | 10.00 | 0.81  |
|   | 0.833   | 0.81    | 3.917    | 13.74   | 7.000       | 5.66     |       | 0.81  |
|   | 0.917   | 0.81    | 4.000    | 13.74   | 7.083       | 5.66     | 10.17 | 0.81  |
|   | 1.000   | 0.81    | 4.083    | 13.74   | 7.167       | 5.66     | 10.25 | 0.81  |
|   | 1.083   | 0.81    |          | 13.74   | 7.250       | 5.66     |       | 0.81  |
|   | 1.167   | 0.81    |          | 13.74   |             | 3.23     |       | 0.81  |
|   | 1.250   | 0.81    |          | 37.17   |             | 3.23     |       | 0.81  |
|   | 1.333   | 0.81    | 4.417    | 37.17   | 7.500       | 3.23     |       | 0.81  |
|   | 1.417   | 0.81    | 4.500    | 37.17   | 7.583       | 3.23     | 10.67 | 0.81  |
|   | 1.500   | 0.81    | 4.583    | 37.17   | 7.667       | 3.23     | 10.75 | 0.81  |
|   | 1.583   | 0.81    | 4.667    | 37.17   | 7.750       | 3.23     | 10.83 | 0.81  |
|   | 1.667   | 0.81    | 4.750    | 37.17   | 7.833       | 3.23     |       | 0.81  |
|   | 1.750   | 0.81    | 4.833    | 37.17   | 7.917       | 3.23     | 11.00 | 0.81  |
|   | 1.833   | 0.81    | 4.917    | 37.17   | 8.000       | 3.23     | 11.08 | 0.81  |
|   | 1.917   | 0.81    | 5.000    | 37.17   | 8.083       | 3.23     | 11.17 | 0.81  |
|   | 2.000   | 0.81    | 5.083    | 37.17   | 8.167       | 3.23     | 11.25 | 0.81  |
|   | 2.083   | 0.81    | 5.167    | 37.17   | 8.250       | 3.23     |       | 0.81  |
|   | 2.167   | 0.81    | 5.250    | 37.17   | 8.333       | 1.62     |       | 0.81  |
|   | 2.250   | 0.81    | 5.333    | 10.50   | 8.417       | 1.62     | 11.50 | 0.81  |
|   | 2.333   | 4.85    | 5.417    | 10.50   | 8.500       | 1.62     | 11.58 | 0.81  |
|   |         |         |          |         |             |          |       |       |

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|                 | Lange      | +affDd E  | A Dnono | sed Humberw | latonch | od         |      |
|-----------------|------------|-----------|---------|-------------|---------|------------|------|
| 2.41            |            |           |         |             |         |            | 0.81 |
| 2.50            |            | 5.583     |         | 8.667       | 1.62    |            | 0.81 |
|                 | 3 4.85     |           |         | 8.750       |         | 11.73      | 0.81 |
|                 | 7 4.85     |           |         | 8.833       |         |            | 0.81 |
|                 |            |           |         | 8.917       |         | 12.00      | 0.81 |
|                 | 3 4.85     |           |         | 9.000       |         | 12.00      | 0.81 |
|                 |            |           |         |             |         |            |      |
|                 | 7 4.85     |           |         | 9.083       |         | 12.17      | 0.81 |
|                 | 0 4.85     |           |         | 9.167       |         | 12.25      | 0.81 |
| 3.08            | 3 4.85     | 6.167     | 10.50   | 9.250       | 1.62    |            |      |
| M FCC T-+ /-    | (1 )       | 27.47     |         | 27.26       |         |            |      |
| Max.Eff.Inten.( |            | 37.17     |         | 27.36       |         |            |      |
|                 | (min)      | 10.00     |         | 15.00       |         |            |      |
| Storage Coeff.  |            | 9.67      |         | 13.88 (ii)  |         |            |      |
| Unit Hyd. Tpeak |            | 10.00     |         | 15.00       |         |            |      |
| Unit Hyd. peak  | (cms)=     | 0.11      |         | 0.08        |         |            |      |
|                 |            |           |         |             |         | TALS*      |      |
| PEAK FLOW       | (cms)=     | 0.09      |         | 0.02        |         | .116 (iii) |      |
| TIME TO PEAK    | (hrs)=     | 5.25      |         | 5.25        |         | 5.25       |      |
| RUNOFF VOLUME   | (mm)=      | 78.82     |         | 44.97       | 69      | 9.67       |      |
| TOTAL RAINFALL  | (mm)=      | 80.82     |         | 80.82       | 86      | 3.82       |      |
| RUNOFF COEFFICI | ENT =      | 0.98      |         | 0.56        | (       | 9.86       |      |
|                 |            |           |         |             |         |            |      |
|                 |            |           |         |             |         |            |      |
| (i) CN PROCED   | URE SELECT | ED FOR PE | RVIOUS  | LOSSES:     |         |            |      |
| CN* =           | 83.0 Ia    | = Dep. S  | torage  | (Above)     |         |            |      |
| (ii) TIME STEP  | (DT) SHOU  | LD BE SMA | LLER OR | ÈOUAL       |         |            |      |
| THAN THE        | STORÁGE CO | EFFICIENT |         | -           |         |            |      |
| (iii) PEAK FLOW | DOES NOT   | INCLUDE B | ASEFLOW | IF ANY.     |         |            |      |
| , ,             |            |           |         |             |         |            |      |

| CALIB   STANDHYD ( 0115)   ID= 1 DT= 5.0 min                          | Area<br>Total                  | (ha)=<br>Imp(%)=                                     | 1.00<br>63.00 | Dir. Conn.(%)=   | 63.00 |
|---|--------------------------------|--|---------------|--|-------|
| Surface Area<br>Dep. Storage<br>Average Slope<br>Length<br>Mannings n | (ha)=<br>(mm)=<br>(%)=<br>(m)= | IMPERVIOU<br>0.63<br>2.00<br>1.00<br>475.00<br>0.013 | JS            | PERVIOUS (i)<br>0.37<br>5.00<br>2.00<br>17.00<br>0.250 |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       |       |       | D HYETOGR |       |      |       |
|-------|-------|-------|-------|-----------|-------|------|-------|
| TIME  | RAIN  | TIME  | RAIN  | TIME      | RAIN  | TIME | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr | ' hrs     | mm/hr | hrs  | mm/hr |
| 0.083 | 0.00  | 3.167 | 4.85  | 6.250     | 10.50 | 9.33 | 0.81  |
| 0.167 | 0.00  | 3.250 | 4.85  | 6.333     | 5.66  | 9.42 | 0.81  |
| 0.250 | 0.00  | 3.333 | 13.74 | 6.417     | 5.66  | 9.50 | 0.81  |
| 0.333 | 0.81  | 3.417 | 13.74 | 6.500     | 5.66  | 9.58 | 0.81  |
| 0.417 | 0.81  | 3.500 | 13.74 | 6.583     | 5.66  | 9.67 | 0.81  |

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#### ${\tt LangstaffRd\_EA\_Proposed\_HumberWatershed}$

| ADD HYD ( 0410) <br>1 + 2 = 3  <br>ID1= 1 ( 01:<br>+ ID2= 2 ( 01: | AREA (ha) 15): 1.00 20): 1.24                 | QPEAK<br>(cms)<br>0.089<br>0.116   | (hrs)<br>5.25<br>5.25 | (mm)<br>66.29<br>69.67 |               |
|---|---|------------------------------------|-----------------------|------------------------|---------------|
|   | 10): 2.24                                     |                                    |                       |                        |               |
| NOTE: PEAK FLO  | WS DO NOT INCL                                | UDE BASEFL                         | OWS IF AM             | IY.                    |               |
| RESERVOIR( 0510) <br>IN= 2> OUT= 1                                |   |                                    |                       |                        |               |
| DT= 5.0 min   | (cms)   |                                    | (cn                   | ıs) (                  | (ha.m.)       |
|   | 0.0457  | 0.0099<br>0.0204                   | 0.6                   | 876                    | 0.0666        |
| INFLOW : ID= 2 (<br>OUTFLOW: ID= 1 (                              | (h<br>0410) 2.                                | EA QPE<br>a) (cm<br>240 0<br>240 0 | s) (h                 | nrs)<br>5.25           | (mm)<br>68.16 |
| T.  | EAK FLOW R<br>IME SHIFT OF P<br>AXIMUM STORAG | EAK FLOW                           | (n                    | nin)= 25.              | .00           |
|   |   |                                    |                       |                        |               |
| ADD HYD ( 0420) <br>1 + 2 = 3                                     | ADEA  | QPEAK                              | TDEAU                 | P V                    |               |
| 1 + 2 - 3   | (ha)  | (cms)                              | (hrs)                 | (mm)                   |               |
| ID1= 1 ( 05<br>+ ID2= 2 ( 05                                      |   |                                    |                       |                        |               |
| =========   |   |                                    |                       |                        |               |

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0.47 5.00 2.00

Area (ha)= 1.58 Total Imp(%)= 70.00 Dir. Conn.(%)= 70.00

IMPERVIOUS PERVIOUS (i)

1.11 2.00 1.00

Surface Area Dep. Storage Average Slope

(ha)= (mm)= (%)=

| 0.667 6 0.750 0 0.833 6 0.917 6 1.080 1 1.080 1 1.250 6 1.333 1 1.417 6 1.500 1 1.583 6 1.583 6 1.583 6 1.583 6 2.667 6 2.250 6 2.333 4 2.417 4 2.590 4 2.583 6 2.250 4 2.583 4 2.591 4  | .81   3.667   3.667   3.667   3.667   3.683   3.750   3.683    | 13.74<br>13.74<br>13.74<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>10.50<br>10.50<br>10.50<br>10.50                   | 6.833<br>6.917<br>7.000<br>7.083<br>7.167<br>7.250<br>7.333<br>7.417<br>7.566<br>7.759<br>7.833<br>7.667<br>7.759<br>8.000<br>8.003<br>8.167<br>8.250<br>8.250<br>8.250<br>8.250<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503<br>8.503 | 5.66<br>5.66<br>5.66<br>5.66<br>5.66<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3 | 9,92<br>  10.00<br>  10.08<br>  10.17<br>  10.25<br>  10.33<br>  10.42<br>  10.58<br>  10.67<br>  10.58<br>  10.67<br>  10.75<br>  10.83<br>  10.92<br>  11.08<br>  11.10<br>  11.08<br>  11.13<br>  11.25<br>  11.33<br>  11.42<br>  11.58<br>  11.58<br>  11.58 | 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0                 |
|--|--|---|---|---|---|--|
| 0.750 0.00 0.833 0.917 1.000 0 | .81   3.833 .833 .81   3.817 .81   4.000 .81   4.050 .81   4.150 . | 13.74<br>13.74<br>13.74<br>13.74<br>13.74<br>13.74<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>10.50<br>10.50<br>10.50 | 6.917<br>7.003<br>7.083<br>7.167<br>7.259<br>7.333<br>7.417<br>7.560<br>7.583<br>7.667<br>7.750<br>7.883<br>7.917<br>8.000<br>8.083<br>8.167<br>8.233<br>8.417<br>8.583<br>8.583  | 5.66<br>5.66<br>5.66<br>5.66<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3         | 10.00<br>10.08<br>10.08<br>10.17<br>10.25<br>10.33<br>10.50<br>10.58<br>10.68<br>10.67<br>10.75<br>10.83<br>11.00<br>11.08<br>11.17<br>11.25<br>11.33<br>11.42<br>11.50<br>11.58<br>11.50<br>11.58  | 0.<br>0.<br>0.<br>0.<br>0.<br>0.<br>0.<br>0.<br>0.<br>0. |
| 0.833 0 0.917 6 1.080 1 1.083 6 1.105 6 1.250 6 1.333 1 1.417 6 1.590 6 1.583 6 1.583 6 1.667 6 1.750 6 2.083 2 2.167 6 2.250 6 2.333 4 2.417 4 2.583 4 2.583 4 2.583 4 2.583 4 2.583 4 2.583 4 2.583 4 3.667 6 3.750 4 3.083 6 3.083 6 4 Max.Eff.Inten.(mm/hr) over (min) Storage Coeff. (min/hr)   | .81   3.917<br>.81   4.483<br>.81   4.483<br>.81   4.457<br>.81   4.457<br>.81   4.459<br>.81   4.590<br>.81   4.590<br>.81   4.593<br>.81   4.667<br>.81   4.667<br>.81   4.667<br>.81   5.090<br>.81   5.090<br>.81   5.090<br>.81   5.090<br>.81   5.593<br>.85   5.5167<br>.85   5.556<br>.85   5.567<br>.85   5.576<br>.85   5.576  | 13.74<br>13.74<br>13.74<br>13.74<br>13.74<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>10.50<br>10.50<br>10.50          | 7.000<br>7.083<br>7.167<br>7.250<br>7.333<br>7.417<br>7.560<br>7.583<br>7.667<br>7.753<br>7.917<br>8.003<br>8.167<br>8.250<br>8.333<br>8.417<br>8.583<br>8.497<br>8.583   | 5.66<br>5.66<br>5.66<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3                 | 10.08<br>10.17<br>10.25<br>10.33<br>10.42<br>10.58<br>10.58<br>10.67<br>10.75<br>10.83<br>10.92<br>11.08<br>11.08<br>11.17<br>11.25<br>11.33<br>11.42<br>11.58<br>11.58   | 0.<br>0.<br>0.<br>0.<br>0.<br>0.<br>0.<br>0.<br>0.<br>0. |
| 0.917 6 1.000 6 1.083 6 1.087 6 1.250 6 1.333 6 1.417 6 1.500 6 1.833 6 1.667 6 1.750 6 1.833 6 2.417 4 2.500 6 2.250 6 2.333 6 2.417 4 2.583 4 2.417 4 2.590 6 2.583 4 2.417 4 2.590 6 3.383 6 3.917 4 3.000 4 3.883 6 3.083 6 3.083 6 3.083 6 3.083 6 3.083 6 3.083 6 3.083 6 3.083 6 3.083 6 3.083 6 3.083 6 3.083 6 3.083 6 3.083 6 3.083 6 3.083 6 3.083 6 3.083 6 6.000  | .81   4.000   .81   4.000   .81   4.000   .81   4.167   .81   4.250   .81   4.167   .81   4.50   .81   4.50   .81   4.50   .81   4.50   .81   4.50   .81   4.50   .81   4.50   .81   4.50   .81   4.50   .81   4.50   .81   4.50   .81   5.000   .81   5.000   .81   5.000   .81   5.50   .81   5.50   .81   5.50   .81   5.50   .81   5.50   .81   5.50   .81   5.50   .81   5.50   .81   5.50   .81   5.50   .81   5.50   .85   5.50   5.50   .85   5.50   .85   5.50   .85   5.50   .85   5.50   .85   5.50   .85   5.50   .85   5.50   .85   5.50   .85   5.50   .85   5.50   .85   5.50   .85   5.50   .85   5.50   .85   5.50   .85   5.50   .85   5.50   .85   5.50   .85   | 13.74<br>13.74<br>13.74<br>13.74<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>10.50<br>10.50<br>10.50<br>10.50                   | 7.083<br>7.167<br>7.259<br>7.333<br>7.417<br>7.500<br>7.583<br>7.667<br>7.760<br>7.850<br>7.818<br>8.083<br>8.167<br>8.253<br>8.167<br>8.258<br>8.333<br>8.410<br>8.583<br>8.583<br>8.583   | 5.66<br>5.66<br>5.66<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3                 | 10.17<br>10.25<br>10.33<br>10.42<br>10.50<br>10.50<br>10.67<br>10.75<br>10.83<br>10.92<br>11.08<br>11.125<br>11.33<br>11.59<br>11.59<br>11.59<br>11.58<br>11.58<br>11.58<br>11.67<br>11.75  | 0.<br>0.<br>0.<br>0.<br>0.<br>0.<br>0.<br>0.<br>0.<br>0. |
| 1.000 6 1.083 6 1.167 6 1.250 6 1.333 6 1.417 6 1.500 6 1.583 6 1.667 6 1.750 6 1.833 6 1.917 6 2.000 6 2.083 6 2.167 6 2.250 6 2.333 4 2.417 4 2.500 6 2.583 4 2.417 4 3.000 6 3.083 6 3.061 6 3.083 6 3.061 6 3.061 6 3.061 6 3.062 6 3.063  | .81   4.083<br>.81   4.163<br>.81   4.250<br>.81   4.250<br>.81   4.333<br>.81   4.417<br>.81   4.583<br>.81   4.667<br>.81   4.667<br>.81   4.675<br>.81   4.750<br>.81   5.083<br>.81   5.083<br>.81   5.165<br>.81   5.583<br>.85   5.583<br>.85   5.583<br>.85   5.586<br>.85   5.586<br>.85   5.586<br>.85   5.586<br>.85   5.586<br>.85   5.583  | 13.74<br>13.74<br>13.74<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>10.50<br>10.50<br>10.50<br>10.50                   | 7.167<br>7.259<br>7.333<br>7.417<br>7.593<br>7.583<br>7.667<br>7.759<br>7.833<br>7.917<br>8.000<br>8.083<br>8.167<br>8.259<br>8.333<br>8.4167<br>8.583<br>8.583<br>8.583  | 5.66<br>5.66<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3                         | 10.25<br>10.33<br>10.42<br>10.50<br>10.58<br>10.67<br>10.75<br>10.83<br>10.92<br>11.08<br>11.17<br>11.25<br>11.35<br>11.35<br>11.56<br>11.57<br>11.58   | 0.<br>0.<br>0.<br>0.<br>0.<br>0.<br>0.<br>0.<br>0.       |
| 1.083 6 1.167 6 1.250 6 1.333 6 1.417 6 1.583 1.667 6 1.750 6 1.833 6 1.667 6 1.750 6 1.833 6 2.000 6 2.083 6 2.167 6 2.250 6 2.333 4 2.417 4 2.500 2 2.583 4 2.417 4 2.500 6 2.583 4 2.417 4 2.580 6 2.583 4 3.417 4 3.000 4 3.383 6 4.417 4 5.500 6 6.333 6 6.437 6 6.438 6  | .81   4.167<br>.81   4.258<br>.81   4.333<br>.81   4.417<br>.81   4.580<br>.81   4.580<br>.81   4.580<br>.81   4.667<br>.81   4.750<br>.81   4.750<br>.81   4.917<br>.81   5.083<br>.81   5.167<br>.81   5.333<br>.81   5.167<br>.81   5.333<br>.85   5.550<br>.85   5.583<br>.85   5.580<br>.85   5.583   | 13.74<br>13.74<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>10.50<br>10.50<br>10.50<br>10.50                            | 7.259<br>7.337<br>7.447<br>7.500<br>7.583<br>7.667<br>7.750<br>7.837<br>7.917<br>8.000<br>8.083<br>8.167<br>8.250<br>8.333<br>8.417<br>8.560<br>8.583<br>8.667<br>8.750   | 5.66<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3                                 | 10.33<br>10.42<br>10.58<br>10.67<br>10.58<br>10.67<br>10.75<br>10.83<br>10.92<br>11.00<br>11.25<br>11.35<br>11.25<br>11.35<br>11.58<br>11.58<br>11.58<br>11.75  | 0.<br>0.<br>0.<br>0.<br>0.<br>0.<br>0.<br>0.             |
| 1.167 6 1.250 6 1.333 6 1.417 6 1.500 1 1.583 6 1.667 1 1.750 6 1.833 6 1.917 2 2.000 6 2.083 6 2.167 6 2.250 2 2.333 4 2.417 4 2.500 4 2.583 4 2.417 4 2.500 4 3.003 3 4 3.017 4 3.000 4 3.083 4  Max.Eff.Inten.(mm/hr) over (min) Storage Coeff. (min/hr)  | .81   4.250<br>.81   4.333<br>.81   4.437<br>.81   4.583<br>.81   4.583<br>.81   4.583<br>.81   4.667<br>.81   4.750<br>.81   4.833<br>.81   4.917<br>.81   5.083<br>.81   5.083<br>.81   5.167<br>.81   5.333<br>.83   5.567<br>.85   5.583<br>.85   5.583  | 13.74<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>10.50<br>10.50<br>10.50<br>10.50                            | 7.333<br>7.417<br>7.500<br>7.583<br>7.667<br>7.758<br>7.833<br>7.917<br>8.003<br>8.083<br>8.167<br>8.250<br>8.333<br>8.417<br>8.500<br>8.563<br>8.667<br>8.750  | 3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23                                      | 10.42<br>10.50<br>10.58<br>10.67<br>10.75<br>10.83<br>10.92<br>11.00<br>11.08<br>11.17<br>11.25<br>11.50<br>11.50<br>11.58<br>11.75   | 0.<br>0.<br>0.<br>0.<br>0.<br>0.<br>0.                   |
| 1.250 6 1.333 6 1.417 6 1.500 6 1.583 1.667 6 1.750 1.833 6 1.667 6 2.260 6 2.083 6 2.167 6 2.250 6 2.333 4 2.417 4 2.500 4 2.583 4 2.417 4 2.500 4 3.083 6 3.083 6 3.083 6 3.083 6 6.084 6 6.084 6 6.084 6 6.085 6 6. | .81   4.333<br>.81   4.417<br>.81   4.500<br>.81   4.508<br>.81   4.667<br>.81   4.667<br>.81   4.667<br>.81   5.000<br>.81   5.000<br>.81   5.000<br>.81   5.250<br>.81   5.250<br>.81   5.503<br>.85   5.547<br>.85   5.583<br>.85   5.583<br>.85   5.583  | 37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>10.50<br>10.50<br>10.50<br>10.50                            | 7.417<br>7.500<br>7.583<br>7.667<br>7.750<br>8.083<br>7.917<br>8.000<br>8.083<br>8.167<br>8.250<br>8.333<br>8.417<br>8.500<br>8.583<br>8.667<br>8.750   | 3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23                                      | 10.50<br>10.58<br>10.67<br>10.75<br>10.75<br>10.83<br>10.92<br>11.00<br>11.08<br>11.17<br>11.25<br>11.33<br>11.42<br>11.50<br>11.50<br>11.50<br>11.75   | 0.<br>0.<br>0.<br>0.<br>0.<br>0.<br>0.                   |
| 1.333 6 1.417 6 1.500 6 1.583 6 1.667 1 1.750 6 1.750 6 1.833 6 1.917 6 2.000 2.083 6 2.167 6 2.250 6 2.333 4 2.417 4 2.583 4 2.583 4 2.583 4 2.583 4 2.583 4 3.080 4 3.080 4 3.080 4 3.080 4 3.083 6 Max.Eff.Inten.(mm/hr) over (min)   | .81   4.417<br>.81   4.583<br>.81   4.658<br>.81   4.658<br>.81   4.750<br>.81   4.833<br>.81   4.917<br>.81   5.083<br>.81   5.083<br>.81   5.167<br>.81   5.250<br>.81   5.333<br>.85   5.567<br>.85   5.583<br>.85   5.583<br>.85   5.583   | 37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>10.50<br>10.50<br>10.50<br>10.50                                     | 7.500<br>7.583<br>7.667<br>7.750<br>7.833<br>7.917<br>8.000<br>8.083<br>8.167<br>8.250<br>8.333<br>8.417<br>8.500<br>8.583<br>8.667<br>8.750  | 3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23                                      | 10.58<br>10.67<br>10.75<br>10.83<br>10.92<br>11.00<br>11.08<br>11.17<br>11.25<br>11.33<br>11.42<br>11.50<br>11.58<br>11.58<br>11.67   | 0.<br>0.<br>0.<br>0.<br>0.<br>0.                         |
| 1.417 6 1.590 6 1.583 6 1.667 6 1.750 6 1.833 6 1.917 6 2.000 6 2.083 6 2.167 6 2.250 6 2.333 2 4.17 4 2.590 4 2.583 4 2.1917 4 3.000 4 3.083 6 4 3.000 4 3.083 6  Max.Eff.Inten.(mm/hr) over (min) Storage Coeff. (min/hr)  | .81   4.500<br>.81   4.583<br>.81   4.667<br>.81   4.750<br>.81   4.833<br>.81   5.000<br>.81   5.000<br>.81   5.083<br>.81   5.167<br>.81   5.250<br>.81   5.333<br>.85   5.417<br>.85   5.503<br>.85   5.583<br>.85   5.583<br>.85   5.583   | 37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>10.50<br>10.50<br>10.50<br>10.50                                     | 7.583<br>7.667<br>7.750<br>7.833<br>7.917<br>8.000<br>8.083<br>8.167<br>8.250<br>8.333<br>8.417<br>8.500<br>8.583<br>8.667<br>8.750   | 3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23                                      | 10.67<br>  10.75<br>  10.83<br>  10.92<br>  11.00<br>  11.17<br>  11.25<br>  11.33<br>  11.42<br>  11.50<br>  11.58<br>  11.67<br>  11.75   | 0.<br>0.<br>0.<br>0.<br>0.<br>0.                         |
| 1.500 6 1.583 1.667 6 1.750 6 1.833 6 2.000 6 2.083 6 2.167 6 2.250 6 2.333 4 2.417 4 2.583 4 2.583 4 2.583 4 2.583 4 3.080 4 3.080 4 3.080 4 3.080 4 3.083 6 Max.Eff.Inten.(mm/hr) over (min)   | .81   4.583<br>.81   4.667<br>.81   4.750<br>.81   4.833<br>.81   4.917<br>.81   5.083<br>.81   5.060<br>.81   5.250<br>.81   5.250<br>.81   5.550<br>.85   5.560<br>.85   5.583<br>.85   5.667<br>.85   5.583<br>.85   5.835<br>.85   5.835   | 37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>10.50<br>10.50<br>10.50   | 7.667<br>7.750<br>7.833<br>7.917<br>8.000<br>8.083<br>8.167<br>8.250<br>8.333<br>8.417<br>8.500<br>8.583<br>8.667<br>8.750  | 3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>1.62<br>1.62<br>1.62                      | 10.75<br>10.83<br>10.92<br>11.00<br>11.08<br>11.17<br>11.25<br>11.33<br>11.42<br>11.50<br>11.58<br>11.67<br>11.75   | 0.<br>0.<br>0.<br>0.<br>0.<br>0.                         |
| 1.583 6 1.667 6 1.750 6 1.833 6 1.917 6 2.000 6 2.083 6 2.167 6 2.250 6 2.333 4 2.417 4 2.583 4 2.583 4 2.583 4 2.583 4 3.917 4 3.000 4 3.083 6  Max.Eff.Inten.(mm/hr) over (min) Storage Coeff. (min/hr)  | .81   4.667<br>.81   4.750<br>.81   4.833<br>.81   4.917<br>.81   5.000<br>.81   5.083<br>.81   5.167<br>.81   5.500<br>.81   5.533<br>.85   5.5417<br>.85   5.560<br>.85   5.583<br>.85   5.583<br>.85   5.583  | 37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>10.50<br>10.50<br>10.50<br>10.50   | 7.750<br>7.833<br>7.917<br>8.000<br>8.083<br>8.167<br>8.250<br>8.333<br>8.417<br>8.500<br>8.583<br>8.667<br>8.750   | 3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>1.62<br>1.62<br>1.62                              | 10.83<br>  10.92<br>  11.00<br>  11.08<br>  11.17<br>  11.25<br>  11.33<br>  11.42<br>  11.50<br>  11.58<br>  11.67<br>  11.75  | 0.<br>0.<br>0.<br>0.<br>0.<br>0.                         |
| 1.667 6 1.750 1 1.833 6 1.917 6 2.080 6 2.083 6 2.167 6 2.250 6 2.333 4 2.417 4 2.580 4 2.583 4 2.417 4 2.590 6 2.583 4 2.917 4 3.000 4 3.000 4 3.000 4 3.083 6 Max.Eff.Inten.(mm/hr) over (min) Storage Coeff. (min)  | .81   4.750<br>.81   4.833<br>.81   4.837<br>.81   5.000<br>.81   5.083<br>.81   5.167<br>.81   5.333<br>.85   5.457<br>.85   5.500<br>.85   5.583<br>.85   5.667<br>.88   5.750<br>.85   5.835  | 37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>10.50<br>10.50<br>10.50<br>10.50   | 7.833<br>7.917<br>8.000<br>8.083<br>8.167<br>8.250<br>8.333<br>8.417<br>8.500<br>8.583<br>8.667<br>8.750  | 3.23<br>3.23<br>3.23<br>3.23<br>3.23<br>1.62<br>1.62<br>1.62<br>1.62                              | 10.92<br>  11.00<br>  11.08<br>  11.17<br>  11.25<br>  11.33<br>  11.42<br>  11.50<br>  11.58<br>  11.67<br>  11.75   | 0.<br>0.<br>0.<br>0.<br>0.                               |
| 1.750 6 1.833 6 1.917 2.000 6 2.083 2.167 6 2.250 2.333 4 2.417 4 2.590 4 2.583 4 2.417 4 2.590 4 2.583 4 2.917 4 3.000 3.083 4  Max.Eff.Inten.(mm/hr) over (min) Storage Coeff. (min/hr)  | .81   4.833<br>.81   4.917<br>.81   5.000<br>.81   5.083<br>.81   5.167<br>.81   5.250<br>.81   5.333<br>.85   5.417<br>.85   5.583<br>.85   5.567<br>.85   5.583<br>.85   5.667<br>.85   5.583  | 37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>10.50<br>10.50<br>10.50<br>10.50  | 7.917<br>  8.000<br>  8.083<br>  8.167<br>  8.250<br>  8.333<br>  8.417<br>  8.500<br>  8.583<br>  8.667<br>  8.750   | 3.23<br>3.23<br>3.23<br>3.23<br>1.62<br>1.62<br>1.62<br>1.62                                      | 11.00<br>  11.08<br>  11.17<br>  11.25<br>  11.33<br>  11.42<br>  11.50<br>  11.58<br>  11.67<br>  11.75  | 0.<br>0.<br>0.<br>0.<br>0.                               |
| 1.833 6 1.917 6 2.000 6 2.083 6 2.167 6 2.250 6 2.333 4 2.417 4 2.590 4 2.583 4 2.750 4 2.583 4 2.917 4 3.000 4 3.083 6  Max.Eff.Inten.(mm/hr) over (min) Storage Coeff. (min)   | .81   4.917<br>.81   5.000<br>.81   5.083<br>.81   5.167<br>.81   5.250<br>.81   5.333<br>.85   5.417<br>.85   5.500<br>.85   5.583<br>.85   5.667<br>.85   5.750<br>.85   5.750   | 37.17<br>37.17<br>37.17<br>37.17<br>37.17<br>10.50<br>10.50<br>10.50<br>10.50   | 8.000<br>8.083<br>8.167<br>8.250<br>8.333<br>8.417<br>8.500<br>8.583<br>8.667<br>8.750  | 3.23<br>3.23<br>3.23<br>3.23<br>1.62<br>1.62<br>1.62<br>1.62                                      | 11.08<br>  11.17<br>  11.25<br>  11.33<br>  11.42<br>  11.50<br>  11.58<br>  11.67<br>  11.75   | 0.<br>0.<br>0.<br>0.                                     |
| 1.917 6 2.000 6 2.083 6 2.167 6 2.250 6 2.333 4 2.417 4 2.500 4 2.583 4 2.750 4 2.750 4 2.750 4 3.000 3 3.000 4  Max.Eff.Inten.(mm/hr) over (min) Storage Coeff. (min)   | .81   5.000<br>.81   5.083<br>.81   5.167<br>.81   5.250<br>.81   5.333<br>.85   5.417<br>.85   5.500<br>.85   5.583<br>.85   5.667<br>.85   5.750<br>.85   5.833  | 37.17<br>37.17<br>37.17<br>37.17<br>10.50<br>10.50<br>10.50<br>10.50  | 8.083<br>8.167<br>8.250<br>8.333<br>8.417<br>8.500<br>8.583<br>8.667<br>8.750   | 3.23<br>3.23<br>3.23<br>1.62<br>1.62<br>1.62<br>1.62  | 11.17<br>  11.25<br>  11.33<br>  11.42<br>  11.50<br>  11.58<br>  11.67<br>  11.75  | 0.<br>0.<br>0.<br>0.                                     |
| 2.000 6 2.083 6 2.167 6 2.250 6 2.333 4 2.417 4 2.500 2 2.583 4 2.667 4 2.750 4 2.917 4 3.000 4 3.083 4 Max.Eff.Inten.(mm/hr) over (min) Storage Coeff. (min)  | .81   5.083<br>.81   5.167<br>.81   5.250<br>.81   5.333<br>.85   5.417<br>.85   5.590<br>.85   5.583<br>.85   5.667<br>.85   5.750<br>.85   5.750   | 37.17<br>37.17<br>37.17<br>10.50<br>10.50<br>10.50<br>10.50   | 8.167<br>  8.250<br>  8.333<br>  8.417<br>  8.500<br>  8.583<br>  8.667<br>  8.750  | 3.23<br>3.23<br>1.62<br>1.62<br>1.62<br>1.62<br>1.62  | 11.25<br>  11.33<br>  11.42<br>  11.50<br>  11.58<br>  11.67<br>  11.75   | 0.<br>0.<br>0.<br>0.                                     |
| 2.083 6 2.167 6 2.250 6 2.333 4 2.417 4 2.500 4 2.583 4 2.667 4 2.750 4 2.750 4 3.083 4 4 4 3.083 4  Max.Eff.Inten.(mm/hr) over (min) Storage Coeff. (min)   | .81   5.167<br>.81   5.250<br>.81   5.333<br>.85   5.417<br>.85   5.500<br>.85   5.583<br>.85   5.750<br>.85   5.750<br>.85   5.750  | 37.17<br>37.17<br>10.50<br>10.50<br>10.50<br>10.50  | 8.250<br>  8.333<br>  8.417<br>  8.500<br>  8.583<br>  8.667<br>  8.750   | 3.23<br>1.62<br>1.62<br>1.62<br>1.62<br>1.62  | 11.33<br>  11.42<br>  11.50<br>  11.58<br>  11.67<br>  11.75  | 0.<br>0.<br>0.   |
| 2.167 6 2.250 6 2.333 4 2.417 4 2.580 4 2.583 4 2.587 6 2.750 4 2.833 4 2.917 4 3.000 4 3.083 4 Max.Eff.Inten.(mm/hr) over (min) Storage Coeff. (min)  | .81   5.250<br>.81   5.333<br>.85   5.417<br>.85   5.500<br>.85   5.583<br>.85   5.667<br>.85   5.750<br>.85   5.833   | 37.17<br>10.50<br>10.50<br>10.50<br>10.50<br>10.50  | 8.333<br>8.417<br>8.500<br>8.583<br>8.667<br>8.750  | 1.62<br>1.62<br>1.62<br>1.62<br>1.62  | 11.42<br>  11.50<br>  11.58<br>  11.67<br>  11.75   | 0.<br>0.<br>0.   |
| 2.250 6 2.333 4 2.417 4 2.500 4 2.583 4 2.667 4 2.750 4 2.833 4 2.917 4 3.000 4 3.083 4  Max.Eff.Inten.(mm/hr) over (min) Storage Coeff. (min)   | .81   5.333<br>.85   5.417<br>.85   5.500<br>.85   5.583<br>.85   5.667<br>.85   5.750<br>.85   5.833  | 10.50<br>10.50<br>10.50<br>10.50<br>10.50   | 8.417<br>8.500<br>8.583<br>8.667<br>8.750   | 1.62<br>1.62<br>1.62<br>1.62  | 11.50<br>  11.58<br>  11.67<br>  11.75  | 0.<br>0.<br>0.   |
| 2.333 4 2.417 4 2.590 4 2.583 4 2.750 4 2.750 4 2.917 4 3.000 4 3.083 4  Max.Eff.Inten.(mm/hr) over (min) Storage Coeff. (min)   | .85   5.417<br>.85   5.500<br>.85   5.583<br>.85   5.667<br>.85   5.750<br>.85   5.833   | 10.50<br>10.50<br>10.50<br>10.50  | 8.500<br>8.583<br>8.667<br>8.750  | 1.62<br>1.62<br>1.62  | 11.58<br>11.67<br>11.75   | 0.<br>0.   |
| 2.417 4 2.500 4 2.583 4 2.667 4 2.750 4 2.833 4 2.917 4 3.000 4 3.083 4  Max.Eff.Inten.(mm/hr) over (min) Storage Coeff. (min)   | .85   5.500<br>.85   5.583<br>.85   5.667<br>.85   5.750<br>.85   5.833  | 10.50<br>10.50<br>10.50   | 8.583<br>8.667<br>8.750   | 1.62<br>1.62  | 11.67<br>11.75  | 0.   |
| 2.500 4<br>2.583 4<br>2.667 4<br>2.750 4<br>2.833 4<br>2.917 4<br>3.000 4<br>3.083 4<br>Max.Eff.Inten.(mm/hr)<br>over (min)<br>Storage Coeff. (min)  | .85   5.583<br>.85   5.667<br>.85   5.750<br>.85   5.833   | 10.50<br>10.50  | 8.667<br>8.750  | 1.62  | 11.75   |  |
| 2.583 4 2.667 4 2.750 4 2.833 4 2.917 4 3.000 4 3.083 4  Max.Eff.Inten.(mm/hr) over (min) Storage Coeff. (min)   | .85   5.667<br>.85   5.750<br>.85   5.833  | 10.50   | 8.750   |   |   | 0.   |
| 2.667 4 2.750 4 2.833 4 2.917 4 3.000 4 3.083 4  Max.Eff.Inten.(mm/hr) Storage Coeff. (min)  | .85   5.750<br>.85   5.833   |   |   | 1 (2  |   |  |
| 2.750 4<br>2.833 4<br>2.917 4<br>3.000 4<br>3.083 4<br>Max.Eff.Inten.(mm/hr)<br>Storage Coeff. (min)   | .85   5.833  | 10.50   |   | 1.02  | 11.83   | 0.   |
| 2.833 4<br>2.917 4<br>3.000 4<br>3.083 4<br>Max.Eff.Inten.(mm/hr)<br>over (min)<br>Storage Coeff. (min)  |  |   | 8.833   | 1.62  | 11.92   | 0.   |
| 2.917 4<br>3.000 4<br>3.083 4<br>Max.Eff.Inten.(mm/hr)<br>over (min)<br>Storage Coeff. (min)   |  | 10.50   | 8.917   | 1.62  | 12.00   | 0.   |
| 3.000 4<br>3.083 4<br>Max.Eff.Inten.(mm/hr)<br>over (min)<br>Storage Coeff. (min)  | .85   5.917  | 10.50   | 9.000   | 1.62  | 12.08   | 0.   |
| 3.083 4 Max.Eff.Inten.(mm/hr) over (min) Storage Coeff. (min)  | .85   6.000  |   | 9.083   | 1.62  | 12.17   | 0.   |
| Max.Eff.Inten.(mm/hr) over (min) Storage Coeff. (min)  | .85   6.083  | 10.50   | 9.167   | 1.62  | 12.25   | 0.   |
| over (min)<br>Storage Coeff. (min)   | .85   6.167  | 10.50   | 9.250   | 1.62  | İ   |  |
| Storage Coeff. (min)   | = 37.17  |   | 27.36   |   |   |  |
|  | 10.00  | )   | 20.00   |   |   |  |
| Unit Hvd Tneak (min)   |  | (ii)  | 16.76 (ii   | .)  |   |  |
|  |  |   | 20.00   |   |   |  |
| Unit Hyd. peak (cms)   | = 0.11   |   | 0.06  |   |   |  |
| DEAK 51.011 ()   | 0.05   |   | 0.00  |   | TALS*   |  |
| PEAK FLOW (cms)  |  |   | 0.02  |   | .089 (iii   | L)   |
| TIME TO PEAK (hrs)   |  |   | 5.33  |   | 5.25  |  |
| RUNOFF VOLUME (mm)   |  |   | 44.97   |   | 6.29  |  |
| TOTAL RAINFALL (mm)  |  |   | 80.82   |   | 0.82  |  |
| RUNOFF COEFFICIENT   | = 0.98   |   | 0.56  | (   | 0.82  |  |

CN\* = 83.0 I a = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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 $LangstaffRd\_EA\_Proposed\_HumberWatershed \\ Length & (m) = & 650.00 & 25.00 \\ Mannings n & = & 0.013 & 0.250 \\ \\ \end{cases}$ 

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TRA   | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 4.85     | 6.250   | 10.50 | 9.33  | 0.81  |
| 0.167 | 0.00  | 3.250 | 4.85     | 6.333   | 5.66  | 9.42  | 0.81  |
| 0.250 | 0.00  | 3.333 | 13.74    | 6.417   | 5.66  | 9.50  | 0.81  |
| 0.333 | 0.81  | 3.417 | 13.74    | 6.500   | 5.66  | 9.58  | 0.81  |
| 0.417 | 0.81  | 3.500 | 13.74    | 6.583   | 5.66  | 9.67  | 0.81  |
| 0.500 | 0.81  | 3.583 | 13.74    |         | 5.66  |       | 0.81  |
| 0.583 | 0.81  | 3.667 |          | 6.750   | 5.66  |       | 0.81  |
| 0.667 |       | 3.750 | 13.74    |         | 5.66  |       | 0.81  |
| 0.750 | 0.81  | 3.833 | 13.74    |         | 5.66  |       | 0.81  |
| 0.833 | 0.81  | 3.917 | 13.74    |         | 5.66  |       | 0.81  |
| 0.917 |       | 4.000 | 13.74    | 7.083   | 5.66  |       | 0.81  |
| 1.000 |       | 4.083 | 13.74    | 7.167   | 5.66  |       | 0.81  |
| 1.083 | 0.81  | 4.167 | 13.74    | 7.250   | 5.66  |       | 0.81  |
| 1.167 |       | 4.250 | 13.74    | 7.333   | 3.23  |       | 0.81  |
| 1.250 |       | 4.333 | 37.17    | 7.417   | 3.23  |       | 0.81  |
| 1.333 |       | 4.417 | 37.17    | 7.500   | 3.23  |       | 0.81  |
| 1.417 |       | 4.500 | 37.17    | 7.583   | 3.23  |       | 0.81  |
| 1.500 |       | 4.583 | 37.17    | 7.667   | 3.23  |       | 0.81  |
| 1.583 |       | 4.667 | 37.17    | 7.750   | 3.23  |       | 0.81  |
| 1.667 |       | 4.750 | 37.17    | 7.833   | 3.23  |       | 0.81  |
| 1.750 | 0.81  | 4.833 | 37.17    | 7.917   | 3.23  |       | 0.81  |
| 1.833 |       | 4.917 | 37.17    | 8.000   | 3.23  |       | 0.81  |
| 1.917 | 0.81  | 5.000 | 37.17    | 8.083   | 3.23  |       | 0.81  |
| 2.000 | 0.81  | 5.083 | 37.17    | 8.167   | 3.23  |       | 0.81  |
| 2.083 | 0.81  | 5.167 | 37.17    | 8.250   | 3.23  |       | 0.81  |
| 2.167 | 0.81  | 5.250 | 37.17    | 8.333   | 1.62  |       | 0.81  |
| 2.250 | 0.81  | 5.333 | 10.50    | 8.417   | 1.62  |       | 0.81  |
| 2.333 | 4.85  | 5.417 | 10.50    |         | 1.62  |       | 0.81  |
| 2.417 | 4.85  | 5.500 | 10.50    | 8.583   | 1.62  |       | 0.81  |
| 2.500 | 4.85  | 5.583 | 10.50    | 8.667   | 1.62  |       | 0.81  |
| 2.583 | 4.85  | 5.667 | 10.50    | 8.750   | 1.62  |       | 0.81  |
| 2.667 | 4.85  | 5.750 | 10.50    |         | 1.62  | 11.92 | 0.81  |
| 2.750 | 4.85  | 5.833 | 10.50    | 8.917   | 1.62  |       | 0.81  |
| 2.833 | 4.85  | 5.917 | 10.50    | 9.000   | 1.62  |       | 0.81  |
| 2.917 | 4.85  | 6.000 | 10.50    | 9.083   | 1.62  |       | 0.81  |
| 3.000 | 4.85  | 6.083 | 10.50    |         | 1.62  |       | 0.81  |
| 3.083 | 4.85  | 0.16/ | 10.50    | 9.250   | 1.62  |       |       |
|       |       |       |          |         |       |       |       |

Max.Eff.Inten.(mm/hr)= over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)= 37.17 28.73 10.00 25.00 11.67 (ii) 20.44 (ii) 10.00 25.00 0.10 0.05

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\*TOTALS\*

|                 | Lang   | staffRd_EA_Pr | roposed_HumberN | Natershed   |
|-----------------|--------|---------------|-----------------|-------------|
| PEAK FLOW       | (cms)= | 0.11          | 0.03            | 0.144 (iii) |
| TIME TO PEAK    | (hrs)= | 5.25          | 5.33            | 5.25        |
| RUNOFF VOLUME   | (mm)=  | 78.82         | 47.65           | 69.46       |
| TOTAL RAINFALL  | (mm)=  | 80.82         | 80.82           | 80.82       |
| RUNOFF COEFFICI | ENT =  | 0.98          | 0.59            | 0.86        |

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 85.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

| THAN THE S<br>(iii) PEAK FLOW        |                                       |           |  | F ANY.             |        |            |         |
|--------------------------------------|---------------------------------------|-----------|--|--------------------|--------|------------|---------|
| RESERVOIR( 0525) <br>  IN= 2> OUT= 1 | OVERFL                                | .OW IS O  | FF                                     |                    |        |            |         |
| DT= 5.0 min                          | OUTELO                                | NJ CT     | DRACE I                                | OUTFLOW            | сто    | DACE       |         |
| 51- 5.0   111                        | OUTFLO<br>(cms)<br>0.000              | /m /h:    | o m )                                  | (cms)<br>0.0181    | (ha    | m )        |         |
|                                      | 9 999                                 | na a      | 9999                                   | 0 0181             | (      | 9 9161     |         |
|                                      | 0.008                                 | 81 0      | .0031                                  | 0.0584             | è      | 0.0204     |         |
|                                      |                                       | 3 0       |  | 0.0920             |        |            |         |
|                                      |                                       |           | .0118                                  |                    |        |            |         |
|                                      |                                       |           |  |                    |        |            |         |
|                                      |                                       | AREA      | QPEAK                                  | TPEAK              |        | R.V.       |         |
|                                      |                                       |           | (cms)                                  |                    |        |            |         |
| INFLOW : ID= 2 (                     |                                       |           |  |                    |        |            |         |
| OUTFLOW: ID= 1 (                     | 0525)                                 | 1.580     | 0.120                                  | 5.4                | 2      | 69.40      |         |
| TI                                   | EAK FLOW<br>EME SHIFT O<br>EXIMUM STO | OF PEAK I | FLOW<br>JSED                           | (min)=<br>(ha.m.)= | 0.03   | )          |         |
| **************                       |                                       |           |  |                    |        |            |         |
| ** SIMULATION:Run 12                 | *                                     | *         |  |                    |        |            |         |
|                                      |                                       |           |  |                    |        |            |         |
| READ STORM                           | Filenan                               | ata\I     | sers\ray.z<br>Local\Temp<br>f5d6-df0e- | ^                  | 25500  | )=281004\  | .07221  |
| Ptotal= 88.54 mm                     | Comment                               |           |  | 430a-0139          | -21365 | 7428109U\( | 09Cd/23 |
| TIME                                 | RAIN                                  | TIME      | RAIN   '                               | TIME               | RAIN   | TIME       | RAIN    |
| hrs                                  | RAIN  <br>mm/hr                       | hrs       | mm/hr   '                              | hrs                | mm/hr  | hrs        | mm/hr   |
| 0.25                                 | 0.00                                  | 3.50      | 15.05                                  | 6.75               | 6.20   | 10.00      | 0.89    |
| 0.56                                 | 0.89                                  | 3.75      | 15.05                                  | 7.00               | 6.20   | 10.25      | 0.89    |
| 0.75                                 | 0.89<br>0.89<br>0.89                  | 4.00      | 15.05                                  | 7.25               | 6.20   | 10.50      | 0.89    |
| 1.00                                 | 0.89                                  | 4.25      | 15.05                                  | 7.50               | 3.54   | 10.75      | 0.89    |
| 1.25                                 | 0.89                                  | 4.50      | 40.71                                  | 7.75               | 3.54   | 11.00      | 0.89    |

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|                  | Langs  | taffRd E | A Propos | sed HumberW | atersh | ed         |      |
|------------------|--------|----------|----------|-------------|--------|------------|------|
| 2.256            | 0.89   | 5.333    | 11.51    | 8.417       | 1.77   | 11.50      | 0.89 |
| 2.333            | 5.31   | 5.417    | 11.51    | 8.500       | 1.77   | 11.58      | 0.89 |
| 2.417            | 5.31   | 5.500    | 11.51    | 8.583       | 1.77   | 11.67      | 0.89 |
| 2.500            | 5.31   | 5.583    | 11.51    | 8.667       | 1.77   | 11.75      | 0.89 |
| 2.583            | 5.31   | 5.667    | 11.51    | 8.750       | 1.77   | 11.83      | 0.89 |
| 2.667            | 5.31   | 5.750    | 11.51    | 8.833       | 1.77   | 11.92      | 0.89 |
| 2.756            | 5.31   | 5.833    | 11.51    | 8.917       | 1.77   | 12.00      | 0.89 |
| 2.833            | 5.31   | 5.917    | 11.51    | 9.000       | 1.77   | 12.08      | 0.89 |
| 2.917            | 5.31   | 6.000    | 11.51    | 9.083       | 1.77   | 12.17      | 0.89 |
| 3.006            | 5.31   | 6.083    | 11.51    | 9.167       | 1.77   | 12.25      | 0.89 |
| 3.083            | 5.31   | 6.167    | 11.51    | 9.250       | 1.77   |            |      |
|                  |        |          |          |             |        |            |      |
| Max.Eff.Inten.(m |        | 40.71    |          | 33.12       |        |            |      |
|                  | (min)  | 10.00    |          | 20.00       |        |            |      |
| Storage Coeff.   | (min)= |          |          | 19.53 (ii)  |        |            |      |
| Unit Hyd. Tpeak  |        | 10.00    |          | 20.00       |        |            |      |
| Unit Hyd. peak   | (cms)= | 0.10     |          | 0.06        |        |            |      |
|                  |        |          |          |             | *T01   | ΓALS*      |      |
| PEAK FLOW        | (cms)= | 0.13     |          | 0.04        | 0.     | .166 (iii) |      |
| TIME TO PEAK     | (hrs)= | 5.25     |          | 5.33        |        | 5.25       |      |
| RUNOFF VOLUME    | (mm)=  | 86.54    |          | 55.88       | 77     | 7.03       |      |
| TOTAL RAINFALL   | (mm)=  | 88.54    |          | 88.54       | 88     | 3.54       |      |
| RUNOFF COEFFICIE | NT =   | 0.98     |          | 0.63        | 6      | 9.87       |      |
|                  |        |          |          |             |        |            |      |
|                  |        |          |          |             |        |            |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 86.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| DECERMAND ( DESCRIPTION )                   | OVEREL OU                                      |  |  |  |   |
|---|--|--|--|--|---|
| RESERVOIR( 0520)<br>IN= 2> OUT= 1           | OVERFLOW                                       | 12 011   |  |  |   |
| DT= 5.0 min                                 | OUTFLOW  | STORAGE  | I OUTFLO   | N STORAGE  |   |
|   | (cms)  | (ha.m.)  | (cms)  | (ha.m.)  |   |
|   | 0.0000   | 0.0000   | 0.018  | 0.0161   |   |
|   | 0.0081   | 0.0031   | 0.058  | 0.0204   |   |
|   | 0.0123   | 0.0074   | 0.092  | 0.0259   |   |
|   | 0.0155   | 0 0110   | 1 0 000  |  |   |
|   |  | 0.0110   | 0.000  | 0.0000   |   |
| **** WARNING : ST                           |  |  |  |  |   |
| **** WARNING : ST                           | ORAGE-DISCHA                                   | RGE TABLE  |  | ).   |   |
| **** WARNING : ST                           | ORAGE-DISCHA<br>AR                             | RGE TABLE<br>EA QPE                              | WAS EXCEEDED  AK TPEA  | ).   |   |
| **** WARNING : ST                           | ORAGE-DISCHA<br>AR<br>(h                       | RGE TABLE  EA QPE  a) (cm                        | WAS EXCEEDED  AK TPEAN  s) (hrs                              | R.V. (mm)  | 3 |
|   | ORAGE-DISCHA<br>AR<br>(h<br>105) 1.            | RGE TABLE  EA QPE a) (cm 630 0                   | WAS EXCEEDED  AK TPEAN  s) (hrs)  .166 5                     | R.V.<br>( R.V.<br>( mm)<br>.25 77.03               |   |
| INFLOW: ID= 2 ( 0.OUTFLOW: ID= 1 ( 0.       | ORAGE-DISCHA<br>AR<br>(h<br>105) 1.<br>520) 1. | RGE TABLE  EA QPE a) (cm 630 0 630 0             | WAS EXCEEDED  AK TPEAR  s) (hrs: .166 5 .139 5               | R.V.<br>( R.V.<br>) (mm)<br>.25 77.03<br>.33 76.98 |   |
| INFLOW : ID= 2 ( 0) OUTFLOW: ID= 1 ( 0) PEA | ORAGE-DISCHA<br>AR<br>(h<br>105) 1.            | RGE TABLE  EA QPE a) (cm 630 0 630 0  EDUCTION [ | WAS EXCEEDED  AK TPEAN  s) (hrs  .166 5  .139 5  Qout/Qin](% | C. R.V. (mm) .25 77.03 .33 76.98                   |   |

|                   | Lang     | staffRd_EA   | Propos | ed_Humber | Watersh | ed    |      |
|-------------------|----------|--------------|--------|-----------|---------|-------|------|
| 2.00              | 0.89     | 5.25         | 40.71  | 8.50      |         |       | 0.89 |
| 2.25              | 0.89     | 5.50         | 11.51  | 8.75      | 1.77    | 12.00 | 0.89 |
| 2.50              | 5.31     | 5.75         | 11.51  | 9.00      | 1.77    | 12.25 | 0.89 |
| 2.75              | 5.31     | 6.00         | 11.51  | 9.25      | 1.77    |       |      |
| 3.00              | 5.31     | 6.25         | 11.51  | 9.50      | 0.89    | l     |      |
| 3.25              | 5.31     | 6.50         | 6.20   | 9.75      | 0.89    |       |      |
|                   |          |              |        |           |         |       |      |
|                   |          |              |        |           |         |       |      |
|                   |          |              |        |           |         |       |      |
|                   |          |              |        |           |         |       |      |
| CALIB             |          |              |        |           |         |       |      |
|                   | Area     |              | .63    |           |         |       |      |
| ID= 1 DT= 5.0 min | Total I  | mp(%) = 69   | .00 E  | Dir. Conn | .(%)=   | 59.00 |      |
|                   |          | THREENITOLIC |        | NATOUR (4 | ,       |       |      |
|                   |          | IMPERVIOUS   |        | RVIOUS (i | .)      |       |      |
| Surface Area      | (ha)=    | 1.12         |        | 0.51      |         |       |      |
| Dep. Storage      | (mm)=    | 2.00         |        | 5.00      |         |       |      |
| Average Slope     | (%)=     | 1.00         |        | 2.00      |         |       |      |
| Length            | (m)=     | 650.00       | 2      | 25.00     |         |       |      |
| Mannings n        | =        | 0.013        | e      | 250       |         |       |      |
| NOTE - DATNE      | NI HAC T | DANCEODME    |        | O MTN     | TTME CT | -0    |      |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TRANSFORMED HYETOGRAPH |       |        |       |         |       |       |       |
|------------------------|-------|--------|-------|---------|-------|-------|-------|
| TIME                   | RAIN  | l TIME | RAIN  | l' TIME | RAIN  | TIME  | RAIN  |
| hrs                    | mm/hr | hrs    | mm/hr | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083                  | 0.00  | 3.167  | 5.31  | 6.250   | 11.51 | 9.33  | 0.89  |
| 0.167                  | 0.00  | 3.250  | 5.31  | 6.333   | 6.20  | 9.42  | 0.89  |
| 0.250                  | 0.00  | 3.333  | 15.05 | 6.417   | 6.20  | 9.50  | 0.89  |
| 0.333                  | 0.89  | 3.417  | 15.05 | 6.500   | 6.20  | 9.58  | 0.89  |
| 0.417                  | 0.89  | 3.500  | 15.05 | 6.583   | 6.20  | 9.67  | 0.89  |
| 0.500                  | 0.89  | 3.583  | 15.05 | 6.667   | 6.20  | 9.75  | 0.89  |
| 0.583                  | 0.89  | 3.667  | 15.05 | 6.750   | 6.20  | 9.83  | 0.89  |
| 0.667                  | 0.89  | 3.750  | 15.05 | 6.833   | 6.20  | 9.92  | 0.89  |
| 0.750                  | 0.89  | 3.833  | 15.05 | 6.917   | 6.20  | 10.00 | 0.89  |
| 0.833                  | 0.89  | 3.917  | 15.05 | 7.000   | 6.20  | 10.08 | 0.89  |
| 0.917                  | 0.89  | 4.000  | 15.05 | 7.083   | 6.20  | 10.17 | 0.89  |
| 1.000                  | 0.89  | 4.083  | 15.05 | 7.167   | 6.20  | 10.25 | 0.89  |
| 1.083                  | 0.89  | 4.167  | 15.05 | 7.250   | 6.20  | 10.33 | 0.89  |
| 1.167                  | 0.89  | 4.250  | 15.05 | 7.333   | 3.54  | 10.42 | 0.89  |
| 1.250                  | 0.89  | 4.333  | 40.71 | 7.417   | 3.54  | 10.50 | 0.89  |
| 1.333                  | 0.89  | 4.417  | 40.71 | 7.500   | 3.54  | 10.58 | 0.89  |
| 1.417                  | 0.89  | 4.500  | 40.71 | 7.583   | 3.54  | 10.67 | 0.89  |
| 1.500                  | 0.89  | 4.583  | 40.71 | 7.667   | 3.54  | 10.75 | 0.89  |
| 1.583                  | 0.89  | 4.667  | 40.71 | 7.750   | 3.54  | 10.83 | 0.89  |
| 1.667                  | 0.89  | 4.750  | 40.71 | 7.833   | 3.54  | 10.92 | 0.89  |
| 1.750                  | 0.89  | 4.833  | 40.71 | 7.917   | 3.54  | 11.00 | 0.89  |
| 1.833                  | 0.89  | 4.917  | 40.71 | 8.000   | 3.54  | 11.08 | 0.89  |
| 1.917                  | 0.89  | 5.000  | 40.71 | 8.083   | 3.54  | 11.17 | 0.89  |
| 2.000                  | 0.89  | 5.083  | 40.71 | 8.167   | 3.54  | 11.25 | 0.89  |
| 2.083                  | 0.89  | 5.167  | 40.71 | 8.250   | 3.54  | 11.33 | 0.89  |
| 2.167                  | 0.89  | 5.250  | 40.71 | 8.333   | 1.77  | 11.42 | 0.89  |

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 ${\tt LangstaffRd\_EA\_Proposed\_HumberWatershed}$ 

| CALIB<br>  STANDHYD ( 0130) <br> ID= 1 DT= 5.0 min | Area<br>Total | (ha)=<br>Imp(%)= | 2.08<br>82.00 | Dir. Conn.(%)= | 82.00 |
|--|---------------|------------------|---------------|----------------|-------|
|  |               | IMPERVIO         | US            | PERVIOUS (i)   |       |
| Surface Area                                       | (ha)=         | 1.71             |               | 0.37           |       |
| Dep. Storage                                       | (mm)=         | 2.00             |               | 5.00           |       |
| Average Slope                                      | (%)=          | 1.00             |               | 2.00           |       |
| Length   | (m)=          | 800.00           |               | 20.00          |       |
| Mannings n   |               | 0 013            |               | a 25a          |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       |       |       | D HYETOGR |       |       |       |
|-------|-------|-------|-------|-----------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN  | TIME      | RAIN  |       | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr | hrs       |       | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 5.31  | 6.250     | 11.51 | 9.33  | 0.89  |
| 0.167 | 0.00  |       | 5.31  |           | 6.20  | 9.42  | 0.89  |
| 0.250 | 0.00  |       |       |           | 6.20  | 9.50  | 0.89  |
| 0.333 | 0.89  |       | 15.05 |           | 6.20  | 9.58  | 0.89  |
| 0.417 | 0.89  |       | 15.05 |           | 6.20  | 9.67  | 0.89  |
| 0.500 |       | 3.583 | 15.05 |           | 6.20  |       | 0.89  |
| 0.583 | 0.89  |       |       |           | 6.20  |       | 0.89  |
| 0.667 | 0.89  |       | 15.05 |           | 6.20  | 9.92  | 0.89  |
| 0.750 | 0.89  |       | 15.05 |           | 6.20  |       | 0.89  |
| 0.833 | 0.89  |       | 15.05 |           | 6.20  |       | 0.89  |
| 0.917 | 0.89  |       | 15.05 | 7.083     | 6.20  |       | 0.89  |
| 1.000 | 0.89  |       | 15.05 |           | 6.20  |       | 0.89  |
| 1.083 | 0.89  |       | 15.05 |           | 6.20  |       | 0.89  |
| 1.167 | 0.89  |       | 15.05 |           | 3.54  | 10.42 | 0.89  |
| 1.250 | 0.89  |       | 40.71 |           | 3.54  |       | 0.89  |
| 1.333 |       | 4.417 | 40.71 |           | 3.54  |       | 0.89  |
| 1.417 | 0.89  |       | 40.71 |           | 3.54  |       | 0.89  |
| 1.500 | 0.89  |       |       |           | 3.54  |       | 0.89  |
| 1.583 | 0.89  |       | 40.71 | 7.750     | 3.54  | 10.83 | 0.89  |
| 1.667 | 0.89  |       | 40.71 | 7.833     | 3.54  |       | 0.89  |
| 1.750 | 0.89  |       | 40.71 | 7.917     | 3.54  |       | 0.89  |
| 1.833 | 0.89  |       | 40.71 |           | 3.54  |       | 0.89  |
| 1.917 | 0.89  |       | 40.71 |           | 3.54  |       | 0.89  |
| 2.000 | 0.89  |       | 40.71 |           | 3.54  | 11.25 | 0.89  |
| 2.083 | 0.89  |       | 40.71 | 8.250     | 3.54  | 11.33 | 0.89  |
| 2.167 | 0.89  |       | 40.71 | 8.333     | 1.77  |       | 0.89  |
| 2.250 | 0.89  |       | 11.51 |           | 1.77  | 11.50 | 0.89  |
| 2.333 | 5.31  |       | 11.51 |           | 1.77  | 11.58 | 0.89  |
| 2.417 | 5.31  |       | 11.51 |           | 1.77  | 11.67 | 0.89  |
| 2.500 | 5.31  | 5.583 | 11.51 |           | 1.77  | 11.75 | 0.89  |
| 2.583 | 5.31  | 5.667 | 11.51 |           | 1.77  | 11.83 | 0.89  |
| 2.667 | 5.31  |       | 11.51 |           | 1.77  | 11.92 | 0.89  |
| 2.750 | 5.31  | 5.833 | 11.51 |           | 1.77  | 12.00 | 0.89  |
| 2.833 | 5.31  |       | 11.51 |           | 1.77  | 12.08 | 0.89  |
| 2.917 | 5.31  | 6.000 | 11.51 | 9.083     | 1.77  | 12.17 | 0.89  |

#### LangstaffRd\_EA\_Proposed\_HumberWatershed 5.31 | 6.083 | 11.51 | 9.167 | 1.77 | 12.25 | 0.89 5.31 | 6.167 | 11.51 | 9.250 | 1.77 | 40.71 15.00 12.74 (ii) 15.00 0.08 30.98 20.00 16.38 (ii) 20.00 0.06 Max.Eff.Inten.(mm/hr)= over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)= \*TOTALS\* 0.219 (iii) 5.25 80.22 88.54 0.91 0.19 0.03 TIME TO PEAK (hrs)= RUNOFF VOLUME (mm)= TOTAL RAINFALL (mm)= RUNOFF COEFFICIENT = 5.25 86.54 88.54 0.98 5.25 51.48 88.54 0.58

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB         | Area<br>Total | (ha)= 2.27<br>Imp(%)= 77.06 |              | 77.00 |
|---------------|---------------|-----------------------------|--------------|-------|
|               |               | IMPERVIOUS                  | PERVIOUS (i) |       |
| Surface Area  | (ha)=         | 1.75                        | 0.52         |       |
| Dep. Storage  | (mm)=         | 2.00                        | 5.00         |       |
| Average Slope | (%)=          | 1.00                        | 2.00         |       |
| Length        | (m)=          | 800.00                      | 20.00        |       |
| Mannings n    | =             | 0.013                       | 0.250        |       |
|               |               |                             |              |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TRANSFORMED HYETOGRAPH |       |       |       |        |       |       |       |  |
|------------------------|-------|-------|-------|--------|-------|-------|-------|--|
| TIME                   | RAIN  | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |
| hrs                    | mm/hr | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |
| 0.083                  | 0.00  | 3.167 | 5.31  | 6.250  | 11.51 | 9.33  | 0.89  |  |
| 0.167                  | 0.00  | 3.250 | 5.31  | 6.333  | 6.20  | 9.42  | 0.89  |  |
| 0.250                  | 0.00  | 3.333 | 15.05 | 6.417  | 6.20  | 9.50  | 0.89  |  |
| 0.333                  | 0.89  | 3.417 | 15.05 | 6.500  | 6.20  | 9.58  | 0.89  |  |
| 0.417                  | 0.89  | 3.500 | 15.05 | 6.583  | 6.20  | 9.67  | 0.89  |  |
| 0.500                  | 0.89  | 3.583 | 15.05 | 6.667  | 6.20  | 9.75  | 0.89  |  |
| 0.583                  | 0.89  | 3.667 | 15.05 | 6.750  | 6.20  | 9.83  | 0.89  |  |
| 0.667                  | 0.89  | 3.750 | 15.05 | 6.833  | 6.20  | 9.92  | 0.89  |  |
| 0.750                  | 0.89  | 3.833 | 15.05 | 6.917  | 6.20  | 10.00 | 0.89  |  |
| 0.833                  | 0.89  | 3.917 | 15.05 | 7.000  | 6.20  | 10.08 | 0.89  |  |
| 0.917                  | 0.89  | 4.000 | 15.05 | 7.083  | 6.20  | 10.17 | 0.89  |  |
| 1.000                  | 0.89  | 4.083 | 15.05 | 7.167  | 6.20  | 10.25 | 0.89  |  |

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### LangstaffRd\_EA\_Proposed\_HumberWatershed ID = 3 ( 0405): 4.35 0.454 5.25

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| RESERVOIR( 0505) <br>  IN= 2> OUT= 1 | OVERFLOW IS OF | F           |            |         |
|--------------------------------------|----------------|-------------|------------|---------|
| DT= 5.0 min                          | OUTFLOW STO    | RAGE I O    | JTFLOW     | STORAGE |
| ii                                   | (cms) (ha      | .m.)        | (cms)      | (ha.m.) |
|                                      | 0.0000 0.      | 0000   0    | 0.2110     | 0.0383  |
|                                      | 0.0185 0.      | 0030   (    | 2.2743     | 0.0515  |
|                                      | 0.0302 0.      | 0120   (    | 0.3250     | 0.0792  |
|                                      | 0.1102 0.      | 0251   (    | 0.0000     | 0.0000  |
|                                      | AREA           | QPEAK       | TPEAK      | R.V.    |
|                                      | (ha)           | (cms)       | (hrs)      | (mm)    |
| INFLOW : ID= 2 ( 04                  | 05) 4.350      | 0.454       | 5.25       | 79.31   |
| OUTFLOW: ID= 1 ( 05                  | 05) 4.350      | 0.325       | 5.50       | 79.30   |
| PEAK                                 | FLOW REDUCT    | ION [Qout/Q | in](%)= 71 | .51     |

TIME SHIFT OF PEAK FLOW (min)= 15.00 (ha.m.)= 0.0792

| CALIB<br>  STANDHYD ( 0120)<br> ID= 1 DT= 5.0 min                     | Area<br>Total                  | (ha)=<br>Imp(%)=                              |             | Dir.  | Conn.(%)=   | 73.00 |
|---|--------------------------------|---|-------------|---|-------------|-------|
| Surface Area<br>Dep. Storage<br>Average Slope<br>Length<br>Mannings n | (ha)=<br>(mm)=<br>(%)=<br>(m)= | IMPERVI<br>0.9<br>2.0<br>1.0<br>475.0<br>0.01 | 1<br>0<br>0 | PERVIOU<br>0.33<br>5.00<br>2.00<br>17.00<br>0.250 | 3<br>)<br>) |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TRANSFORMED HYETOGRAPH |       |       |       |       |       |       |       |  |
|------------------------|-------|-------|-------|-------|-------|-------|-------|--|
| TIME                   | RAIN  | TIME  | RAIN  | TIME  | RAIN  | TIME  | RAIN  |  |
| hrs                    | mm/hr | hrs   | mm/hr | ' hrs | mm/hr | hrs   | mm/hr |  |
| 0.083                  | 0.00  | 3.167 | 5.31  | 6.250 | 11.51 | 9.33  | 0.89  |  |
| 0.167                  | 0.00  | 3.250 | 5.31  | 6.333 | 6.20  | 9.42  | 0.89  |  |
| 0.250                  | 0.00  | 3.333 | 15.05 | 6.417 | 6.20  | 9.50  | 0.89  |  |
| 0.333                  | 0.89  | 3.417 | 15.05 | 6.500 | 6.20  | 9.58  | 0.89  |  |
| 0.417                  | 0.89  | 3.500 | 15.05 | 6.583 | 6.20  | 9.67  | 0.89  |  |
| 0.500                  | 0.89  | 3.583 | 15.05 | 6.667 | 6.20  | 9.75  | 0.89  |  |
| 0.583                  | 0.89  | 3.667 | 15.05 | 6.750 | 6.20  | 9.83  | 0.89  |  |
| 0.667                  | 0.89  | 3.750 | 15.05 | 6.833 | 6.20  | 9.92  | 0.89  |  |
| 0.750                  | 0.89  | 3.833 | 15.05 | 6.917 | 6.20  | 10.00 | 0.89  |  |
| 0.833                  | 0.89  | 3.917 | 15.05 | 7.000 | 6.20  | 10.08 | 0.89  |  |

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LangstaffRd_EA_Proposed_Humberi
0.89 | 4.167 | 15.05 | 7.250
0.89 | 4.150 | 15.05 | 7.250
0.89 | 4.250 | 15.05 | 7.333
0.89 | 4.333 | 40.71 | 7.417
0.89 | 4.417 | 40.71 | 7.590
0.89 | 4.590 | 40.71 | 7.759
0.89 | 4.583 | 40.71 | 7.657
0.89 | 4.583 | 40.71 | 7.657
0.89 | 4.4667 | 40.71 | 7.759
0.89 | 4.458 | 40.71 | 7.759
0.89 | 4.458 | 40.71 | 7.633
0.89 | 4.333 | 40.71 | 7.917
0.89 | 4.917 | 40.71 | 8.080
0.89 | 5.080 | 40.71 | 8.167
0.89 | 5.167 | 40.71 | 8.259
0.89 | 5.250 | 40.71 | 8.250
0.89 | 5.250 | 40.71 | 8.250
0.89 | 5.250 | 15.15 | 8.583
5.31 | 5.583 | 15.51 | 8.417
5.31 | 5.417 | 11.51 | 8.580
5.31 | 5.580 | 11.51 | 8.583
5.31 | 5.583 | 11.51 | 8.590
5.31 | 5.750 | 11.51 | 8.583
5.31 | 5.833 | 11.51 | 8.917
5.31 | 5.417 | 11.51 | 8.900
5.31 | 6.060 | 11.51 | 9.083
5.31 | 6.080 | 11.51 | 9.083
5.31 | 6.083 | 11.51 | 9.250
hr)= 40.71 | 30.98
                                                                   1.083
                                                                                                                                                                                                                                                       6.20 | 10.33
3.54 | 10.42
                                                                     1.167
                                                                   1.167
1.250
1.333
1.417
1.500
1.583
                                                                                                                                                                                                                                                                                     10.42
10.50
10.58
10.67
10.75
10.83
10.92
                                                                                                                                                                                                                                                                                                                              0.89
0.89
0.89
0.89
0.89
                                                                                                                                                                                                                                                       3.54
3.54
3.54
3.54
3.54
3.54
3.54
3.54
                                                                     1.667
                                                                                                                                                                                                                                                                                                                               0.89
                                                                   1.750
                                                                                                                                                                                                                                                                                     11.00
11.08
                                                                                                                                                                                                                                                                                                                               0.89
                                                                     1.833
                                                                                                                                                                                                                                                                                                                               0.89
                                                                   1.833
1.917
2.000
2.083
2.167
2.250
2.333
                                                                                                                                                                                                                                                       3.54
3.54
3.54
3.54
1.77
1.77
                                                                                                                                                                                                                                                                                     11.08
11.17
11.25
11.33
11.42
11.50
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0.89
0.89
0.89
0.89
                                                                                                                                                                                                                                                                                                                               0.89
                                                                                                                                                                                                                                                                                     11.58
11.67
11.75
11.83
11.92
12.00
12.08
                                                                   2.417
                                                                                                                                                                                                                                                      0.89
                                                                   2.417
2.500
2.583
2.667
2.750
2.833
                                                                                                                                                                                                                                                                                                                               0.89
                                                                                                                                                                                                                                                                                                                              0.89
0.89
0.89
0.89
0.89
                                                                     2.917
                                                                                                                                                                                                                                                                                     12.17
12.25
                                                                   3.083
                  Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                                                                                                             40.71
15.00
12.74 (ii)
15.00
                                                                                                                                                                                                       30.98
20.00
16.86 (ii)
                                                                                                                                                  0.08
                                                                                                                                                                                                           0.06
                                                                                                                                                                                                                                                                  *TOTALS*
                  PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                                                                                                               0.20
5.25
86.54
88.54
0.98
                                                                                                                                                                                                       0.04
5.25
51.48
88.54
0.58
                                                                                                                                                                                                                                                                      0.235 (iii)
5.25
78.47
88.54
0.89
                            (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
                    (1) CN* = 83.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
| ADD HYD ( 0405)|
| 1 + 2 = 3 |
                                                                                                                                                           QPEAK
(cms)
0.235
0.219
                                                                                                                                                                                                                                         R.V.
(mm)
78.47
80.22
                                                                                                                             ARFA
                                                                                                                                                                                                       TPFAK
                                                                                                                                                                                                     (hrs)
5.25
5.25
```

|                    | Lange | taffRd F | A Propo | sed Humberw | latarch | od         |      |
|--------------------|-------|----------|---------|-------------|---------|------------|------|
| 0.917              | 0.89  |          | 15.05   | 7.083       | 6.20    |            | 0.89 |
| 1.000              | 0.89  | 4.083    | 15.05   | 7.167       | 6.20    | 10.25      | 0.89 |
| 1.083              | 0.89  | 4.167    | 15.05   | 7.250       | 6.20    |            | 0.89 |
| 1.167              |       | 4.250    | 15.05   |             | 3.54    |            | 0.89 |
| 1.250              | 0.89  |          | 40.71   |             | 3.54    |            | 0.89 |
| 1.333              | 0.89  |          | 40.71   | 7.500       | 3.54    | 10.58      | 0.89 |
| 1.417              |       | 4.500    | 40.71   | 7.583       | 3.54    |            | 0.89 |
| 1.500              | 0.89  | 4.583    | 40.71   | 7.667       | 3.54    | 10.75      | 0.89 |
| 1.583              | 0.89  | 4.667    | 40.71   | 7.750       | 3.54    | 10.83      | 0.89 |
| 1.667              | 0.89  | 4.750    | 40.71   | 7.833       | 3.54    | 10.92      | 0.89 |
| 1.750              | 0.89  | 4.833    | 40.71   | 7.917       | 3.54    | 11.00      | 0.89 |
| 1.833              | 0.89  | 4.917    | 40.71   | 8.000       | 3.54    | 11.08      | 0.89 |
| 1.917              | 0.89  | 5.000    | 40.71   | 8.083       | 3.54    | 11.17      | 0.89 |
| 2.000              | 0.89  | 5.083    | 40.71   | 8.167       | 3.54    | 11.25      | 0.89 |
| 2.083              | 0.89  | 5.167    | 40.71   | 8.250       | 3.54    | 11.33      | 0.89 |
| 2.167              | 0.89  | 5.250    | 40.71   | 8.333       | 1.77    | 11.42      | 0.89 |
| 2.250              | 0.89  | 5.333    | 11.51   | 8.417       | 1.77    | 11.50      | 0.89 |
| 2.333              | 5.31  | 5.417    | 11.51   | 8.500       | 1.77    | 11.58      | 0.89 |
| 2.417              | 5.31  | 5.500    | 11.51   | 8.583       | 1.77    | 11.67      | 0.89 |
| 2.500              | 5.31  | 5.583    | 11.51   |             | 1.77    |            | 0.89 |
| 2.583              | 5.31  | 5.667    | 11.51   |             | 1.77    | 11.83      | 0.89 |
| 2.667              | 5.31  | 5.750    | 11.51   | 8.833       | 1.77    |            | 0.89 |
| 2.750              | 5.31  | 5.833    | 11.51   | 8.917       | 1.77    | 12.00      | 0.89 |
| 2.833              | 5.31  | 5.917    | 11.51   |             | 1.77    |            | 0.89 |
| 2.917              | 5.31  | 6.000    | 11.51   |             | 1.77    | 12.17      | 0.89 |
| 3.000              | 5.31  | 6.083    | 11.51   | 9.167       | 1.77    | 12.25      | 0.89 |
| 3.083              | 5.31  | 6.167    | 11.51   | 9.250       | 1.77    | l          |      |
| Max.Eff.Inten.(mm, |       | 40.71    |         | 30.98       |         |            |      |
| over (r            |       | 10.00    |         | 15.00       |         |            |      |
|                    | nin)= | 9.32     | (ii)    | 13.39 (ii)  |         |            |      |
| Unit Hyd. Tpeak (r |       | 10.00    |         | 15.00       |         |            |      |
| Unit Hyd. peak (   | cms)= | 0.12     |         | 0.08        |         |            |      |
|                    |       |          |         |             |         | TALS*      |      |
|                    | cms)= | 0.10     |         | 0.03        |         | .129 (iii) |      |
|                    | nrs)= | 5.25     |         | 5.25        |         | 5.25       |      |
|                    | (mm)= | 86.54    |         | 51.48       |         | 7.07       |      |
|                    | (mm)= | 88.54    |         | 88.54       |         | 3.54       |      |
| RUNOFF COEFFICIEN  | Γ =   | 0.98     |         | 0.58        | 6       | 3.87       |      |

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(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

- (1) CN\* PROCEDURE SELECTED FOR FEXTURES USED SELECTED FOR FEXTURE STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB | CALIB | STANDHYD ( 0115) |ID= 1 DT= 5.0 min | Area (ha)= 1.00 Total Imp(%)= 63.00 Dir. Conn.(%)= 63.00

## LangstaffRd\_EA\_Proposed\_HumberWatershed IMPERVIOUS PERVIOUS (i)

| Surface Area  | (ha)= | 0.63   | 0.37  |  |
|---------------|-------|--------|-------|--|
| Dep. Storage  | (mm)= | 2.00   | 5.00  |  |
| Average Slope | (%)=  | 1.00   | 2.00  |  |
| Length        | (m)=  | 475.00 | 17.00 |  |
| Mannings n    | =     | 0.013  | 0.250 |  |
|               |       |        |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TRANSFORMED HYETOGRAPH |       |       |       |        |       |       |       |  |
|------------------------|-------|-------|-------|--------|-------|-------|-------|--|
| TIME                   | RAIN  | TIME  |       | ' TIME | RAIN  |       | RAIN  |  |
| hrs                    | mm/hr | hrs   | mm/hr | ' hrs  |       | hrs   | mm/hr |  |
| 0.083                  | 0.00  | 3.167 | 5.31  | 6.250  | 11.51 | 9.33  | 0.89  |  |
| 0.167                  | 0.00  | 3.250 | 5.31  | 6.333  | 6.20  | 9.42  | 0.89  |  |
| 0.250                  | 0.00  | 3.333 | 15.05 | 6.417  | 6.20  | 9.50  | 0.89  |  |
| 0.333                  | 0.89  | 3.417 | 15.05 | 6.500  | 6.20  | 9.58  | 0.89  |  |
| 0.417                  | 0.89  | 3.500 | 15.05 | 6.583  | 6.20  | 9.67  | 0.89  |  |
| 0.500                  | 0.89  | 3.583 | 15.05 | 6.667  | 6.20  | 9.75  | 0.89  |  |
| 0.583                  | 0.89  | 3.667 | 15.05 | 6.750  | 6.20  | 9.83  | 0.89  |  |
| 0.667                  | 0.89  | 3.750 | 15.05 | 6.833  | 6.20  | 9.92  | 0.89  |  |
| 0.750                  | 0.89  | 3.833 | 15.05 | 6.917  | 6.20  | 10.00 | 0.89  |  |
| 0.833                  | 0.89  | 3.917 | 15.05 | 7.000  | 6.20  | 10.08 | 0.89  |  |
| 0.917                  | 0.89  | 4.000 | 15.05 | 7.083  | 6.20  | 10.17 | 0.89  |  |
| 1.000                  | 0.89  | 4.083 | 15.05 | 7.167  | 6.20  | 10.25 | 0.89  |  |
| 1.083                  | 0.89  | 4.167 | 15.05 | 7.250  | 6.20  | 10.33 | 0.89  |  |
| 1.167                  | 0.89  | 4.250 | 15.05 | 7.333  | 3.54  | 10.42 | 0.89  |  |
| 1.250                  | 0.89  | 4.333 | 40.71 | 7.417  | 3.54  | 10.50 | 0.89  |  |
| 1.333                  | 0.89  | 4.417 | 40.71 | 7.500  | 3.54  | 10.58 | 0.89  |  |
| 1.417                  | 0.89  | 4.500 | 40.71 | 7.583  | 3.54  | 10.67 | 0.89  |  |
| 1.500                  | 0.89  | 4.583 | 40.71 | 7.667  | 3.54  | 10.75 | 0.89  |  |
| 1.583                  | 0.89  | 4.667 | 40.71 | 7.750  | 3.54  | 10.83 | 0.89  |  |
| 1.667                  | 0.89  | 4.750 | 40.71 | 7.833  | 3.54  | 10.92 | 0.89  |  |
| 1.750                  | 0.89  | 4.833 | 40.71 | 7.917  | 3.54  | 11.00 | 0.89  |  |
| 1.833                  | 0.89  | 4.917 | 40.71 | 8.000  | 3.54  | 11.08 | 0.89  |  |
| 1.917                  | 0.89  | 5.000 | 40.71 | 8.083  | 3.54  | 11.17 | 0.89  |  |
| 2.000                  | 0.89  | 5.083 | 40.71 | 8.167  | 3.54  | 11.25 | 0.89  |  |
| 2.083                  | 0.89  | 5.167 | 40.71 | 8.250  | 3.54  | 11.33 | 0.89  |  |
| 2.167                  | 0.89  | 5.250 | 40.71 | 8.333  | 1.77  | 11.42 | 0.89  |  |
| 2.250                  | 0.89  | 5.333 | 11.51 | 8.417  | 1.77  | 11.50 | 0.89  |  |
| 2.333                  | 5.31  | 5.417 | 11.51 | 8.500  | 1.77  | 11.58 | 0.89  |  |
| 2.417                  | 5.31  | 5.500 | 11.51 | 8.583  | 1.77  | 11.67 | 0.89  |  |
| 2.500                  | 5.31  | 5.583 | 11.51 | 8.667  | 1.77  | 11.75 | 0.89  |  |
| 2.583                  | 5.31  | 5.667 | 11.51 | 8.750  | 1.77  | 11.83 | 0.89  |  |
| 2.667                  | 5.31  | 5.750 | 11.51 | 8.833  | 1.77  | 11.92 | 0.89  |  |
| 2.750                  | 5.31  | 5.833 | 11.51 | 8.917  | 1.77  | 12.00 | 0.89  |  |
| 2.833                  | 5.31  | 5.917 | 11.51 | 9.000  | 1.77  | 12.08 | 0.89  |  |
| 2.917                  | 5.31  | 6.000 | 11.51 | 9.083  | 1.77  | 12.17 | 0.89  |  |
| 3.000                  | 5.31  | 6.083 | 11.51 | 9.167  | 1.77  | 12.25 | 0.89  |  |
| 3.083                  | 5.31  | 6.167 | 11.51 | 9.250  | 1.77  |       |       |  |

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|                   | Langstaff | Rd_EA_Pro | posed_Hum | berWatershed |
|-------------------|-----------|-----------|-----------|--------------|
| 1 + 2 = 3         | AREA      | QPEAK     | TPEAK     | R.V.         |
|                   | (ha)      | (cms)     | (hrs)     | (mm)         |
| ID1= 1 ( 0505):   | 4.35      | 0.325     | 5.50      | 79.30        |
| + ID2= 2 ( 0510): | 2.24      | 0.087     | 5.67      | 75.50        |
| ===========       |           |           |           |              |
| ID = 3 ( 0420):   | 6.59      | 0.411     | 5.50      | 78.01        |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

Max.Eff.Inten.(mm/hr)=

over (min)

| CALIB<br>  STANDHYD ( 0110) <br> ID= 1 DT= 5.0 min | Area<br>Total | (ha)=<br>Imp(%)= | 1.58<br>70.00 | Dir. Conn.(%)= | 70.00 |
|--|---------------|------------------|---------------|----------------|-------|
|  |               | IMPERVI          | ous           | PERVIOUS (i)   |       |
| Surface Area                                       | (ha)=         | 1.1              | 1             | 0.47           |       |
| Dep. Storage                                       | (mm)=         | 2.0              | 0             | 5.00           |       |
| Average Slope                                      | (%)=          | 1.0              | 0             | 2.00           |       |
| Length   | (m)=          | 650.0            | 0             | 25.00          |       |
| Mannings n   | =             | 0.01             | 3             | 0.250          |       |
|  |               |                  |               |                |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  |       | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 5.31     | 6.250   | 11.51 | 9.33  | 0.89  |
| 0.167 | 0.00  | 3.250 | 5.31     | 6.333   | 6.20  | 9.42  | 0.89  |
| 0.250 | 0.00  | 3.333 | 15.05    | 6.417   | 6.20  | 9.50  | 0.89  |
| 0.333 | 0.89  | 3.417 | 15.05    | 6.500   | 6.20  | 9.58  | 0.89  |
| 0.417 | 0.89  | 3.500 | 15.05    | 6.583   | 6.20  | 9.67  | 0.89  |
| 0.500 | 0.89  | 3.583 | 15.05    | 6.667   | 6.20  | 9.75  | 0.89  |
| 0.583 | 0.89  | 3.667 | 15.05    | 6.750   | 6.20  | 9.83  | 0.89  |
| 0.667 | 0.89  | 3.750 | 15.05    | 6.833   | 6.20  | 9.92  | 0.89  |
| 0.750 | 0.89  | 3.833 | 15.05    | 6.917   | 6.20  | 10.00 | 0.89  |
| 0.833 | 0.89  |       | 15.05    |         | 6.20  |       | 0.89  |
| 0.917 |       | 4.000 | 15.05    |         | 6.20  |       | 0.89  |
| 1.000 | 0.89  |       | 15.05    |         | 6.20  |       | 0.89  |
| 1.083 | 0.89  |       | 15.05    |         | 6.20  |       | 0.89  |
| 1.167 | 0.89  |       | 15.05    |         | 3.54  | 10.42 | 0.89  |
| 1.250 |       | 4.333 | 40.71    |         | 3.54  |       | 0.89  |
| 1.333 | 0.89  |       | 40.71    | 7.500   | 3.54  |       | 0.89  |
| 1.417 |       | 4.500 | 40.71    |         | 3.54  |       | 0.89  |
| 1.500 | 0.89  |       | 40.71    | 7.667   | 3.54  | 10.75 | 0.89  |
| 1.583 | 0.89  | 4.667 | 40.71    | 7.750   | 3.54  | 10.83 | 0.89  |
| 1.667 | 0.89  |       | 40.71    | 7.833   | 3.54  |       | 0.89  |
| 1.750 | 0.89  |       | 40.71    |         | 3.54  |       | 0.89  |
| 1.833 | 0.89  |       | 40.71    | 8.000   | 3.54  | 11.08 | 0.89  |
| 1.917 | 0.89  |       | 40.71    | 8.083   | 3.54  |       | 0.89  |
| 2.000 |       | 5.083 | 40.71    | 8.167   | 3.54  |       | 0.89  |
| 2.083 | 0.89  |       | 40.71    | 8.250   | 3.54  | 11.33 | 0.89  |
| 2.167 | 0.89  | 5.250 | 40.71    | 8.333   | 1.77  | 11.42 | 0.89  |

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LangstaffRd\_EA\_Proposed\_HumberWatershed )= 9.32 (ii) 14.21 (ii) )= 10.00 15.00 Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)= 0.12 0.08 \*TOTALS\* PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 0.07 5.25 86.54 88.54 0.03 5.25 51.48 88.54 0.100 (iii) 5.25 73.56 88.54 0.98 0.58 0.83 (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 83.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COFFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY. | ADD HYD ( 0410) | | 1 + 2 = 3 | | ID1= 1 ( 0115): + ID2= 2 ( 0120): QPEAK (cms) 0.100 0.129 (mm) 73.56 77.07 (ha) 1.00 1.24 (hrs) 5.25 5.25 ID = 3 ( 0410): 2.24 0.229 5.25 75.50 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY. RESERVOIR( 0510)| OVERFLOW IS OFF IN= 2---> OUT= 1 DT= 5.0 min OUTFLOW STORAGE OUTFLOW STORAGE STORAGE | (ha.m.) | 0.0000 | 0.0024 | 0.0099 | 0.0204 | OUTFLOW (cms) 0.0699 0.0792 0.0876 0.0000 STORAGE (ha.m.) 0.0309 0.0414 0.0666 0.0000 OUTFLOW (cms) 0.0000 0.0264 0.0457 0.0590 AREA OPEAK TPEAK R.V. (ha) 2.240 2.240 (cms) 0.229 0.087 (hrs) 5.25 5.67 INFLOW : ID= 2 ( 0410) OUTFLOW: ID= 1 ( 0510) PEAK FLOW REDUCTION [Qout/Qin](%)= 37.90
TIME SHIFT OF PEAK FLOW (min)= 25.00
MAXIMUM STORAGE USED (ha.m.)= 0.0640 | ADD HYD ( 0420)|

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|                  | Lange    | taffRd E | A Propo | sed HumberW | atorche | ad        |      |
|------------------|----------|----------|---------|-------------|---------|-----------|------|
| 2.256            |          |          |         |             | 1.77    |           | 0.89 |
| 2.33             |          | 5.417    | 11.51   | 8.500       | 1.77    | 11.58     | 0.89 |
| 2.41             |          |          |         |             | 1.77    | 11.67     | 0.89 |
| 2.500            |          | 5.583    |         | 8.667       | 1.77    |           | 0.89 |
| 2.58             |          |          |         |             | 1.77    | 11.83     | 0.89 |
| 2.66             |          |          |         |             | 1.77    | 11.92     | 0.89 |
| 2.75             |          | 5.833    |         |             | 1.77    |           | 0.89 |
| 2.730            |          |          |         |             | 1.77    |           | 0.89 |
|                  |          |          |         |             |         | 12.08     |      |
| 2.91             |          |          |         |             | 1.77    | 12.17     | 0.89 |
| 3.000            |          |          |         |             | 1.77    | 12.25     | 0.89 |
| 3.083            | 3 5.31   | 6.167    | 11.51   | 9.250       | 1.77    |           |      |
| Max.Eff.Inten.(r | nm/hr)=  | 40.71    |         | 32.40       |         |           |      |
|                  | (min)    | 10.00    |         | 20.00       |         |           |      |
| Storage Coeff.   | (min)=   |          |         | 19.61 (ii)  |         |           |      |
| Unit Hyd. Tpeak  |          | 10.00    |         | 20.00       |         |           |      |
|                  |          | 0.10     |         | 0.06        |         |           |      |
| Unit Hyd. peak   | (cms)=   | 0.10     |         | 0.00        | ****    | ALS*      |      |
| DEAK FLOW        | (        | 0.40     |         | 0.04        |         |           |      |
| PEAK FLOW        | (cms)=   | 0.12     |         | 0.04        |         | 161 (iii) |      |
| TIME TO PEAK     | (hrs)=   | 5.25     |         | 5.33        |         | .25       |      |
| RUNOFF VOLUME    | ( mm ) = | 86.54    |         | 54.37       |         | .88       |      |
| TOTAL RAINFALL   | (mm)=    | 88.54    |         | 88.54       |         | .54       |      |
| RUNOFF COEFFICIE | ENT =    | 0.98     |         | 0.61        | 6       | .87       |      |
|                  |          |          |         |             |         |           |      |
|                  |          |          |         |             |         |           |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: CN\* = 85.0 Ia = Dep. Storage (Above) (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT. (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| (111) PEAK FLOW D                    | JES NOT INCLU | DE BASEFLOW | IF ANY.     |         |  |
|--------------------------------------|---------------|-------------|-------------|---------|--|
|                                      |               |             |             |         |  |
| RESERVOIR( 0525) <br>  IN= 2> OUT= 1 | OVERFLOW I    | S OFF       |             |         |  |
| DT= 5.0 min                          | OUTFLOW       | STORAGE     | OUTFLOW     | STORAGE |  |
| ii                                   | (cms)         | (ha.m.)     | (cms)       | (ha.m.) |  |
|                                      | ò.0000        | 0.0000      | 0.0181      | 0.0161  |  |
|                                      | 0.0081        | 0.0031      | 0.0584      | 0.0204  |  |
|                                      | 0.0123        | 0.0074      | 0.0920      | 0.0259  |  |
|                                      | 0.0155        | 0.0118      | 0.0000      | 0.0000  |  |
|                                      |               |             |             |         |  |
|                                      | ARE           | A QPEAK     | TPEAK       | R.V.    |  |
|                                      | (ha           | ) (cms)     | (hrs)       | (mm)    |  |
| INFLOW : ID= 2 ( 0:                  | 110) 1.5      | 80 0.1      | 61 5.25     | 76.88   |  |
| OUTFLOW: ID= 1 ( 0                   | 525) 1.5      | 80 0.1      | 35 5.33     | 76.82   |  |
|                                      |               |             |             |         |  |
| PEA                                  | K FLOW RE     | DUCTION [Qo | ut/Qin](%)= | 83.80   |  |
| TIM                                  | E SHIFT OF PE | AK FLOW     | (min)=      | 5.00    |  |
| MAX                                  | IMUM STORAGE  | USED        | (ha.m.)=    | 0.0331  |  |
|                                      |               |             |             |         |  |
|                                      |               |             |             |         |  |

# Don River Watershed Visual OTTHYMO Summary- Proposed

# PCSWMM Modelling for Culvert LC1 Don River Watershed

## LangstaffRd\_EA\_Proposed\_WestDonWatershd

| ** SIMULATION:Run 02 | **   |
|----------------------|------|
| ***********          | **** |
|                      |      |

| _   |            |     |           |   |
|-----|------------|-----|-----------|---|
| -   | READ STORM |     | Filename: | C:\Users\ray.zhao\AppD                        |
| - 1 |            |     |           | ata\Local\Temp\                               |
| - 1 |            | - 1 |           | e8da0adc-3b43-467d-984d-5ab4a7d3492c\e8708d30 |

| 1                |           | eouabauc-3043-407u-30 |
|------------------|-----------|-----------------------|
| Ptotal= 42.93 mm | Comments: | 2yr-12hrSCS           |
|                  |           |                       |

| 33 | mm   | Comment | :s: 2yr-1 | 12hrSCS |        |              |       |
|----|------|---------|-----------|---------|--------|--------------|-------|
|    |      |         |           |         |        |              |       |
|    | TIME | RAIN    | TIME      | RAIN    | ' TIME | RAIN   TIME  | RAIN  |
|    | hrs  | mm/hr   | hrs       | mm/hr   | ' hrs  | mm/hr   hrs  | mm/hr |
|    | 0.25 | 0.00    | 3.50      | 1.02    | 6.75   | 8.13   10.00 | 1.02  |
|    | 0.50 | 1.02    | 3.75      | 2.03    | 7.00   | 3.05   10.25 | 1.02  |
|    | 0.75 | 1.02    | 4.00      | 2.03    | 7.25   | 3.05   10.50 | 1.02  |
|    | 1.00 | 1.02    | 4.25      | 1.02    | 7.50   | 3.05   10.75 | 1.02  |
|    | 1.25 | 0.00    | 4.50      | 3.05    | 7.75   | 2.03   11.00 | 1.02  |
|    | 1.50 | 1.02    | 4.75      | 3.05    | 8.00   | 3.05   11.25 | 1.02  |
|    | 1.75 | 1.02    | 5.00      | 3.05    | 8.25   | 2.03   11.50 | 0.00  |
|    | 2.00 | 1.02    | 5.25      | 3.05    | 8.50   | 2.03   11.75 | 1.02  |
|    | 2.25 | 1.02    | 5.50      | 5.08    | 8.75   | 2.03   12.00 | 1.02  |
|    | 2.50 | 1.02    | 5.75      | 5.08    | 9.00   | 1.02   12.25 | 1.02  |
|    | 2.75 | 2.03    | 6.00      | 38.61   | 9.25   | 2.03         |       |
|    | 3.00 | 2.03 İ  | 6.25      | 38.61 İ | 9.50   | 1.02         |       |
|    | 3.25 | 2.03    | 6.50      | 8.13    | 9.75   | 2.03         |       |
|    |      |         |           |         |        | •            |       |

| STANDHYD ( 0165) <br> ID= 1 DT= 5.0 min | Area<br>Total | (ha)=<br>Imp(%)= 7 | 0.60<br>72.00 | Dir. Conn.(%)= | 72.00 |
|---|---------------|--------------------|---------------|----------------|-------|
|   |               | IMPERVIOL          | JS            | PERVIOUS (i)   |       |
| Surface Area                            | (ha)=         | 0.43               |               | 0.17           |       |
| Dep. Storage                            | (mm)=         | 2.00               |               | 5.00           |       |
| Average Slope                           | (%)=          | 1.00               |               | 2.00           |       |
| Length                                  | (m)=          | 250.00             |               | 20.00          |       |
| Mannings n                              | =             | 0.013              |               | 0.250          |       |
|   |               |                    |               |                |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   |      |       |
|-------|-------|-------|----------|---------|-------|------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs  | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250   | 38.61 | 9.33 | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333   | 8.13  | 9.42 | 1.02  |
| 0.250 | 0.00  | 3.333 | 1.02     | 6.417   | 8.13  | 9.50 | 1.02  |
| 0.333 | 1.02  | 3.417 | 1.02     | 6.500   | 8.13  | 9.58 | 2.03  |
| 0.417 | 1.02  | 3.500 | 1.02     | 6.583   | 8.13  | 9.67 | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03     | 6.667   | 8.13  | 9.75 | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03     | 6.750   | 8.13  | 9.83 | 1.02  |
|       |       |       |          |         |       |      |       |

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## LangstaffRd\_EA\_Proposed\_WestDonWatershd

|                   |       | TMDEDVT | OLIC  | DEDVITOUS (4)  |       |
|-------------------|-------|---------|-------|----------------|-------|
|                   |       |         |       |                |       |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 98.00 | Dir. Conn.(%)= | 98.00 |
| STANDHYD ( 01/0)  |       |         |       |                |       |

|               |       | IMPERVIOUS | PERVIOUS (i) |
|---------------|-------|------------|--------------|
| Surface Area  | (ha)= | 0.42       | 0.01         |
| Dep. Storage  | (mm)= | 2.00       | 5.00         |
| Average Slope | (%)=  | 1.00       | 2.00         |
| Length        | (m)=  | 250.00     | 20.00        |
| Mannings n    | =     | 0.013      | 0.250        |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TP    | ANS EORMEI | D HYETOGR | ADH   | _     |       |
|-------|-------|-------|------------|-----------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN       | l' TIME   | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr      | l' hrs    | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03       | 6.250     | 38.61 | 9.33  | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03       | 6.333     | 8.13  | 9.42  | 1.02  |
| 0.250 | 0.00  | 3.333 | 1.02       | 6.417     | 8.13  | 9.50  | 1.02  |
| 0.333 | 1.02  | 3.417 | 1.02       | 6.500     | 8.13  | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 1.02       | 6.583     | 8.13  | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03       | 6.667     | 8.13  | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03       | 6.750     | 8.13  | 9.83  | 1.02  |
| 0.667 | 1.02  | 3.750 | 2.03       | 6.833     | 3.05  | 9.92  | 1.02  |
| 0.750 | 1.02  | 3.833 | 2.03       | 6.917     | 3.05  | 10.00 | 1.02  |
| 0.833 | 1.02  | 3.917 | 2.03       | 7.000     | 3.05  | 10.08 | 1.02  |
| 0.917 | 1.02  | 4.000 | 2.03       | 7.083     | 3.05  | 10.17 | 1.02  |
| 1.000 | 1.02  | 4.083 | 1.02       | 7.167     | 3.05  | 10.25 | 1.02  |
| 1.083 | 0.00  | 4.167 | 1.02       | 7.250     | 3.05  | 10.33 | 1.02  |
| 1.167 | 0.00  | 4.250 | 1.02       | 7.333     | 3.05  | 10.42 | 1.02  |
| 1.250 | 0.00  | 4.333 | 3.05       | 7.417     | 3.05  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 3.05       | 7.500     | 3.05  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 3.05       | 7.583     | 2.03  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 3.05       | 7.667     | 2.03  | 10.75 | 1.02  |
| 1.583 | 1.02  | 4.667 | 3.05       | 7.750     | 2.03  | 10.83 | 1.02  |
| 1.667 | 1.02  | 4.750 | 3.05       | 7.833     | 3.05  | 10.92 | 1.02  |
| 1.750 | 1.02  | 4.833 | 3.05       | 7.917     | 3.05  | 11.00 | 1.02  |
| 1.833 | 1.02  | 4.917 | 3.05       | 8.000     | 3.05  | 11.08 | 1.02  |
| 1.917 | 1.02  | 5.000 | 3.05       | 8.083     | 2.03  | 11.17 | 1.02  |
| 2.000 | 1.02  | 5.083 | 3.05       | 8.167     | 2.03  | 11.25 | 1.02  |
| 2.083 | 1.02  | 5.167 | 3.05       | 8.250     | 2.03  | 11.33 | 0.00  |
| 2.167 | 1.02  | 5.250 | 3.05       | 8.333     | 2.03  | 11.42 | 0.00  |
| 2.250 | 1.02  | 5.333 | 5.08       | 8.417     | 2.03  | 11.50 | 0.00  |
| 2.333 | 1.02  | 5.417 | 5.08       | 8.500     | 2.03  | 11.58 | 1.02  |
| 2.417 | 1.02  | 5.500 | 5.08       | 8.583     | 2.03  | 11.67 | 1.02  |
| 2.500 | 1.02  | 5.583 | 5.08       | 8.667     | 2.03  | 11.75 | 1.02  |
| 2.583 | 2.03  | 5.667 | 5.08       | 8.750     | 2.03  | 11.83 | 1.02  |
| 2.667 | 2.03  | 5.750 | 5.08       | 8.833     | 1.02  | 11.92 | 1.02  |
| 2.750 | 2.03  | 5.833 | 38.61      | 8.917     | 1.02  | 12.00 | 1.02  |
| 2.833 | 2.03  | 5.917 | 38.61      | 9.000     | 1.02  | 12.08 | 1.02  |
| 2.917 | 2.03  | 6.000 | 38.61      | 9.083     | 2.03  | 12.17 | 1.02  |
| 3.000 | 2.03  | 6.083 | 38.61      | 9.167     | 2.03  | 12.25 | 1.02  |
| 3.083 | 2.03  | 6.167 | 38.61      | 9.250     | 2.03  | l     |       |

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|              |                |       |               |              | sed_WestDon   |              |              |   |
|--------------|----------------|-------|---------------|--------------|---------------|--------------|--------------|---|
|              | 0.667          |       | 3.750         |              | 6.833         | 3.05         |              | 1 |
|              | 0.750          |       | 3.833         |              | 6.917         | 3.05         |              | 1 |
|              | 0.833          |       | 3.917         | 2.03         |               | 3.05         |              | 1 |
|              | 9.917          |       | 4.000         |              | 7.083         | 3.05         |              | 1 |
|              | 1.000          |       | 4.083         | 1.02         |               | 3.05         |              |   |
|              | 1.083          |       | 4.167         | 1.02         |               | 3.05         |              | 1 |
|              | 1.167<br>1.250 |       | 4.250         | 1.02<br>3.05 |               | 3.05<br>3.05 |              | 1 |
|              | 1.333          |       | 4.333         | 3.05         |               | 3.05         |              | 1 |
|              | 1.417          |       | 4.500         | 3.05         |               | 2.03         |              | 1 |
|              | 1.500          |       | 4.583         | 3.05         |               | 2.03         |              | 1 |
|              | 1.583          |       | 4.667         | 3.05         |               | 2.03         |              | 1 |
|              | 1.667          |       | 4.750         | 3.05         |               | 3.05         |              | 1 |
|              | 1.750          |       | 4.833         | 3.05         |               | 3.05         |              | 1 |
|              | 1.833          |       | 4.917         | 3.05         |               | 3.05         |              | 1 |
|              | 1.917          |       | 5.000         | 3.05         |               | 2.03         |              | 1 |
|              | 2.000          |       | 5.083         | 3.05         |               | 2.03         |              | 1 |
|              | 2.083          |       | 5.167         |              | 8.250         | 2.03         |              | 0 |
|              | 2.167          |       | 5.250         | 3.05         |               | 2.03         |              | 0 |
|              | 2.250          |       | 5.333         |              | 8.417         | 2.03         |              | 0 |
|              | 2.333          |       | 5.417         | 5.08         |               | 2.03         |              | 1 |
|              | 2.417          |       | 5.500         |              | 8.583         | 2.03         |              | 1 |
| :            | 2.500          | 1.02  | 5.583         | 5.08         | 8.667         | 2.03         | 11.75        | 1 |
|              | 2.583          | 2.03  | 5.667         | 5.08         | 8.750         | 2.03         | 11.83        | 1 |
|              | 2.667          | 2.03  | 5.750         | 5.08         | 8.833         | 1.02         | 11.92        | 1 |
|              | 2.750          | 2.03  | 5.833         | 38.61        | 8.917         | 1.02         | 12.00        | 1 |
|              | 2.833          |       | 5.917         | 38.61        | 9.000         | 1.02         | 12.08        | 1 |
| :            | 2.917          | 2.03  | 6.000         |              | 9.083         | 2.03         |              | 1 |
|              | 3.000          |       | 6.083         |              | 9.167         | 2.03         |              | 1 |
| :            | 3.083          | 2.03  | 6.167         | 38.61        | 9.250         | 2.03         | I            |   |
| Max.Eff.Inte | en.(mm/        | 'hr)= | 38.61         |              | 19.37         |              |              |   |
|              | over (m        | nin)  | 5.00          |              | 15.00         |              |              |   |
| Storage Coe  | ff. (n         | nin)= | 6.48          | (ii)         | 11.15 (ii)    |              |              |   |
| Unit Hyd. T  | oeak (n        | nin)= | 5.00          |              | 15.00         |              |              |   |
| Unit Hyd. pe | eak (c         | :ms)= | 0.18          |              | 0.09          |              |              |   |
|              |                |       |               |              |               |              | TALS*        |   |
| PEAK FLOW    |                | :ms)= | 0.05          |              | 0.01          |              | .052 (iii    | ) |
| TIME TO PEAK |                | irs)= | 6.25          |              | 6.33          |              | 6.25         |   |
| RUNOFF VOLUM |                | mm)=  | 40.93         |              | 15.99         |              | 3.93         |   |
| TOTAL RAINFA |                | mm)=  | 42.93<br>0.95 |              | 42.93<br>0.37 |              | 2.93<br>0.79 |   |
| RUNOFF COEFI |                |       |               |              |               |              |              |   |

- CN\* = 83.0 Ia = Dep. Storage (Above)
  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
  THAN THE STORAGE COEFFICIENT.
  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |

 ${\tt LangstaffRd\_EA\_Proposed\_WestDonWatershd}$ 

| Max.Eff.Inten.(mm/hr)= | 38.61     | 25.09     |             |
|------------------------|-----------|-----------|-------------|
| over (min)             | 5.00      | 10.00     |             |
| Storage Coeff. (min)=  | 6.48 (ii) | 7.91 (ii) |             |
| Unit Hyd. Tpeak (min)= | 5.00      | 10.00     |             |
| Unit Hyd. peak (cms)=  | 0.18      | 0.13      |             |
|                        |           |           | *TOTALS*    |
| PEAK FLOW (cms)=       | 0.04      | 0.00      | 0.045 (iii) |
| TIME TO PEAK (hrs)=    | 6.25      | 6.25      | 6.25        |
| RUNOFF VOLUME (mm)=    | 40.93     | 20.75     | 40.52       |
| TOTAL RAINFALL (mm)=   | 42.93     | 42.93     | 42.93       |
| RUNOFF COEFFICIENT =   | 0.95      | 0.48      | 0.94        |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 89.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB<br>  STANDHYD ( 0180) <br> ID= 1 DT= 5.0 min | Area (ha)=<br>Total Imp(%)= | 0.65<br>52.00 Dir. Conn.(%)= | 52.00 |
|--|-----------------------------|------------------------------|-------|

|               |       | IMPERVIOUS | PERVIOUS (i) |
|---------------|-------|------------|--------------|
| Surface Area  | (ha)= | 0.34       | 0.31         |
| Dep. Storage  | (mm)= | 2.00       | 5.00         |
| Average Slope | (%)=  | 1.00       | 2.00         |
| Length        | (m)=  | 65.83      | 40.00        |
| Mannings n    | =     | 0.013      | 0.250        |
|               |       |            |              |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250   | 38.61 | 9.33  | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333   | 8.13  | 9.42  | 1.02  |
| 0.250 | 0.00  | 3.333 | 1.02     | 6.417   | 8.13  | 9.50  | 1.02  |
| 0.333 | 1.02  | 3.417 | 1.02     | 6.500   | 8.13  | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 1.02     | 6.583   | 8.13  | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03     | 6.667   | 8.13  | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03     | 6.750   | 8.13  | 9.83  | 1.02  |
| 0.667 | 1.02  | 3.750 | 2.03     | 6.833   | 3.05  | 9.92  | 1.02  |
| 0.750 | 1.02  | 3.833 | 2.03     | 6.917   | 3.05  | 10.00 | 1.02  |
| 0.833 | 1.02  | 3.917 | 2.03     | 7.000   | 3.05  | 10.08 | 1.02  |
| 0.917 | 1.02  | 4.000 | 2.03     | 7.083   | 3.05  | 10.17 | 1.02  |
| 1.000 | 1.02  | 4.083 | 1.02     | 7.167   | 3.05  | 10.25 | 1.02  |
| 1.083 | 0.00  | 4.167 | 1.02     | 7.250   | 3.05  | 10.33 | 1.02  |
| 1.167 | 0.00  | 4.250 | 1.02     | 7.333   | 3.05  | 10.42 | 1.02  |

```
nWatershd
3.05 | 10.50
3.05 | 10.58
2.03 | 10.67
2.03 | 10.75
2.03 | 10.83
3.05 | 10.92
3.05 | 11.00
3.05 | 11.08
2.03 | 11.17
                                    1.250
                                    1.250
1.333
1.417
1.500
1.583
1.667
1.750
1.833
                                                                                                                                                                       1.02
1.02
1.02
1.02
1.02
1.02
                                    1.917
                                                                                                                                                 11.25
11.33
11.42
11.50
11.58
11.67
11.75
                                    2.083
2.167
2.250
2.333
2.417
                                    2.583
                                                                                                                                                  11.83
                                                                                                                                                                       1.02
                                    2.667
                                                                                                                                                  11.92
                                    2.750
2.833
2.917
3.000
           Max.Eff.Inten.(mm/hr)=
                                                                           38.61
                                                                                                         18.46
           over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                                             5.00 20.00
2.91 (ii) 16.78 (ii)
5.00 20.00
0.28 0.06
                                                                                                                                       *TOTALS*
0.045 (iii)
6.25
28.94
42.93
           PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                                           0.04
6.25
40.93
42.93
0.95
                                                                                                           0.01
                                                                                                        6.42
15.99
42.93
0.37
***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
              (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* = 83.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

| CALIB | | STANDHYD ( 0185)| |ID= 1 DT= 5.0 min | Area (ha)= 0.47 Total Imp(%)= 72.00 Dir. Conn.(%)= 72.00 PERVIOUS (i) IMPERVIOUS Surface Area Dep. Storage 0.13 5.00 (ha)= (mm)=

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LangstaffRd\_EA\_Proposed\_WestDonWatershd

|                 |        |       |       | *TOTALS*    |
|-----------------|--------|-------|-------|-------------|
| PEAK FLOW       | (cms)= | 0.04  | 0.00  | 0.039 (iii) |
| TIME TO PEAK    | (hrs)= | 6.25  | 6.42  | 6.25        |
| RUNOFF VOLUME   | (mm)=  | 40.93 | 13.64 | 33.27       |
| TOTAL RAINFALL  | (mm)=  | 42.93 | 42.93 | 42.93       |
| RUNOFF COEFFICI | ENT =  | 0.95  | 0.32  | 0.77        |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  $CN^*=79.0$  Ia = Dep. Storage (Above) (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ID1= 1 ( 0180):<br>+ ID2= 2 ( 0185): | AREA<br>(ha)<br>0.65<br>0.47 | QPEAK<br>(cms)<br>0.045<br>0.039 | 6.25     | 28.94 |
|--------------------------------------|------------------------------|----------------------------------|----------|-------|
| ID = 3 ( 0445):                      | 1.12                         | 0.084                            | 6.25     | 30.76 |
| NOTE: PEAK FLOWS DO                  | NOT INCL                     | JDE BASEFL                       | OWS IF A | NY.   |

| ADD HYD ( 0450)   |        |       |       |       |
|-------------------|--------|-------|-------|-------|
| 1 + 2 = 3         | AREA   | QPEAK | TPEAK | R.V.  |
|                   | (ha)   | (cms) | (hrs) | (mm)  |
| ID1= 1 ( 0165):   | 0.60   | 0.052 | 6.25  | 33.93 |
| + ID2= 2 ( 0170): | 0.43   | 0.045 | 6.25  | 40.52 |
| ==============    | ====== |       |       |       |
| ID = 3 ( 0450):   | 1.03   | 0.098 | 6.25  | 36.68 |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| RESERVOIR( 0520)| OVERFLOW IS OFF

LangstaffRd\_EA\_Proposed\_WestDonWatershd () = 1.00 2.00 () = 240.00 20.00 Average Slope Length Mannings n 0.013 0.350

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   | -     |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250   | 38.61 | 9.33  | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333   | 8.13  | 9.42  | 1.02  |
| 0.250 | 0.00  | 3.333 | 1.02     | 6.417   | 8.13  |       | 1.02  |
| 0.333 | 1.02  | 3.417 | 1.02     | 6.500   | 8.13  | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 1.02     | 6.583   | 8.13  | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03     | 6.667   | 8.13  | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03     | 6.750   | 8.13  | 9.83  | 1.02  |
| 0.667 | 1.02  | 3.750 | 2.03     | 6.833   | 3.05  | 9.92  | 1.02  |
| 0.750 | 1.02  | 3.833 | 2.03     | 6.917   | 3.05  | 10.00 | 1.02  |
| 0.833 | 1.02  | 3.917 | 2.03     | 7.000   | 3.05  | 10.08 | 1.02  |
| 0.917 | 1.02  | 4.000 | 2.03     | 7.083   | 3.05  | 10.17 | 1.02  |
| 1.000 | 1.02  | 4.083 | 1.02     | 7.167   | 3.05  | 10.25 | 1.02  |
| 1.083 | 0.00  | 4.167 | 1.02     | 7.250   | 3.05  | 10.33 | 1.02  |
| 1.167 | 0.00  |       | 1.02     | 7.333   | 3.05  | 10.42 | 1.02  |
| 1.250 | 0.00  | 4.333 | 3.05     | 7.417   | 3.05  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 3.05     | 7.500   | 3.05  | 10.58 | 1.02  |
| 1.417 |       | 4.500 | 3.05     | 7.583   | 2.03  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 3.05     | 7.667   | 2.03  |       | 1.02  |
| 1.583 | 1.02  |       |          | 7.750   |       |       | 1.02  |
| 1.667 |       |       | 3.05     |         |       |       | 1.02  |
| 1.750 | 1.02  |       |          |         | 3.05  |       | 1.02  |
| 1.833 |       | 4.917 |          | 8.000   |       | 11.08 | 1.02  |
| 1.917 |       | 5.000 |          | 8.083   |       | 11.17 | 1.02  |
| 2.000 |       | 5.083 |          | 8.167   |       | 11.25 | 1.02  |
| 2.083 |       | 5.167 |          | 8.250   |       | 11.33 | 0.00  |
| 2.167 |       | 5.250 |          | 8.333   |       |       | 0.00  |
| 2.250 | 1.02  | 5.333 |          | 8.417   | 2.03  |       | 0.00  |
| 2.333 | 1.02  | 5.417 | 5.08     | 8.500   | 2.03  | 11.58 | 1.02  |
| 2.417 | 1.02  | 5.500 | 5.08     | 8.583   | 2.03  | 11.67 | 1.02  |
| 2.500 | 1.02  | 5.583 | 5.08     | 8.667   | 2.03  | 11.75 | 1.02  |
| 2.583 | 2.03  | 5.667 | 5.08     | 8.750   | 2.03  |       | 1.02  |
| 2.667 | 2.03  | 5.750 | 5.08     | 8.833   | 1.02  |       | 1.02  |
| 2.750 | 2.03  | 5.833 |          | 8.917   | 1.02  |       | 1.02  |
| 2.833 | 2.03  | 5.917 | 38.61    | 9.000   | 1.02  |       | 1.02  |
| 2.917 | 2.03  | 6.000 | 38.61    | 9.083   | 2.03  | 12.17 | 1.02  |
| 3.000 |       | 6.083 |          | 9.167   | 2.03  | 12.25 | 1.02  |
| 3.083 | 2.03  | 6.167 | 38.61    | 9.250   | 2.03  |       |       |

5.00 20.00 6.32 (ii) 18.29 (ii) 5.00 20.00 0.19 0.06 Page 6

15.64

38.61

Max.Eff.Inten.(mm/hr)=

over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=

|   | Langsta                                | fRd EA Prop | osed We | estDonWat | ershd   |  |
|---|--|-------------|---------|-----------|---------|--|
| IN= 2> OUT= 1   |  |             |         |           |         |  |
| DT= 5.0 min   |  | STORAGE     |         | JTFLOW    | STORAGE |  |
|   | (cms)                                  | (ha.m.)     | (       | cms)      | (ha.m.) |  |
|   | 0.0000                                 | 0.0000      | 0       | .0181     | 0.0552  |  |
|   | 0.0081                                 | 0.0048      | 0       | .0203     | 0.0732  |  |
|   |  | 0.0192      |         |           |         |  |
|   | 0.0155                                 | 0.0372      | 0       | .0000     | 0.0000  |  |
|   | А                                      | REA QPE     | AK      | TPEAK     | R.V.    |  |
|   | (                                      | ha) (cm     | s)      | (hrs)     | (mm)    |  |
| INFLOW : ID= 2 (  | 0450) 2                                | .150 0      | .182    | 6.25      | 33.59   |  |
| OUTFLOW: ID= 1 (  | 0520) 2                                | .150 0      | .016    | 7.50      | 33.53   |  |
| TI  | AK FLOW<br>ME SHIFT OF<br>XXIMUM STORA | PEAK FLOW ` |         | (min)= 75 | 5.00    |  |
|   |  |             |         |           |         |  |
| 1 ***   |  |             |         |           |         |  |
| CALIB   | //-                                    | -) 2.05     |         |           |         |  |
| STANDHYD ( 0145) <br> ID= 1 DT= 5.0 min                               | Area (n                                | a)= 3.05    | D4      | Cann (%)  | 76.00   |  |
| ID= 1 DI= 5.0 Min   | lotal imp(                             | %)= /6.00   | Dir.    | Conn.(%)  | = /6.00 |  |
|   | IMP                                    | ERVIOUS     | PERVIOU | S (i)     |         |  |
| Surface Area  | (ha)=                                  | 2.32        | 0.73    | , ` ′     |         |  |
| Dep. Storage  | (mm)=                                  | 2.00        | 5.00    | )         |         |  |
| Average Slope   | (%)=                                   | 1.00        | 2.00    | )         |         |  |
| Length  | (m)= 5                                 | 31.00       | 40.00   | )         |         |  |
| Surface Area<br>Dep. Storage<br>Average Slope<br>Length<br>Mannings n | =                                      | 0.013       | 0.250   | )         |         |  |
|   | ALL WAS TRAN                           |             |         |           | STEP.   |  |
|   |  | TRANSFOR    | MED HYE | TOGRAPH - |         |  |
|   |  |             |         |           |         |  |

|       |       | TRA   | ANSFORME | ) HYETOGR | APH   |       |       |
|-------|-------|-------|----------|-----------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME    | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs     | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250     | 38.61 | 9.33  | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333     | 8.13  | 9.42  | 1.02  |
| 0.250 | 0.00  | 3.333 | 1.02     | 6.417     | 8.13  | 9.50  | 1.02  |
| 0.333 | 1.02  | 3.417 | 1.02     | 6.500     | 8.13  | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 1.02     | 6.583     | 8.13  | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03     | 6.667     | 8.13  | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03     | 6.750     | 8.13  | 9.83  | 1.02  |
| 0.667 | 1.02  | 3.750 | 2.03     | 6.833     | 3.05  | 9.92  | 1.02  |
| 0.750 | 1.02  | 3.833 | 2.03     | 6.917     | 3.05  | 10.00 | 1.02  |
| 0.833 | 1.02  | 3.917 | 2.03     | 7.000     | 3.05  | 10.08 | 1.02  |
| 0.917 | 1.02  | 4.000 | 2.03     | 7.083     | 3.05  | 10.17 | 1.02  |
| 1.000 | 1.02  | 4.083 | 1.02     | 7.167     | 3.05  | 10.25 | 1.02  |
| 1.083 | 0.00  | 4.167 | 1.02     | 7.250     | 3.05  | 10.33 | 1.02  |
| 1.167 | 0.00  | 4.250 | 1.02     | 7.333     | 3.05  | 10.42 | 1.02  |
| 1.250 | 0.00  | 4.333 | 3.05     | 7.417     | 3.05  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 3.05     | 7.500     | 3.05  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 3.05     | 7.583     | 2.03  | 10.67 | 1.02  |

| 1.583         1.02         4.667         3.05         7.750         2.03         10.83         1.02           1.667         1.02         4.670         3.05         7.750         2.03         10.92         1.02           1.750         1.02         4.4833         3.05         7.917         3.05         11.00         1.02           1.917         1.02         5.000         3.05         8.080         3.05         11.08         1.02           2.080         1.02         5.080         3.05         8.167         2.03         111.7         1.02           2.083         1.02         5.167         3.05         8.250         2.03         111.25         1.02           2.083         1.02         5.520         3.05         8.333         2.03         111.25         1.02           2.167         1.02         5.250         3.05         8.333         2.03         11.12         0.00           2.250         1.02         5.250         3.05         8.333         2.03         11.50         0.00           2.33         1.02         5.417         5.08         8.500         2.03         11.53         1.02           2.500         1.02 <th></th> <th colspan="11">LangstaffRd_EA_Proposed_WestDonWatershd</th>   |       | LangstaffRd_EA_Proposed_WestDonWatershd |       |       |       |      |       |      |  |  |  |  |
|--|-------|---|-------|-------|-------|------|-------|------|--|--|--|--|
| 1.667         1.02         4.750         3.05         7.833         3.05         10.92         1.02           1.750         1.02         4.833         3.05         7.917         3.05         11.00         1.02           1.833         1.02         4.917         3.05         8.060         3.05         11.08         1.02           1.917         1.02         5.0803         3.05         8.083         2.03         11.17         1.02           2.080         1.02         5.083         3.05         8.167         2.03         11.12         1.02           2.083         1.02         5.167         3.05         8.250         2.03         11.33         0.00           2.167         1.02         5.250         3.05         8.250         2.03         11.33         0.00           2.167         1.02         5.250         3.05         8.250         2.03         11.33         0.00           2.250         1.02         5.520         3.08         8.417         2.03         11.50         0.00           2.331         1.02         5.500         5.08         8.583         2.03         11.57         1.02           2.580         2.03  | 1.500 | 1.02                                    | 4.583 | 3.05  | 7.667 | 2.03 | 10.75 | 1.02 |  |  |  |  |
| 1.750         1.02         4.833         3.05         7.917         3.05         11.00         1.02         1.917         3.05         8.000         3.05         11.00         1.02         1.917         3.05         8.000         3.05         11.17         1.02         1.02         1.02         1.02         1.02         1.02         1.02         1.117         1.02         1.02         1.117         1.02         1.02         1.02         1.02         1.02         3.05         8.167         2.03         11.13         0.00         0.02         3.05         8.250         2.03         11.13         0.00         0.00         2.167         1.02         1.533         5.08         8.333         2.03         11.42         0.00         0.00         2.33         11.58         1.02         0.00         0.00         8.417         2.03         11.58         1.02         1.333         5.08         8.8417         2.03         11.58         1.02         1.343         1.02         1.500         0.00         8.858         2.03         11.58         1.02         2.500         1.02         1.500         8.08         8.580         2.03         11.58         1.02         2.500         1.02         8.500         2.03 </td <td>1.583</td> <td>1.02</td> <td>4.667</td> <td>3.05</td> <td>7.750</td> <td>2.03</td> <td>10.83</td> <td>1.02</td>   | 1.583 | 1.02                                    | 4.667 | 3.05  | 7.750 | 2.03 | 10.83 | 1.02 |  |  |  |  |
| 1.833         1.02         4.917         3.05         8.000         3.05         11.08         1.02           1.917         1.02         5.000         3.05         8.083         2.03         11.17         1.02           2.000         1.02         5.083         3.05         8.167         2.03         11.25         1.02           2.083         1.02         5.167         3.05         8.250         2.03         11.32         0.00           2.167         1.02         5.259         3.05         8.333         2.03         11.42         0.00           2.250         1.02         5.333         5.08         8.417         2.03         11.50         0.00           2.333         1.02         5.417         5.08         8.590         2.03         11.58         1.02           2.417         1.02         5.580         5.08         8.563         2.03         11.67         1.02           2.580         2.03         5.560         5.08         8.560         2.03         11.57         1.02           2.563         2.03         5.560         5.08         8.750         2.03         11.57         1.02           2.667         2.03   | 1.667 | 1.02                                    | 4.750 | 3.05  | 7.833 | 3.05 | 10.92 | 1.02 |  |  |  |  |
| 1.917         1.02         5.000         3.05         8.083         2.03         11.17         1.02           2.000         1.02         5.083         3.05         8.167         2.03         11.25         1.02           2.083         1.02         5.167         3.05         8.250         2.03         11.33         0.00           2.167         1.02         5.250         3.05         8.333         2.03         11.42         0.00           2.250         1.02         5.333         5.08         8.417         2.03         11.58         1.02           2.417         1.02         5.500         5.08         8.500         2.03         11.58         1.02           2.500         1.02         5.583         5.08         8.658         2.03         11.75         1.02           2.580         2.03         5.67         5.08         8.658         2.03         11.67         1.02           2.580         2.03         5.750         5.08         8.8750         2.03         11.75         1.02           2.675         2.03         5.750         5.08         8.833         1.02         11.92         1.02           2.750         2.03   | 1.750 | 1.02                                    | 4.833 | 3.05  | 7.917 | 3.05 | 11.00 | 1.02 |  |  |  |  |
| 2.000   1.02   5.083   3.05   8.167   2.03   11.25   1.02     2.083   1.02   5.167   3.05   8.250   2.03   11.33   0.00     2.167   1.02   5.250   3.65   8.333   2.03   11.42   0.00     2.250   1.02   5.333   5.08   8.417   2.03   11.50   0.00     2.333   1.02   5.417   5.08   8.500   2.03   11.58   1.02     2.417   1.02   5.590   5.08   8.583   2.03   11.67   1.02     2.500   1.02   5.583   5.08   8.667   2.03   11.57   1.02     2.583   2.03   5.667   5.08   8.750   2.03   11.83   1.02     2.667   2.03   5.853   5.08   8.833   1.02   11.92   1.02     2.750   2.03   5.833   38.61   8.917   1.02   12.00   1.02     2.833   2.03   5.917   38.61   9.000   1.02   12.08   1.02     2.917   2.03   6.000   38.61   9.083   2.03   12.17   1.02     2.917   2.03   6.080   38.61   9.083   2.03   12.27   1.02     3.000   2.03   6.083   38.61   9.167   2.03   12.25   1.02     3.000   2.03   6.083   38.61   9.167   2.03   12.25   1.02     3.000   2.03   6.083   38.61   9.167   2.03   12.25   1.02     3.000   2.03   6.083   38.61   9.167   2.03   12.25   1.02     3.000   2.03   6.083   38.61   9.167   2.03   12.25   1.02     3.000   2.03   6.083   38.61   9.167   2.03   12.25   1.02     3.000   2.03   6.083   38.61   9.167   2.03   12.25   1.02     3.000   2.03   6.083   38.61   9.167   2.03   12.25   1.02     3.000   2.03   6.083   38.61   9.167   2.03   12.25   1.02     3.000   2.03   6.083   38.61   9.167   2.03   12.25   1.02     3.000   2.03   6.083   38.61   9.167   2.03   12.25   1.02     3.000   2.03   6.000   38.61   9.167   2.03   12.25   1.02     3.000   2.03   6.000   38.61   9.167   2.03   12.25   1.02     3.000   2.03   6.000   38.61   9.167   2.03   12.25   1.02     3.000   2.03   6.000   38.61   9.167   2.03   12.25   1.02     3.000   2.03   6.000   38.61   9.167   2.03   12.25   1.02     3.000   2.03   6.000   38.61   9.000   38.61   9.000   38.61   9.000   38.61   9.000   38.61   9.000   38.61   9.000   38.61   9.000   38.61   9.000   38.61   9.000   38.61   9.000   38.61   9.000   38.61   9.000   38.61   9.0 | 1.833 | 1.02                                    | 4.917 | 3.05  | 8.000 | 3.05 | 11.08 | 1.02 |  |  |  |  |
| 2.083         1.02         5.167         3.05         8.250         2.03         11.33         0.06           2.167         1.02         5.250         3.05         8.333         2.03         11.42         0.00           2.250         1.02         5.233         5.08         8.417         2.03         11.50         0.00           2.333         1.02         5.417         5.08         8.500         2.03         11.58         1.02           2.417         1.02         5.500         5.08         8.658         2.03         11.67         1.02           2.580         2.03         5.667         5.08         8.667         2.03         11.75         1.02           2.667         2.03         5.88         8.750         2.03         11.67         1.02           2.750         2.03         5.750         5.08         8.833         1.02         11.92         1.02           2.750         2.03         5.750         5.08         8.833         1.02         11.92         1.02           2.750         2.03         5.570         5.08         8.833         1.02         11.92         1.02           2.750         2.03         5.570   | 1.917 | 1.02                                    | 5.000 | 3.05  | 8.083 | 2.03 | 11.17 | 1.02 |  |  |  |  |
| 2.167   1.02   5.250   3.05   8.333   2.03   11.42   0.00     2.250   1.02   5.333   5.08   8.417   2.03   11.50   0.00     2.333   1.02   5.417   5.08   8.500   2.03   11.50   0.00     2.417   1.02   5.500   5.08   8.583   2.03   11.67   1.02     2.500   1.02   5.583   5.08   8.667   2.03   11.67   1.02     2.503   2.03   5.667   5.08   8.750   2.03   11.83   1.02     2.667   2.03   5.750   5.08   8.833   1.02   11.92   1.02     2.750   2.03   5.833   38.61   8.917   1.02   12.00   1.02     2.833   2.03   5.917   38.61   9.000   1.02   12.08   1.02     2.917   2.03   6.000   38.61   9.083   2.03   12.17   1.02     3.000   2.03   6.083   38.61   9.167   2.03   12.25   1.02     3.000   2.03   6.083   38.61   9.167   2.03   12.25   1.02     3.000   2.03   6.083   38.61   9.167   2.03   12.25   1.02     3.000   2.03   6.083   38.61   9.167   2.03   12.25   1.02     3.000   3 | 2.000 | 1.02                                    | 5.083 | 3.05  | 8.167 | 2.03 | 11.25 | 1.02 |  |  |  |  |
| 2.250         1.02         5.333         5.08         8.417         2.03         11.59         0.08           2.333         1.02         5.417         5.08         8.500         2.03         11.58         1.02           2.417         1.02         5.500         5.08         8.583         2.03         11.67         1.02           2.580         1.02         15.583         5.08         8.667         2.03         11.75         1.02           2.667         2.03         15.750         5.08         8.750         2.03         11.92         1.02           2.750         2.03         5.750         5.08         8.833         1.02         11.92         1.02           2.750         2.03         5.533         38.61         8.917         1.02         12.00         1.02           2.833         2.03         5.591         38.61         9.000         1.02         12.08         1.02           2.917         2.03         6.000         38.61         9.083         2.03         12.17         1.02           3.000         2.03         6.083         38.61         9.083         2.03         12.25         1.02  | 2.083 | 1.02                                    | 5.167 | 3.05  | 8.250 | 2.03 | 11.33 | 0.00 |  |  |  |  |
| 2.333         1.02         5.417         5.08         8.590         2.03         11.58         1.02           2.417         1.02         5.590         5.08         8.583         2.03         11.67         1.02           2.580         1.02         5.583         5.08         8.667         2.03         11.75         1.02           2.583         2.03         5.667         5.08         8.750         2.03         11.92         11.92           2.667         2.03         5.759         5.08         8.833         1.02         11.92         1.02           2.750         2.03         5.833         3.61         8.917         1.02         12.00         1.02           2.833         2.03         5.917         38.61         9.000         1.02         12.08         1.02           2.917         2.03         6.000         38.61         9.083         2.03         12.17         1.02           2.917         2.03         6.000         38.61         9.083         2.03         12.17         1.02           3.000         2.03         6.083         38.61         9.167         2.03         12.25         1.02   | 2.167 | 1.02                                    | 5.250 | 3.05  | 8.333 | 2.03 | 11.42 | 0.00 |  |  |  |  |
| 2.417     1.02     5.500     5.08     8.583     2.03     11.67     1.02       2.500     1.02     5.583     5.08     8.667     2.03     11.75     1.02       2.583     2.03     5.667     5.08     8.750     2.03     11.83     1.02       2.667     2.03     5.750     5.08     8.833     1.02     11.92     1.02       2.750     2.03     5.833     38.61     8.917     1.02     11.00     1.02       2.833     2.03     5.917     38.61     9.000     1.02     12.08     1.02       2.917     2.03     6.000     38.61     9.083     2.03     12.17     1.02       3.000     2.03     6.083     38.61     9.167     2.03     12.25     1.02  | 2.250 | 1.02                                    | 5.333 | 5.08  | 8.417 | 2.03 | 11.50 | 0.00 |  |  |  |  |
| 2.500     1.02     5.583     5.08     8.667     2.03     11.75     1.02       2.583     2.03     5.667     5.08     8.750     2.03     11.83     1.02       2.667     2.03     5.750     5.08     8.833     1.02     11.92     1.02       2.750     2.03     5.833     3.61     8.917     1.02     12.08     1.02       2.833     2.03     5.917     38.61     9.000     1.02     12.08     1.02       2.917     2.03     6.000     38.61     9.083     2.03     12.17     1.02       3.000     2.03     6.083     38.61     9.167     2.03     12.25     1.02       3.000     2.03     6.083     38.61     9.167     2.03     12.25     1.02  | 2.333 | 1.02                                    | 5.417 | 5.08  | 8.500 | 2.03 | 11.58 | 1.02 |  |  |  |  |
| 2.583         2.03         5.667         5.08         8.759         2.03         11.83         1.02           2.667         2.03         5.750         5.08         8.833         1.02         11.92         1.02           2.759         2.03         5.833         38.61         8.917         1.02         12.00         1.02           2.833         2.03         5.917         38.61         9.000         1.02         12.08         1.02           2.917         2.03         6.000         38.61         9.083         2.03         12.17         1.02           3.000         2.03         6.083         38.61         9.167         2.03         12.25         1.02  | 2.417 | 1.02                                    | 5.500 | 5.08  | 8.583 | 2.03 | 11.67 | 1.02 |  |  |  |  |
| 2.667     2.03     5.750     5.08     8.833     1.02     11.92     1.2.0       2.750     2.03     5.833     38.61     8.917     1.02     12.00     1.02       2.833     2.03     5.917     38.61     9.000     1.02     12.08     1.02       2.917     2.03     6.000     38.61     9.083     2.03     12.17     1.02       3.000     2.03     6.083     38.61     9.167     2.03     12.25     1.02   | 2.500 | 1.02                                    | 5.583 | 5.08  | 8.667 | 2.03 | 11.75 | 1.02 |  |  |  |  |
| 2.750     2.03     5.833     38.61     8.917     1.02     12.00     1.02       2.833     2.03     5.917     38.61     9.000     1.02     12.08     1.02       2.917     2.03     6.000     38.61     9.083     2.03     12.17     1.02       3.000     2.03     6.083     38.61     9.167     2.03     12.25     1.02  | 2.583 | 2.03                                    | 5.667 | 5.08  | 8.750 | 2.03 | 11.83 | 1.02 |  |  |  |  |
| 2.833     2.03     5.917     38.61     9.000     1.02     12.08     1.02       2.917     2.03     6.000     38.61     9.083     2.03     12.17     1.02       3.000     2.03     6.083     38.61     9.167     2.03     12.25     1.02   | 2.667 | 2.03                                    | 5.750 | 5.08  | 8.833 | 1.02 | 11.92 | 1.02 |  |  |  |  |
| 2.917 2.03   6.000 38.61   9.083 2.03   12.17 1.02<br>3.000 2.03   6.083 38.61   9.167 2.03   12.25 1.02   | 2.750 | 2.03                                    | 5.833 | 38.61 | 8.917 | 1.02 | 12.00 | 1.02 |  |  |  |  |
| 3.000 2.03   6.083 38.61   9.167 2.03   12.25 1.02   | 2.833 | 2.03                                    | 5.917 | 38.61 | 9.000 | 1.02 | 12.08 | 1.02 |  |  |  |  |
|  | 2.917 | 2.03                                    | 6.000 | 38.61 | 9.083 | 2.03 | 12.17 | 1.02 |  |  |  |  |
| 3.083 2.03   6.167 38.61   9.250 2.03  | 3.000 | 2.03                                    | 6.083 | 38.61 | 9.167 | 2.03 | 12.25 | 1.02 |  |  |  |  |
|  | 3.083 | 2.03                                    | 6.167 | 38.61 | 9.250 | 2.03 |       |      |  |  |  |  |

| Max.Eff.Inten.( | mm/hr)= | 38.61      | 21.04      |             |
|-----------------|---------|------------|------------|-------------|
| over            | (min)   | 10.00      | 25.00      |             |
| Storage Coeff.  | (min)=  | 10.18 (ii) | 23.34 (ii) |             |
| Unit Hyd. Tpeak | (min)=  | 10.00      | 25.00      |             |
| Unit Hyd. peak  | (cms)=  | 0.11       | 0.05       |             |
|                 |         |            |            | *TOTALS*    |
| PEAK FLOW       | (cms)=  | 0.23       | 0.02       | 0.251 (iii) |
| TIME TO PEAK    | (hrs)=  | 6.25       | 6.50       | 6.25        |
| RUNOFF VOLUME   | (mm)=   | 40.93      | 18.14      | 35.45       |
| TOTAL RAINFALL  | (mm)=   | 42.93      | 42.93      | 42.93       |
| RUNOFF COFFETCT | FNT =   | 0.95       | 0.42       | 0.83        |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 86.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COEFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |             |                    |       |
|-------------------|-------|-------------|--------------------|-------|
| STANDHYD ( 0135)  | Area  | (ha)= 1     | .43                |       |
| ID= 1 DT= 5.0 min | Total | Imp(%) = 99 | .00 Dir. Conn.(%)= | 99.00 |
|                   |       |             |                    |       |
|                   |       | IMPERVIOUS  | PERVIOUS (i)       |       |
| Surface Area      | (ha)= | 1.42        | 0.01               |       |
| Dep. Storage      | (mm)= | 2.00        | 5.00               |       |
| Average Slope     | (%)=  | 1.00        | 2.00               |       |
| Length            | (m)=  | 503.00      | 30.00              |       |
| Mannings n        | =     | 0.013       | 0.250              |       |
|                   |       |             |                    |       |

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## 

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 84.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB         | Area<br>Total | (ha)=<br>Imp(%)= | 1.27<br>91.00 | Dir.   | Conn.(%)= | 91.00 |  |
|---------------|---------------|------------------|---------------|--------|-----------|-------|--|
|               |               |                  |               |        |           |       |  |
|               |               | IMPERVIO         | US            | PERVIO | JS (i)    |       |  |
| Surface Area  | (ha)=         | 1.16             |               | 0.1    | 1         |       |  |
| Dep. Storage  | (mm)=         | 2.00             |               | 5.00   | 3         |       |  |
| Average Slope | (%)=          | 1.00             |               | 2.00   | 9         |       |  |
| Length        | (m)=          | 503.00           |               | 25.00  |           |       |  |
| Mannings n    | =             | 0.013            |               | 0.25   |           |       |  |
|               |               |                  |               |        |           |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TRA   | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250   | 38.61 | 9.33  | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333   | 8.13  | 9.42  | 1.02  |
| 0.250 | 0.00  | 3.333 | 1.02     | 6.417   | 8.13  | 9.50  | 1.02  |
| 0.333 | 1.02  | 3.417 | 1.02     | 6.500   | 8.13  | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 1.02     | 6.583   | 8.13  | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03     | 6.667   | 8.13  | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03     | 6.750   | 8.13  | 9.83  | 1.02  |
| 0.667 | 1.02  | 3.750 | 2.03     | 6.833   | 3.05  | 9.92  | 1.02  |
| 0.750 | 1.02  | 3.833 | 2.03     | 6.917   | 3.05  | 10.00 | 1.02  |
| 0.833 | 1.02  | 3.917 | 2.03     | 7.000   | 3.05  | 10.08 | 1.02  |
| 0.917 | 1.02  | 4.000 | 2.03     | 7.083   | 3.05  | 10.17 | 1.02  |
| 1.000 | 1.02  | 4.083 | 1.02     | 7.167   | 3.05  | 10.25 | 1.02  |
| 1.083 | 0.00  | 4.167 | 1.02     | 7.250   | 3.05  | 10.33 | 1.02  |
| 1.167 | 0.00  | 4.250 | 1.02     | 7.333   | 3.05  | 10.42 | 1.02  |
| 1.250 | 0.00  | 4.333 | 3.05     | 7.417   | 3.05  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 3.05     | 7.500   | 3.05  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 3.05     | 7.583   | 2.03  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 3.05     | 7.667   | 2.03  | 10.75 | 1.02  |
| 1.583 | 1.02  | 4.667 | 3.05     | 7.750   | 2.03  | 10.83 | 1.02  |
| 1.667 | 1.02  | 4.750 | 3.05     | 7.833   | 3.05  | 10.92 | 1.02  |
| 1.750 | 1.02  | 4.833 | 3.05     | 7.917   | 3.05  | 11.00 | 1.02  |
| 1.833 | 1.02  | 4.917 | 3.05     | 8.000   | 3.05  | 11.08 | 1.02  |
| 1.917 | 1.02  | 5.000 | 3.05     | 8.083   | 2.03  | 11.17 | 1.02  |
| 2.000 | 1.02  | 5.083 | 3.05     | 8.167   | 2.03  | 11.25 | 1.02  |

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## LangstaffRd\_EA\_Proposed\_WestDonWatershd NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|                 |         |       | .NC FORM | -D IN/FTOCDA | DI I  |            |       |
|-----------------|---------|-------|----------|--------------|-------|------------|-------|
| TIME            | RAIN    |       |          | D HYETOGRA   | RAIN  |            | RAIN  |
| hrs             |         |       | mm/hr    | l' hrs       | mm/hr |            | mm/hr |
| 0.083           |         |       |          |              | 38.61 |            | 1.02  |
| 0.167           |         | 3.250 | 2.03     |              | 8.13  |            | 1.02  |
| 0.256           |         | 3.333 |          | 6.417        | 8.13  |            | 1.02  |
| 0.333           |         | 3.417 | 1.02     |              | 8.13  |            | 2.03  |
| 0.417           |         | 3.500 |          | 6.583        | 8.13  |            | 2.03  |
| 0.500           |         | 3.583 | 2.03     |              | 8.13  |            | 2.03  |
| 0.583           |         | 3.667 | 2.03     |              | 8.13  |            | 1.02  |
| 0.667           |         | 3.750 |          | 6.833        | 3.05  |            | 1.02  |
| 0.756           |         | 3.833 | 2.03     |              | 3.05  |            | 1.02  |
| 0.833           | 1.02    | 3.917 | 2.03     | 7.000        | 3.05  | 10.08      | 1.02  |
| 0.917           | 7 1.02  | 4.000 | 2.03     | 7.083        | 3.05  | 10.17      | 1.02  |
| 1.000           | 1.02    | 4.083 | 1.02     | 7.167        | 3.05  | 10.25      | 1.02  |
| 1.083           | 0.00    | 4.167 | 1.02     | 7.250        | 3.05  | 10.33      | 1.02  |
| 1.167           | 0.00    | 4.250 | 1.02     | 7.333        | 3.05  | 10.42      | 1.02  |
| 1.256           | 0.00    | 4.333 | 3.05     | 7.417        | 3.05  | 10.50      | 1.02  |
| 1.333           | 1.02    | 4.417 | 3.05     | 7.500        | 3.05  | 10.58      | 1.02  |
| 1.417           |         | 4.500 | 3.05     | 7.583        | 2.03  |            | 1.02  |
| 1.500           | 1.02    | 4.583 | 3.05     | 7.667        | 2.03  |            | 1.02  |
| 1.583           |         | 4.667 | 3.05     | 7.750        | 2.03  |            | 1.02  |
| 1.667           |         | 4.750 | 3.05     | 7.833        | 3.05  |            | 1.02  |
| 1.756           |         | 4.833 | 3.05     | 7.917        | 3.05  |            | 1.02  |
| 1.833           |         | 4.917 | 3.05     |              | 3.05  |            | 1.02  |
| 1.917           |         | 5.000 | 3.05     | 8.083        | 2.03  |            | 1.02  |
| 2.000           |         | 5.083 | 3.05     |              | 2.03  |            | 1.02  |
| 2.083           |         | 5.167 | 3.05     |              | 2.03  |            | 0.00  |
| 2.167           |         | 5.250 |          | 8.333        |       | 11.42      | 0.00  |
| 2.256           |         | 5.333 | 5.08     |              | 2.03  |            | 0.00  |
| 2.333<br>2.417  |         | 5.417 | 5.08     |              | 2.03  |            | 1.02  |
| 2.417           |         | 5.583 | 5.08     |              | 2.03  |            | 1.02  |
| 2.583           |         | 5.667 | 5.08     |              | 2.03  |            | 1.02  |
| 2.667           |         | 5.750 | 5.08     |              | 1.02  |            | 1.02  |
| 2.756           |         | 5.833 | 38.61    |              | 1.02  |            | 1.02  |
| 2.833           |         | 5.917 |          | 9.000        |       | 12.08      | 1.02  |
| 2.917           |         |       | 38.61    | 9.083        | 2.03  |            | 1.02  |
| 3.006           |         |       | 38.61    | 9.167        |       | 12.25      | 1.02  |
| 3.083           |         | 6.167 | 38.61    |              | 2.03  |            | 1.02  |
| Max.Eff.Inten.( | nm/hr)= | 38.61 |          | 20.20        |       |            |       |
|                 | (min)   | 10.00 |          | 15.00        |       |            |       |
| Storage Coeff.  | (min)=  | 9.85  | (ii)     | 11.24 (ii)   |       |            |       |
| Unit Hyd. Tpeak |         | 10.00 | ` ′      | 15.00        |       |            |       |
| Unit Hyd. peak  | (cms)=  | 0.11  |          | 0.09         |       |            |       |
|                 | . ,     |       |          |              | *T0   | TALS*      |       |
| PEAK FLOW       | (cms)=  | 0.14  |          | 0.00         | 0     | .144 (iii) |       |
| TIME TO PEAK    | (hrs)=  | 6.25  |          | 6.33         |       | 6.25       |       |
| RUNOFF VOLUME   | (mm)=   | 40.93 |          | 16.67        | 40    | 0.68       |       |
|                 |         |       | Page     | 10           |       |            |       |

|                  | Langs   | taffRd E | A Propo | sed WestDon | Waters | hd         |     |
|------------------|---------|----------|---------|-------------|--------|------------|-----|
| 2.08             |         |          |         |             | 2.03   |            | 0.0 |
| 2.16             |         | 5.250    | 3.05    | 8.333       | 2.03   | 11.42      | 0.0 |
| 2.256            | 1.02    | 5.333    | 5.08    | 8.417       | 2.03   | 11.50      | 0.0 |
| 2.33             | 3 1.02  | 5.417    | 5.08    | 8.500       | 2.03   | 11.58      | 1.0 |
| 2.41             | 7 1.02  | 5.500    | 5.08    | 8.583       | 2.03   | 11.67      | 1.0 |
| 2.500            | 1.02    | 5.583    | 5.08    | 8.667       | 2.03   | 11.75      | 1.0 |
| 2.583            | 3 2.03  | 5.667    | 5.08    | 8.750       | 2.03   | 11.83      | 1.0 |
| 2.66             | 7 2.03  | 5.750    | 5.08    | 8.833       | 1.02   | 11.92      | 1.0 |
| 2.750            | 2.03    | 5.833    | 38.61   | 8.917       | 1.02   | 12.00      | 1.0 |
| 2.83             | 3 2.03  | 5.917    | 38.61   | 9.000       | 1.02   | 12.08      | 1.0 |
| 2.91             | 7 2.03  | 6.000    | 38.61   | 9.083       | 2.03   | 12.17      | 1.0 |
| 3.000            | 2.03    | 6.083    | 38.61   | 9.167       | 2.03   | 12.25      | 1.0 |
| 3.08             | 3 2.03  | 6.167    | 38.61   | 9.250       | 2.03   | İ          |     |
| Max.Eff.Inten.(r | nm/hr)= | 38.61    |         | 19.37       |        |            |     |
|                  | (min)   | 10.00    |         | 15.00       |        |            |     |
| Storage Coeff.   | (min)=  |          | (ii)    | 12.94 (ii)  |        |            |     |
| Unit Hyd. Tpeak  |         | 10.00    |         | 15.00       |        |            |     |
| Unit Hyd. peak   |         | 0.11     |         | 0.08        |        |            |     |
|                  | ()      |          |         |             | *T01   | TALS*      |     |
| PEAK FLOW        | (cms)=  | 0.12     |         | 0.00        |        | .121 (iii) |     |
| TIME TO PEAK     | (hrs)=  | 6.25     |         | 6.33        |        | 5.25       |     |
| RUNOFF VOLUME    | (mm)=   | 40.93    |         | 15.99       | 38     | 3.68       |     |
| TOTAL RAINFALL   | (mm)=   | 42.93    |         | 42.93       | 42     | 2.93       |     |
| RUNOFF COEFFICIE |         | 0.95     |         | 0.37        |        | 0.90       |     |
|                  |         |          |         |             |        |            |     |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
   CN\* = 83.0 Ia = Dep. Storage (Above)
   (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
   THAN THE STORAGE COFFFICIENT.
   (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0420)                         |      |       |       |       |  |
|---|------|-------|-------|-------|--|
| 1 + 2 = 3                               | AREA | QPEAK | TPEAK | R.V.  |  |
|   | (ha) | (cms) | (hrs) | (mm)  |  |
| ID1= 1 ( 0135):                         | 1.43 | 0.144 | 6.25  | 40.68 |  |
| + ID2= 2 ( 0140):                       | 1.27 | 0.121 | 6.25  | 38.68 |  |
| ======================================= |      |       |       |       |  |
| ID = 3 ( 0420):                         | 2.70 | 0.265 | 6.25  | 39.74 |  |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| RESERVOIR( 0530) | OVERELOW | TS OFF  |   |         |         |  |
|------------------|----------|---------|---|---------|---------|--|
| IN= 2> OUT= 1    | OVERTEON | 13 011  |   |         |         |  |
| DT= 5.0 min      | OUTFLOW  | STORAGE |   | OUTFLOW | STORAGE |  |
|                  | (cms)    | (ha.m.) |   | (cms)   | (ha.m.) |  |
|                  | 0.0000   | 0.0000  |   | 0.0122  | 0.0823  |  |
|                  | 0.0056   | 0.0072  | - | 0.0382  | 0.1093  |  |

LangstaffRd\_EA\_Proposed\_WestDonWatershd 0.0283 | 0.0516 0.0553 | 0.0000 0.0105

AREA (ha) 2.700 2.700 QPEAK (cms) 0.265 0.012 INFLOW : ID= 2 ( 0420) OUTFLOW: ID= 1 ( 0530)

PEAK FLOW REDUCTION [Qout/Qin](%)= 4.55 TIME SHIFT OF PEAK FLOW (min)=160.00 MAXIMUM STORAGE USED (ha.m.)= 0.0796

ADD HYD ( 0425)| 1 + 2 = 3 | QPEAK (cms) 0.251 0.012 R.V. (mm) 35.45 39.62 ARFA ID1= 1 ( 0145): + ID2= 2 ( 0530): ======== ID = 3 ( 0425): 5.75 0.261 6.25

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR( 0512)| IN= 2---> OUT= 1 | DT= 5.0 min | OVERFLOW IS OFF OUTFLOW (ha.m.) 0.0000 0.0165 (cms) 0.0471 0.0636 (ha.m.) 0.1003 0.1284 (cms) 0.0000 0.0071 0.0098 0.0331 0.0526 0.0763 0.1594 0 0119 AREA QPEAK
(ha) (cms)
5.750 0.261
5.750 0.028 TPEAK (hrs) 6.25 8.75 R.V. (mm) 37.41 37.31 INFLOW : ID= 2 ( 0425) OUTFLOW: ID= 1 ( 0512)

PEAK FLOW REDUCTION [Qout/Qin](%)= 10.92 TIME SHIFT OF PEAK FLOW (min)=150.00 MAXIMUM STORAGE USED (ha.m.)= 0.0861

-----| CALIB Area (ha)= 0.58 Total Imp(%)= 81.00 Dir. Conn.(%)= 81.00

| CALIB | STANDHYD ( 0215)| |ID= 1 DT= 5.0 min | IMPERVIOUS PERVIOUS (i) = 0.47 0.11

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Unit Hyd. peak (cms)= 0.10 - 0.00

| Unit Hyd. peak  | (cms)= | 0.18  | 0.09  |             |
|-----------------|--------|-------|-------|-------------|
|                 |        |       |       | *TOTALS*    |
| PEAK FLOW       | (cms)= | 0.05  | 0.00  | 0.054 (iii) |
| TIME TO PEAK    | (hrs)= | 6.25  | 6.33  | 6.25        |
| RUNOFF VOLUME   | (mm)=  | 40.93 | 15.99 | 36.18       |
| TOTAL RAINFALL  | (mm)=  | 42.93 | 42.93 | 42.93       |
| RUNOFF COEFFICI | ENT =  | 0.95  | 0.37  | 0.84        |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

- CN\* = 83.0 Ia = Dep. Storage (Above)
  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
  THAN THE STORAGE COEFFICIENT.
  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB         | Area<br>Total | (ha)= 0.6<br>Imp(%)= 66.6 |              | 66.00 |
|---------------|---------------|---------------------------|--------------|-------|
|               |               | IMPERVIOUS                | PERVIOUS (i) |       |
| Surface Area  | (ha)=         | 0.43                      | 0.22         |       |
| Dep. Storage  | (mm)=         | 2.00                      | 5.00         |       |
| Average Slope | (%)=          | 1.00                      | 2.00         |       |
| Length        | (m)=          | 260.00                    | 20.00        |       |
| Mannings n    | =             | 0.013                     | 0.250        |       |
|               |               |                           |              |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TRANSFORMED HYETOGRAPH |       |       |       |        |       |       |       |
|------------------------|-------|-------|-------|--------|-------|-------|-------|
| TIME                   | RAIN  | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |
| hrs                    | mm/hr | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |
| 0.083                  | 0.00  | 3.167 | 2.03  | 6.250  | 38.61 | 9.33  | 1.02  |
| 0.167                  | 0.00  | 3.250 | 2.03  | 6.333  | 8.13  | 9.42  | 1.02  |
| 0.250                  | 0.00  | 3.333 | 1.02  | 6.417  | 8.13  | 9.50  | 1.02  |
| 0.333                  | 1.02  | 3.417 | 1.02  | 6.500  | 8.13  | 9.58  | 2.03  |
| 0.417                  | 1.02  | 3.500 | 1.02  | 6.583  | 8.13  | 9.67  | 2.03  |
| 0.500                  | 1.02  | 3.583 | 2.03  | 6.667  | 8.13  | 9.75  | 2.03  |
| 0.583                  | 1.02  | 3.667 | 2.03  | 6.750  | 8.13  | 9.83  | 1.02  |
| 0.667                  | 1.02  | 3.750 | 2.03  | 6.833  | 3.05  | 9.92  | 1.02  |
| 0.750                  | 1.02  | 3.833 | 2.03  | 6.917  | 3.05  | 10.00 | 1.02  |
| 0.833                  | 1.02  | 3.917 | 2.03  | 7.000  | 3.05  | 10.08 | 1.02  |
| 0.917                  | 1.02  | 4.000 | 2.03  | 7.083  | 3.05  | 10.17 | 1.02  |
| 1.000                  | 1.02  | 4.083 | 1.02  | 7.167  | 3.05  | 10.25 | 1.02  |
| 1.083                  | 0.00  | 4.167 | 1.02  | 7.250  | 3.05  | 10.33 | 1.02  |
| 1.167                  | 0.00  | 4.250 | 1.02  | 7.333  | 3.05  | 10.42 | 1.02  |
| 1.250                  | 0.00  | 4.333 | 3.05  | 7.417  | 3.05  | 10.50 | 1.02  |
| 1.333                  | 1.02  | 4.417 | 3.05  | 7.500  | 3.05  | 10.58 | 1.02  |
| 1.417                  | 1.02  | 4.500 | 3.05  | 7.583  | 2.03  | 10.67 | 1.02  |
| 1.500                  | 1.02  | 4.583 | 3.05  | 7.667  | 2.03  | 10.75 | 1.02  |
| 1.583                  | 1.02  | 4.667 | 3.05  | 7.750  | 2.03  | 10.83 | 1.02  |

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Dep. Storage 2.00 1.00 5.00

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | тр    | ANC EODMEI   | ) HYETOGR      | ADU          |                |       |
|-------|-------|-------|--------------|----------------|--------------|----------------|-------|
| TIME  | RAIN  | TIME  |              | l' TIME        | RAIN         | TIME           | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr        | l' hrs         | mm/hr        |                | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03         | 6.250          | 38.61        |                | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03         | 6.333          | 8.13         | 9.42           | 1.02  |
| 0.250 | 0.00  | 3.333 | 1.02         | 6.417          | 8.13         | 9.50           | 1.02  |
| 0.333 | 1.02  | 3.417 | 1.02         | 6.500          | 8.13         | 9.58           | 2.03  |
| 0.417 | 1.02  |       | 1.02         |                | 8.13         |                | 2.03  |
| 0.500 | 1.02  |       | 2.03         |                | 8.13         |                | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03         |                | 8.13         | 9.83           | 1.02  |
| 0.667 | 1.02  | 3.750 | 2.03         | 6.833          | 3.05         | 9.92           | 1.02  |
| 0.750 | 1.02  | 3.833 | 2.03         | 6.917          | 3.05         | 10.00          | 1.02  |
| 0.833 | 1.02  | 3.917 | 2.03         | 7.000          | 3.05         | 10.08          | 1.02  |
| 0.917 | 1.02  | 4.000 | 2.03         | 7.083          | 3.05         | 10.17          | 1.02  |
| 1.000 | 1.02  | 4.083 | 1.02         | 7.167          | 3.05         | 10.25          | 1.02  |
| 1.083 | 0.00  | 4.167 | 1.02         | 7.250          | 3.05         | 10.33          | 1.02  |
| 1.167 | 0.00  | 4.250 | 1.02         | 7.333          | 3.05         | 10.42          | 1.02  |
| 1.250 | 0.00  | 4.333 | 3.05         | 7.417          | 3.05         | 10.50          | 1.02  |
| 1.333 | 1.02  | 4.417 | 3.05         | 7.500          | 3.05         |                | 1.02  |
| 1.417 | 1.02  |       | 3.05         |                | 2.03         |                | 1.02  |
| 1.500 | 1.02  |       | 3.05         |                | 2.03         |                | 1.02  |
| 1.583 | 1.02  | 4.667 | 3.05         | 7.750          | 2.03         | 10.83          | 1.02  |
| 1.667 | 1.02  | 4.750 | 3.05         | 7.833          | 3.05         | 10.92          | 1.02  |
| 1.750 | 1.02  | 4.833 | 3.05         | 7.917          | 3.05         | 11.00          | 1.02  |
| 1.833 | 1.02  | 4.917 | 3.05         | 8.000          | 3.05         | 11.08          | 1.02  |
| 1.917 | 1.02  | 5.000 | 3.05         | 8.083          | 2.03         | 11.17          | 1.02  |
| 2.000 | 1.02  | 5.083 | 3.05         | 8.167          | 2.03         |                | 1.02  |
| 2.083 | 1.02  | 5.167 | 3.05         | 8.250          | 2.03         | 11.33          | 0.00  |
| 2.167 | 1.02  | 5.250 | 3.05         | 8.333          | 2.03         | 11.42          | 0.00  |
| 2.250 | 1.02  | 5.333 | 5.08         | 8.417          | 2.03         |                | 0.00  |
| 2.333 | 1.02  | 5.417 | 5.08         | 8.500          | 2.03         |                | 1.02  |
| 2.417 | 1.02  | 5.500 | 5.08         | 8.583<br>8.667 | 2.03         | 11.67<br>11.75 | 1.02  |
|       | 1.02  |       |              |                | 2.03         |                |       |
| 2.583 | 2.03  | 5.667 | 5.08<br>5.08 | 8.750<br>8.833 | 2.03<br>1.02 | 11.83<br>11.92 | 1.02  |
| 2.750 | 2.03  | 5.833 | 38.61        | 8.917          | 1.02         | 12.00          | 1.02  |
| 2.730 | 2.03  | 5.917 | 38.61        | 9.000          | 1.02         | 12.00          | 1.02  |
| 2.033 | 2.03  | 6.000 | 38.61        | 9.083          | 2.03         | 12.08          | 1.02  |
| 3.000 | 2.03  | 6.083 | 38.61        | 9.065          | 2.03         | 12.17          | 1.02  |
| 3.083 | 2.03  | 6.167 | 38.61        | 9.250          | 2.03         | 12.23          | 1.02  |
|       |       |       |              |                |              |                |       |

Max.Eff.Inten.(mm/hr)= over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)= 38.61 19.37 5.00 15.00 6.63 (ii) 11.50 (ii) 5.00 15.00

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|                   | Langs  | taffRd_E | A_Propo | sed_WestDor | Waters | hd    |      |
|-------------------|--------|----------|---------|-------------|--------|-------|------|
| 1.667             | 1.02   | 4.750    | 3.05    | 7.833       | 3.05   | 10.92 | 1.02 |
| 1.750             | 1.02   | 4.833    | 3.05    | 7.917       | 3.05   | 11.00 | 1.02 |
| 1.833             | 1.02   | 4.917    | 3.05    | 8.000       | 3.05   | 11.08 | 1.02 |
| 1.917             | 1.02   | 5.000    | 3.05    | 8.083       | 2.03   | 11.17 | 1.02 |
| 2.000             | 1.02   | 5.083    | 3.05    | 8.167       | 2.03   | 11.25 | 1.02 |
| 2.083             | 1.02   | 5.167    | 3.05    | 8.250       | 2.03   | 11.33 | 0.00 |
| 2.167             | 1.02   | 5.250    | 3.05    | 8.333       | 2.03   | 11.42 | 0.00 |
| 2.250             | 1.02   | 5.333    | 5.08    | 8.417       | 2.03   | 11.50 | 0.00 |
| 2.333             | 1.02   | 5.417    | 5.08    | 8.500       | 2.03   | 11.58 | 1.02 |
| 2.417             | 1.02   | 5.500    | 5.08    | 8.583       | 2.03   | 11.67 | 1.02 |
| 2.500             | 1.02   | 5.583    | 5.08    | 8.667       | 2.03   | 11.75 | 1.02 |
| 2.583             | 2.03   | 5.667    | 5.08    | 8.750       | 2.03   | 11.83 | 1.02 |
| 2.667             | 2.03   | 5.750    | 5.08    | 8.833       | 1.02   | 11.92 | 1.02 |
| 2.750             | 2.03   | 5.833    | 38.61   | 8.917       | 1.02   | 12.00 | 1.02 |
| 2.833             | 2.03   | 5.917    | 38.61   | 9.000       | 1.02   | 12.08 | 1.02 |
| 2.917             | 2.03   | 6.000    | 38.61   | 9.083       | 2.03   | 12.17 | 1.02 |
| 3.000             | 2.03   | 6.083    | 38.61   | 9.167       | 2.03   | 12.25 | 1.02 |
| 3.083             | 2.03   | 6.167    | 38.61   | 9.250       | 2.03   | ĺ     |      |
| Max.Eff.Inten.(mm | 1/hn)- | 38.61    |         | 19.37       |        |       |      |
| over (            |        | 5.00     |         | 20.00       |        |       |      |
| over (            |        |          | (11)    | 20.00       |        |       |      |

| over            | (min)  | 5.00      | 20.00      |             |
|-----------------|--------|-----------|------------|-------------|
| Storage Coeff.  | (min)= | 6.63 (ii) | 15.61 (ii) |             |
| Unit Hyd. Tpeak | (min)= | 5.00      | 20.00      |             |
| Unit Hyd. peak  | (cms)= | 0.18      | 0.07       |             |
|                 |        |           |            | *TOTALS*    |
| PEAK FLOW       | (cms)= | 0.05      | 0.01       | 0.052 (iii) |
| TIME TO PEAK    | (hrs)= | 6.25      | 6.42       | 6.25        |
| RUNOFF VOLUME   | (mm)=  | 40.93     | 15.99      | 32.43       |
| TOTAL RAINFALL  | (mm)=  | 42.93     | 42.93      | 42.93       |
| RUNOFF COEFFICI | ENT =  | 0.95      | 0.37       | 0.76        |
|                 |        |           |            |             |

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 83.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0470)   |              |                |                |              |
|-------------------|--------------|----------------|----------------|--------------|
| 1 + 2 = 3         | AREA<br>(ha) | QPEAK<br>(cms) | TPEAK<br>(hrs) | R.V.<br>(mm) |
| ID1= 1 ( 0215):   | 0.58         | 0.054          | 6.25           | 36.18        |
| + ID2= 2 ( 0220): | 0.65         | 0.052          | 6.25           | 32.43        |
| ID = 3 ( 0470):   | 1.23         | 0.106          | 6.25           | 34.20        |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| RESERVOIR( 0535)| OVERFLOW IS OFF

| IN= 2> OUT= 1  <br>  DT= 5.0 min | Langstaf OUTFLOW (cms) 0.0000 0.0053 0.0080 0.0100 | STORAGE<br>(ha.m.)<br>0.0000<br>0.0048<br>0.0154<br>0.0261 | ed_WestDonWat  OUTFLOW  (cms)  0.0116  0.0131  0.0202  0.0000 | STORAGE<br>(ha.m.)<br>0.0367<br>0.0474<br>0.0639<br>0.0000 |
|----------------------------------|--|--|---|--|
| OUTFLOW: ID= 1 ( 0               | (h<br>470) 1.<br>535) 1.                           |  | (hrs)<br>06 6.25<br>10 7.33                                   | R.V.<br>(mm)<br>34.20<br>34.02                             |

MAXIMUM STORAGE USED (ha.m.)= 0.0260

| CALIB  <br>  STANDHYD ( 0225) | Area  | (ha)=    | 0.60  |                |       |
|-------------------------------|-------|----------|-------|----------------|-------|
|                               |       |          |       |                |       |
| ID= 1 DT= 5.0 min             | Total | Imp(%)=  | 83.00 | Dir. Conn.(%)= | 83.00 |
| ·                             |       | ,        |       | . ,            |       |
|                               |       |          |       |                |       |
|                               |       | IMPERVIO | )US   | PERVIOUS (i)   |       |
| Surface Area                  | (ha)= | 0.50     | )     | 0.10           |       |
|                               |       |          |       |                |       |
| Dep. Storage                  | (mm)= | 2.00     | )     | 5.00           |       |
| Average Slope                 | (%)=  | 1.00     | )     | 2.00           |       |
| Length                        | (m)=  | 320.00   | )     | 10.00          |       |
| Mannings n                    | - =   | 0.013    | ;     | 0.250          |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       | TRANSFORMED HYETOGRAPH |       |       |        |       |       |       |  |  |
|-------|------------------------|-------|-------|--------|-------|-------|-------|--|--|
| TIME  | RAIN                   | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |  |
| hrs   | mm/hr                  | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |  |
| 0.083 | 0.00                   | 3.167 | 2.03  | 6.250  | 38.61 | 9.33  | 1.02  |  |  |
| 0.167 | 0.00                   | 3.250 | 2.03  | 6.333  | 8.13  | 9.42  | 1.02  |  |  |
| 0.250 | 0.00                   | 3.333 | 1.02  | 6.417  | 8.13  | 9.50  | 1.02  |  |  |
| 0.333 | 1.02                   | 3.417 | 1.02  | 6.500  | 8.13  | 9.58  | 2.03  |  |  |
| 0.417 | 1.02                   | 3.500 | 1.02  | 6.583  | 8.13  | 9.67  | 2.03  |  |  |
| 0.500 | 1.02                   | 3.583 | 2.03  | 6.667  | 8.13  | 9.75  | 2.03  |  |  |
| 0.583 | 1.02                   | 3.667 | 2.03  | 6.750  | 8.13  | 9.83  | 1.02  |  |  |
| 0.667 | 1.02                   | 3.750 | 2.03  | 6.833  | 3.05  | 9.92  | 1.02  |  |  |
| 0.750 | 1.02                   | 3.833 | 2.03  | 6.917  | 3.05  | 10.00 | 1.02  |  |  |
| 0.833 | 1.02                   | 3.917 | 2.03  | 7.000  | 3.05  | 10.08 | 1.02  |  |  |
| 0.917 | 1.02                   | 4.000 | 2.03  | 7.083  | 3.05  | 10.17 | 1.02  |  |  |
| 1.000 | 1.02                   | 4.083 | 1.02  | 7.167  | 3.05  | 10.25 | 1.02  |  |  |
| 1.083 | 0.00                   | 4.167 | 1.02  | 7.250  | 3.05  | 10.33 | 1.02  |  |  |
| 1.167 | 0.00                   | 4.250 | 1.02  | 7.333  | 3.05  | 10.42 | 1.02  |  |  |
| 1.250 | 0.00                   | 4.333 | 3.05  | 7.417  | 3.05  | 10.50 | 1.02  |  |  |
| 1.333 | 1.02                   | 4.417 | 3.05  | 7.500  | 3.05  | 10.58 | 1.02  |  |  |
| 1.417 | 1.02                   | 4.500 | 3.05  | 7.583  | 2.03  | 10.67 | 1.02  |  |  |

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LangstaffRd\_EA\_Proposed\_WestDonWatershd NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|                  |        | TRA                         | ANSFORM | D HYETOGRA              | PH    | _     |       |
|------------------|--------|-----------------------------|---------|-------------------------|-------|-------|-------|
| TIME             | RAIN   |                             | RAIN    |                         | RAIN  |       | RAIN  |
| hrs              | mm/hr  | hrs                         |         | ' hrs                   | mm/hr | hrs   | mm/hr |
| 0.083            |        |                             |         |                         | 38.61 |       |       |
| 0.167            |        | 3.250                       |         | 6.333                   | 8.13  |       | 1.02  |
| 0.250            |        |                             |         | 6.417                   | 8.13  |       | 1.02  |
| 0.333            | 1.02   | 3.333<br>3.417<br>3.500     | 1.02    | 6.500                   | 8.13  |       | 2.03  |
| 0.417            | 1.02   | 3.500                       | 1.02    | 6.583                   | 8.13  |       | 2.03  |
| 0.500            |        | 3.583                       |         | 6.667                   |       |       | 2.03  |
| 0.583            |        | 3.667                       |         | 6.750                   | 8.13  |       | 1.02  |
| 0.667            |        | 3.750                       |         | 6.833                   |       |       | 1.02  |
| 0.750            | 4 00   | 2 022                       | 2 02    | 6.917                   | 3.05  |       | 1.02  |
| 0.833            | 1 02   | 2 017                       | 2 02    | 7.000                   |       | 10.08 | 1.02  |
| 0.917            | 1.02   | 4.000                       | 2.03    | 7.083                   | 3.05  |       | 1.02  |
| 1.000            | 1 02   | 4.083                       | 1 02    | 7.167                   | 3 05  | 10.25 | 1.02  |
| 1.083            |        | 4.167                       |         | 7.250                   | 3.05  |       |       |
| 1.167            | 0.00   | 4.250                       | 1 02    | 7.333                   |       | 10.42 | 1.02  |
| 1.250            |        | 4.333                       | 3 05    | 7.417                   | 3 05  | 10.50 |       |
| 1.333            |        | 4.417                       |         | 7.500                   |       | 10.58 | 1.02  |
| 1.417            |        |                             |         | 7.583                   |       | 10.67 | 1.02  |
| 1.500            | 1 02   | 4.500<br>  4.583<br>  4.667 | 3.05    |                         | 2.03  |       | 1.02  |
| 1.583            | 1 02   | 4.667                       | 3 05    | 7.750                   | 2 03  | 10.83 | 1.02  |
| 1.667            |        | 4.750                       |         | 7.833                   |       | 10.92 |       |
| 1.750            |        | 4.833                       |         | 7.917                   |       | 11.00 | 1.02  |
| 1.833            | 1 02   | 4.917                       | 3 05    | 8.000                   | 3 05  | 11.08 |       |
| 1.917            | 1 02   | 5.000                       |         | 1 0 000                 | 2 22  |       | 1.02  |
| 2.000            |        | 5.083                       | 3 05    | 8.167                   | 2 03  | 11.25 | 1.02  |
| 2.083            |        |                             | 3 05    | 8.250                   | 2 03  | 11.33 | 0.00  |
| 2.167            | 1 02   | 5.167<br>5.250              | 3 05    | 8.333                   | 2 03  | 11.42 | 0.00  |
| 2.250            |        | 5.333                       |         | 8.417                   |       |       |       |
| 2.333            |        | 5.417                       |         | 8.500                   |       | 11.58 | 1.02  |
| 2.417            | 1 02   | 5 500                       |         |                         |       | 11.67 |       |
| 2.500            | 1 02   | 5 583                       | 5 08    | 8 667                   | 2 03  | 11.75 | 1.02  |
| 2.583            | 2 03   | 5.583                       | 5 08    | 8.583<br>8.667<br>8.750 | 2 03  | 11.83 | 1.02  |
| 2.667            |        | 5.750                       | 5 08    | 8.833                   | 1.02  |       | 1.02  |
| 2.750            |        | 5.833                       |         | 8.917                   | 1 02  | 12.00 | 1.02  |
| 2.833            |        | 5.917                       |         | 9.000                   |       | 12.08 | 1.02  |
| 2.917            |        | 6.000                       |         | 9.083                   |       | 12.17 | 1.02  |
| 3.000            |        | 6.083                       |         | 9.167                   |       | 12.25 | 1.02  |
| 3.083            |        | 6.167                       |         | 9.250                   |       |       | 1.02  |
| 5.005            | 2.03   | 0.107                       | 30.01   | 1 3.230                 | 2.05  | 1     |       |
| Max.Eff.Inten.(m | m/hr)= | 38.61                       |         | 16.97                   |       |       |       |
| over             | (min)  | 10.00                       |         | 20.00                   |       |       |       |
|                  | (min)= | 7.51                        | (ii)    | 19.59 (ii)              |       |       |       |
| Unit Hyd. Tpeak  | (min)= | 10.00                       |         | 20.00                   |       |       |       |
| Unit Hyd. peak   | (cms)= | 0.13                        |         | 0.06                    |       |       |       |
|                  |        |                             |         |                         | *T0   | TALS* |       |

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0.01

0.05 6.25 40.93

PEAK FLOW (cms)= TIME TO PEAK (hrs)= RUNOFF VOLUME (mm)=

0.054 (iii) 6.25 32.01

|   | Lange  | staffRd F    | Δ Prono  | sed WestDo | nWaters | hd        |      |
|---|--|--------------|----------|------------|---------|-----------|------|
| 1.50  | 0 1.02   | 1 4.583      | 3.05     | l 7.667    | 2.03    | 10.75     | 1.02 |
| 1.58  |  | 4.667        | 3.05     | 7.750      | 2.03    | 10.83     | 1.02 |
| 1.66  | 33 1.02<br>57 1.02<br>50 1.02  | 4.750        | 3.05     | 7.833      | 3.05    | 10.92     | 1.02 |
| 1.75  | 1.02<br>60 1.02<br>60 1.02<br>60 1.02<br>60 1.02<br>60 1.02<br>60 1.02<br>60 1.02<br>60 1.02<br>60 1.02<br>60 1.02<br>60 1.02<br>60 1.02<br>60 1.02<br>60 1.02 | 4.833        | 3.05     | 7.917      | 3.05    | 11.00     | 1.02 |
| 1.83  | 3 1.02   | 4.917        | 3.05     | 8.000      | 3.05    | 11.08     | 1.02 |
| 1.91  | 1.02   | 5.000        | 3.05     | 8.083      | 2.03    | 11.17     | 1.02 |
| 2.00  | 0 1.02   | 5.083        | 3.05     | 8.167      | 2.03    | 11.25     | 1.02 |
| 2.08  | 33 1.02  | 5.167        | 3.05     | 8.250      | 2.03    | 11.33     | 0.00 |
| 2.16  | 57 1.02  | 5.250        | 3.05     | 8.333      | 2.03    | 11.42     | 0.00 |
| 2.25  | 0 1.02   | 5.333        | 5.08     | 8.41/      | 2.03    | 11.50     | 0.00 |
| 2.33  | 3 1.02   | 5.41/        | 5.08     | 8.500      | 2.03    | 11.58     | 1.02 |
| 2.41  | 1.02   | 0.500        | 5.00     | 0.505      | 2.03    | 11.0/     | 1.02 |
| 2.36  | 1.02   | 5 667        | 5 08     | 8 750      | 2.03    | 11.73     | 1.02 |
| 2.50  | 7 2.03   | 5 750        | 5 08     | 8 833      | 1 02    | 11 92     | 1.02 |
| 2.75  | 33 2.03<br>57 2.03<br>50 2.03  | 5.833        | 38.61    | 8.917      | 1.02    | 12.00     | 1.02 |
| 2.83  | 3 2.03   | 5.917        | 38.61    | 9.000      | 1.02    | 12.08     | 1.02 |
| 2.91  | 7 2.03   | 6.000        | 38.61    | 9.083      | 2.03    | 12.17     | 1.02 |
| 3.00  | 33 2.03<br>17 2.03<br>00 2.03  | 6.083        | 38.61    | 9.167      | 2.03    | 12.25     | 1.02 |
| 3.08  | 33 2.03  | 6.167        | 38.61    | 9.250      | 2.03    |           |      |
|   |  |              |          |            |         |           |      |
| Max.Eff.Inten.(<br>over                                     | (mm/hr)=   | 38.61        |          | 19.37      |         |           |      |
| over  | (min)  | 10.00        |          | 10.00      |         |           |      |
| Storage Coeff.  | (min)=   | 7.51         | (ii)     | 9.90 (ii   | )       |           |      |
| over<br>Storage Coeff.<br>Unit Hyd. Tpeak<br>Unit Hyd. peak | (min)=   | 10.00        |          | 10.00      |         |           |      |
| Unit Hyd. peak  | (cms)=   | 0.13         |          | 0.11       |         | TALS*     |      |
| DEAK FLOW   | ()   | 0.05         |          | 0.00       |         | .057 (iii | `    |
| PEAK FLOW<br>TIME TO PEAK                                   | (hns)-   | 0.05<br>6.25 |          | 6.25       |         | 5.25      | ,    |
| RUNOFF VOLUME   | (mm)=  | 40.93        |          | 15.99      |         | 5.68      |      |
| TOTAL RAINFALL  |  | 42.93        |          | 42.93      |         | 2.93      |      |
| RUNOFF COEFFICE   |  | 0.95         |          | 0.37       |         | 9.85      |      |
|   |  |              |          |            |         |           |      |
|   |  |              |          |            |         |           |      |
| (i) CN PROCED   | DURE SELECT  | ED FOR PE    | RVIOUS   | LOSSES:    |         |           |      |
|   | 83.0 Ia  |              |          |            |         |           |      |
| (ii) TIME STER  |  |              |          | R EQUAL    |         |           |      |
|   | STORAGE CO   |              |          |            |         |           |      |
| (iii) PEAK FLOW   | DOES NOT   | INCLUDE E    | BASEFLOW | IF ANY.    |         |           |      |
|   |  |              |          |            |         |           |      |
|   |  |              |          |            |         |           |      |
| LOUTE   |  |              |          |            |         |           |      |
| STANDHYD ( 0230)  | Area   | (ha)=        | 0 70     |            |         |           |      |
| STANDHYD ( 0230) <br> ID= 1 DT= 5.0 min                     | Total I  | mn(%)= 6     | 6.00     | Dir. Conn  | .(%)= 6 | 56.00     |      |
|   |  |              |          |            | . (,    |           |      |
|   |  | IMPERVIOL    | JS PE    | RVIOUS (i  | )       |           |      |
| Surface Area  | (ha)=  | 0.46         |          | 0.24       |         |           |      |
| Dep. Storage  | (mm)=  | 2.00         |          | 5.00       |         |           |      |
| Average Slope   | (%)=   | 1.00         |          | 2.00       |         |           |      |
| Length  | (m)=   | 320.00       |          | 25.00      |         |           |      |
| Mannings n  | =  | 0.013        |          | 0.300      |         |           |      |
|   |  |              |          |            |         |           |      |
|   |  |              |          |            |         |           |      |

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(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN* = 81.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COFFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
| ADD HYD ( 0475)|
| 1 + 2 = 3 |
| ID1= 1 ( 0225):
+ ID2= 2 ( 0230):
                                                  AREA
(ha)
0.60
0.70
                                                                                 TPEAK
(hrs)
6.25
6.25
                                                                                              R.V.
(mm)
36.68
32.01
          ID = 3 ( 0475):
                                              1.30 0.111
                                                                             6.25 34.16
        NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
| RESERVOIR( 0540)|
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
                                            OVERFLOW IS OFF
                                            OUTFLOW STORAGE | OUTFLOW
                                                                                                          STORAGE
                                             (cms)
0.0000
0.0118
0.0184
0.0232
                                                               (ha.m.) |
0.0000 |
0.0048 |
0.0154 |
0.0261 |
                                                                                        (cms)
0.0271
0.0306
0.0415
0.0000
                                                                                                          (ha.m.)
0.0367
0.0474
0.0639
0.0000
                                                        AREA QPEAK
(ha) (cms)
1.300 0.111
1.300 0.021
                                                                                          TPEAK
                                                                                                               R.V.
                                                                                          (hrs)
6.25
6.92
     INFLOW : ID= 2 ( 0475)
OUTFLOW: ID= 1 ( 0540)
                                                   1.300
                                PEAK FLOW REDUCTION [Qout/Qin](%)= 19.22 TIME SHIFT OF PEAK FLOW (min)= 40.00 MAXIMUM STORAGE USED (ha.m.)= 0.0218
  ADD HYD ( 0480)|

1 + 2 = 3 |

ID1= 1 ( 0535):

+ ID2= 2 ( 0540):
                                                   AREA
(ha)
1.23
                                                                                 TPEAK
(hrs)
7.33
                                                                                               R.V.
(mm)
34.02
                                                              (cms)
0.010
0.021
                                                                                  6.92
                                                   1.30
                                                                                                34.09
                                                                             6.92
             ID = 3 ( 0480):
                                                  2.53 0.031
                                                                                               34.05
```

LangstaffRd\_EA\_Proposed\_WestDonWatershd
NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY. | CALIB | STANDHYD ( 0155)| |ID= 1 DT= 5.0 min | Area (ha)= 0.56 Total Imp(%)= 93.00 Dir. Conn.(%)= 93.00 IMPERVIOUS PERVIOUS (i) Surface Area Dep. Storage Average Slope Length Mannings n 0.52 2.00 1.00 260.00 0.013 (ha)= (mm)= (%)= (m)= = 0.04 5.00 2.00 25.00 0.290

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR     | NSEORMEI | HYETOGR | ΔPH   |       |       |
|-------|-------|--------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | l TIME | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs    | mm/hr    | l' hrs  | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167  | 2.03     | 6.250   | 38.61 | 9.33  | 1.02  |
| 0.167 | 0.00  | 3.250  | 2.03     | 6.333   | 8.13  | 9.42  | 1.02  |
| 0.250 | 0.00  | 3.333  | 1.02     | 6.417   | 8.13  | 9.50  | 1.02  |
| 0.333 | 1.02  | 3.417  | 1.02     | 6.500   | 8.13  | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500  | 1.02     | 6.583   | 8.13  | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583  | 2.03     | 6.667   | 8.13  | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667  | 2.03     | 6.750   | 8.13  | 9.83  | 1.02  |
| 0.667 | 1.02  | 3.750  | 2.03     | 6.833   | 3.05  | 9.92  | 1.02  |
| 0.750 | 1.02  | 3.833  | 2.03     | 6.917   | 3.05  | 10.00 | 1.02  |
| 0.833 | 1.02  | 3.917  | 2.03     | 7.000   | 3.05  | 10.08 | 1.02  |
| 0.917 | 1.02  | 4.000  | 2.03     | 7.083   | 3.05  | 10.17 | 1.02  |
| 1.000 | 1.02  | 4.083  | 1.02     | 7.167   | 3.05  | 10.25 | 1.02  |
| 1.083 | 0.00  | 4.167  | 1.02     | 7.250   | 3.05  | 10.33 | 1.02  |
| 1.167 | 0.00  | 4.250  | 1.02     | 7.333   | 3.05  | 10.42 | 1.02  |
| 1.250 | 0.00  | 4.333  | 3.05     | 7.417   | 3.05  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417  | 3.05     | 7.500   | 3.05  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500  | 3.05     | 7.583   | 2.03  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583  | 3.05     | 7.667   | 2.03  | 10.75 | 1.02  |
| 1.583 | 1.02  | 4.667  | 3.05     | 7.750   | 2.03  | 10.83 | 1.02  |
| 1.667 | 1.02  | 4.750  | 3.05     | 7.833   | 3.05  | 10.92 | 1.02  |
| 1.750 | 1.02  | 4.833  | 3.05     | 7.917   | 3.05  | 11.00 | 1.02  |
| 1.833 | 1.02  | 4.917  | 3.05     | 8.000   | 3.05  | 11.08 | 1.02  |
| 1.917 | 1.02  | 5.000  | 3.05     | 8.083   | 2.03  | 11.17 | 1.02  |
| 2.000 | 1.02  | 5.083  | 3.05     | 8.167   | 2.03  | 11.25 | 1.02  |
| 2.083 | 1.02  | 5.167  | 3.05     | 8.250   | 2.03  | 11.33 | 0.00  |
| 2.167 | 1.02  | 5.250  | 3.05     | 8.333   | 2.03  | 11.42 | 0.00  |
| 2.250 | 1.02  | 5.333  | 5.08     | 8.417   | 2.03  | 11.50 | 0.00  |
| 2.333 | 1.02  | 5.417  | 5.08     | 8.500   | 2.03  | 11.58 | 1.02  |
| 2.417 | 1.02  | 5.500  | 5.08     | 8.583   | 2.03  | 11.67 | 1.02  |
| 2.500 | 1.02  | 5.583  | 5.08     | 8.667   | 2.03  | 11.75 | 1.02  |
| 2.583 | 2.03  | 5.667  | 5.08     | 8.750   | 2.03  | 11.83 | 1.02  |
| 2.667 | 2.03  | 5.750  | 5.08     | 8.833   | 1.02  | 11.92 | 1.02  |
| 2.750 | 2.03  | 5.833  | 38.61    | 8.917   | 1.02  | 12.00 | 1.02  |

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|       |      | +-EED4 F | A Dunna | ad Haath |      | h.d   |      |
|-------|------|----------|---------|----------|------|-------|------|
| 0.047 |      |          |         | ed_WestD |      |       | 4 00 |
| 0.917 | 1.02 | 4.000    |         |          | 3.05 | 10.17 | 1.02 |
| 1.000 | 1.02 | 4.083    | 1.02    | 7.167    | 3.05 | 10.25 | 1.02 |
| 1.083 | 0.00 | 4.167    | 1.02    | 7.250    | 3.05 | 10.33 | 1.02 |
| 1.167 | 0.00 | 4.250    | 1.02    | 7.333    | 3.05 | 10.42 | 1.02 |
| 1.250 | 0.00 | 4.333    | 3.05    | 7.417    | 3.05 | 10.50 | 1.02 |
| 1.333 | 1.02 | 4.417    | 3.05    | 7.500    | 3.05 | 10.58 | 1.02 |
| 1.417 | 1.02 | 4.500    | 3.05    | 7.583    | 2.03 | 10.67 | 1.02 |
| 1.500 | 1.02 | 4.583    | 3.05    | 7.667    | 2.03 | 10.75 | 1.02 |
| 1.583 | 1.02 | 4.667    | 3.05    | 7.750    | 2.03 | 10.83 | 1.02 |
| 1.667 | 1.02 | 4.750    | 3.05    | 7.833    | 3.05 | 10.92 | 1.02 |
| 1.750 | 1.02 | 4.833    | 3.05    | 7.917    | 3.05 | 11.00 | 1.02 |
| 1.833 | 1.02 | 4.917    | 3.05    | 8.000    | 3.05 | 11.08 | 1.02 |
| 1.917 | 1.02 | 5.000    | 3.05    | 8.083    | 2.03 | 11.17 | 1.02 |
| 2.000 | 1.02 | 5.083    | 3.05    | 8.167    | 2.03 | 11.25 | 1.02 |
| 2.083 | 1.02 | 5.167    | 3.05    | 8.250    | 2.03 | 11.33 | 0.00 |
| 2.167 | 1.02 | 5.250    | 3.05    | 8.333    | 2.03 | 11.42 | 0.00 |
| 2.250 | 1.02 | 5.333    | 5.08    | 8.417    | 2.03 | 11.50 | 0.00 |
| 2.333 | 1.02 | 5.417    | 5.08    | 8.500    | 2.03 | 11.58 | 1.02 |
| 2.417 | 1.02 | 5.500    | 5.08    | 8.583    | 2.03 | 11.67 | 1.02 |
| 2.500 | 1.02 | 5.583    | 5.08    | 8.667    | 2.03 | 11.75 | 1.02 |
| 2.583 | 2.03 | 5.667    | 5.08    | 8.750    | 2.03 | 11.83 | 1.02 |
| 2.667 | 2.03 | 5.750    | 5.08    | 8.833    | 1.02 | 11.92 | 1.02 |
| 2.750 | 2.03 | 5.833    | 38.61   | 8.917    | 1.02 | 12.00 | 1.02 |
| 2.833 | 2.03 | 5.917    | 38.61   | 9.000    | 1.02 | 12.08 | 1.02 |
| 2.917 | 2.03 | 6.000    | 38.61   | 9.083    | 2.03 | 12.17 | 1.02 |
| 3.000 | 2.03 | 6.083    | 38.61   | 9.167    | 2.03 | 12.25 | 1.02 |
| 3.083 | 2.03 | 6.167    | 38.61   | 9.250    | 2.03 | İ     |      |

| Max.Eff.Inten.(r | mm/hr)= | 38.61     | 25.09     |             |
|------------------|---------|-----------|-----------|-------------|
| over             | (min)   | 5.00      | 10.00     |             |
| Storage Coeff.   | (min)=  | 6.63 (ii) | 8.73 (ii) |             |
| Unit Hyd. Tpeak  | (min)=  | 5.00      | 10.00     |             |
| Unit Hyd. peak   | (cms)=  | 0.18      | 0.12      |             |
|                  |         |           |           | *TOTALS*    |
| PEAK FLOW        | (cms)=  | 0.04      | 0.00      | 0.045 (iii) |
| TIME TO PEAK     | (hrs)=  | 6.25      | 6.25      | 6.25        |
| RUNOFF VOLUME    | (mm)=   | 40.93     | 20.75     | 39.91       |
| TOTAL RAINFALL   | (mm)=   | 42.93     | 42.93     | 42.93       |
| RUNOFF COFFETCTI | FNT =   | a 95      | 0 48      | 0 93        |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 89.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0430) |      |       |       |      |
|-----------------|------|-------|-------|------|
| 1 + 2 = 3       | AREA | QPEAK | TPEAK | R.V. |
|                 | (ha) | (cms) | (hrs) | (mm) |

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|                 | Langs   | taffRd_E | A_Propos | sed_WestDon | Watershd   |          |
|-----------------|---------|----------|----------|-------------|------------|----------|
| 2.83            | 3 2.03  | 5.917    | 38.61    | 9.000       | 1.02   12. | .08 1.02 |
| 2.91            | 7 2.03  | 6.000    | 38.61    | 9.083       | 2.03   12. | 17 1.02  |
| 3.00            | 2.03    | 6.083    | 38.61    | 9.167       | 2.03   12. | 25 1.02  |
| 3.08            | 3 2.03  | 6.167    | 38.61    | 9.250       | 2.03       |          |
| Max.Eff.Inten.( | mm/hn)_ | 38.61    |          | 22.96       |            |          |
|                 |         |          |          |             |            |          |
| over            | (min)   | 5.00     |          | 10.00       |            |          |
| Storage Coeff.  | (min)=  | 6.63     | (ii)     | 9.66 (ii)   |            |          |
| Unit Hyd. Tpeak | (min)=  | 5.00     |          | 10.00       |            |          |
| Unit Hyd. peak  | (cms)=  | 0.18     |          | 0.11        |            |          |
|                 |         |          |          |             | *TOTALS*   | •        |
| PEAK FLOW       | (cms)=  | 0.06     |          | 0.00        | 0.057      | (iii)    |
| TIME TO PEAK    | (hrs)=  | 6.25     |          | 6.25        | 6.25       |          |
| RUNOFF VOLUME   | (mm)=   | 40.93    |          | 18.96       | 39.38      |          |
| TOTAL RAINFALL  | (mm)=   | 42.93    |          | 42.93       | 42.93      |          |
| RUNOFF COEFFICI | ENT =   | 0.95     |          | 0.44        | 0.92       |          |
|                 |         |          |          |             |            |          |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 87.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |         |       |         |           |       |  |
|-------------------|-------|---------|-------|---------|-----------|-------|--|
| STANDHYD ( 0160)  | Area  | (ha)=   | 0.43  |         |           |       |  |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 95.00 | Dir.    | Conn.(%)= | 95.00 |  |
|                   |       |         |       |         |           |       |  |
|                   |       | IMPERVI | OUS   | PERVIOL | JS (i)    |       |  |
| Surface Area      | (ha)= | 0.4     | 1     | 0.02    | 2         |       |  |
| Dep. Storage      | (mm)= | 2.0     | 0     | 5.00    | )         |       |  |
| Average Slope     | (%)=  | 1.0     | 0     | 2.00    | )         |       |  |
| Length            | (m)=  | 260.0   | 0     | 20.00   | )         |       |  |
| Mannings n        | ` =   | 0.01    | 3     | 0.250   | )         |       |  |
| =                 |       |         |       |         |           |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | ) HYETOGR | APH   |       |       |
|-------|-------|-------|----------|-----------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME    | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs     | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250     | 38.61 | 9.33  | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333     | 8.13  | 9.42  | 1.02  |
| 0.250 | 0.00  | 3.333 | 1.02     | 6.417     | 8.13  | 9.50  | 1.02  |
| 0.333 | 1.02  | 3.417 | 1.02     | 6.500     | 8.13  | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 1.02     | 6.583     | 8.13  | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03     | 6.667     | 8.13  | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03     | 6.750     | 8.13  | 9.83  | 1.02  |
| 0.667 | 1.02  | 3.750 | 2.03     | 6.833     | 3.05  | 9.92  | 1.02  |
| 0.750 | 1.02  | 3.833 | 2.03     | 6.917     | 3.05  | 10.00 | 1.02  |
| 0.833 | 1.02  | 3.917 | 2.03     | 7.000     | 3.05  | 10.08 | 1.02  |

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|   |      |   |   |        | LangstaffR | Rd_EA_P | roposed_West | DonWater | sho |
|---|------|---|---|--------|------------|---------|--------------|----------|-----|
|   | ID1= | 1 | ( | 0155): | 0.56       | 0.057   | 6.25         | 39.38    |     |
| ŀ | ID2= | 2 | ( | 0160): | 0.43       | 0.045   | 6.25         | 39.91    |     |
|   | ==== |   |   |        |            | ======  |              |          |     |
|   | ID = | 3 | ( | 0430): | 0.99       | 0.102   | 6.25         | 39.61    |     |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB  <br>  STANDHYD ( 0150) <br> ID= 1 DT= 5.0 min | Area<br>Total | (ha)= 3.81<br>Imp(%)= 95.00 |              | 95.00 |
|--|---------------|-----------------------------|--------------|-------|
|  |               |                             |              |       |
|  |               | IMPERVIOUS                  | PERVIOUS (i) |       |
| Surface Area   | (ha)=         | 3.62                        | 0.19         |       |
| Dep. Storage   | (mm)=         | 2.00                        | 5.00         |       |
| Average Slope  | (%)=          | 1.00                        | 2.00         |       |
| Length   | (m)=          | 150.00                      | 40.00        |       |
| Mannings n   | ` ′=          | 0.013                       | 0.250        |       |

|       |       |       |      | HYETOGR |       | •     |      |
|-------|-------|-------|------|---------|-------|-------|------|
| TIME  | RAIN  |       | RAIN | ' TIME  | RAIN  |       | RAIN |
| hrs   | mm/hr | hrs   |      | ' hrs   |       | hrs   |      |
| 0.083 | 0.00  |       | 2.03 | 6.250   | 38.61 |       | 1.02 |
| 0.167 | 0.00  |       | 2.03 |         | 8.13  |       | 1.02 |
| 0.250 | 0.00  |       |      |         |       |       | 1.02 |
| 0.333 | 1.02  |       | 1.02 |         |       |       | 2.03 |
| 0.417 |       | 3.500 | 1.02 |         | 8.13  |       | 2.03 |
| 0.500 |       | 3.583 |      | 6.667   | 8.13  |       | 2.03 |
| 0.583 |       | 3.667 | 2.03 |         | 8.13  |       | 1.02 |
| 0.667 | 1.02  |       |      |         |       |       | 1.02 |
| 0.750 |       | 3.833 |      |         |       |       |      |
| 0.833 |       | 3.917 | 2.03 |         | 3.05  |       | 1.02 |
| 0.917 |       | 4.000 | 2.03 |         | 3.05  |       | 1.02 |
| 1.000 |       | 4.083 | 1.02 |         | 3.05  |       | 1.02 |
| 1.083 | 0.00  |       | 1.02 |         | 3.05  |       | 1.02 |
| 1.167 | 0.00  |       | 1.02 |         |       |       | 1.02 |
| 1.250 | 0.00  |       | 3.05 |         | 3.05  |       | 1.02 |
| 1.333 |       | 4.417 | 3.05 |         | 3.05  |       | 1.02 |
| 1.417 |       | 4.500 | 3.05 |         | 2.03  |       | 1.02 |
| 1.500 | 1.02  |       | 3.05 |         | 2.03  |       | 1.02 |
| 1.583 | 1.02  |       | 3.05 |         |       |       |      |
| 1.667 | 1.02  |       |      |         |       |       | 1.02 |
| 1.750 |       | 4.833 | 3.05 |         | 3.05  |       | 1.02 |
| 1.833 |       | 4.917 | 3.05 |         | 3.05  |       | 1.02 |
| 1.917 | 1.02  |       | 3.05 |         | 2.03  |       | 1.02 |
| 2.000 | 1.02  |       | 3.05 |         | 2.03  |       | 1.02 |
| 2.083 | 1.02  |       | 3.05 |         | 2.03  | 11.33 | 0.00 |
| 2.167 | 1.02  |       | 3.05 |         | 2.03  |       | 0.00 |
| 2.250 |       | 5.333 | 5.08 |         | 2.03  |       | 0.00 |
| 2.333 | 1.02  | 5.417 | 5.08 | 8.500   | 2.03  | 11.58 | 1.02 |
|       |       |       | D    | 24      |       |       |      |

| LangstaffRd_EA_Proposed_WestDonWatershd |      |       |       |       |      |       |      |  |  |
|---|------|-------|-------|-------|------|-------|------|--|--|
| 2.417                                   | 1.02 | 5.500 | 5.08  | 8.583 | 2.03 | 11.67 | 1.02 |  |  |
| 2.500                                   | 1.02 | 5.583 | 5.08  | 8.667 | 2.03 | 11.75 | 1.02 |  |  |
| 2.583                                   | 2.03 | 5.667 | 5.08  | 8.750 | 2.03 | 11.83 | 1.02 |  |  |
| 2.667                                   | 2.03 | 5.750 | 5.08  | 8.833 | 1.02 | 11.92 | 1.02 |  |  |
| 2.750                                   | 2.03 | 5.833 | 38.61 | 8.917 | 1.02 | 12.00 | 1.02 |  |  |
| 2.833                                   | 2.03 | 5.917 | 38.61 | 9.000 | 1.02 | 12.08 | 1.02 |  |  |
| 2.917                                   | 2.03 | 6.000 | 38.61 | 9.083 | 2.03 | 12.17 | 1.02 |  |  |
| 3.000                                   | 2.03 | 6.083 | 38.61 | 9.167 | 2.03 | 12.25 | 1.02 |  |  |
| 3.083                                   | 2.03 | 6.167 | 38.61 | 9.250 | 2.03 |       |      |  |  |

| max.err.inten.(i | mm/ mr.) = | 30.01     | 23.99     |             |
|------------------|------------|-----------|-----------|-------------|
| over             | (min)      | 5.00      | 10.00     |             |
| Storage Coeff.   | (min)=     | 4.77 (ii) | 7.95 (ii) |             |
| Unit Hyd. Tpeak  | (min)=     | 5.00      | 10.00     |             |
| Unit Hyd. peak   | (cms)=     | 0.22      | 0.13      |             |
|                  |            |           |           | *TOTALS*    |
| PEAK FLOW        | (cms)=     | 0.39      | 0.01      | 0.399 (iii) |
| TIME TO PEAK     | (hrs)=     | 6.25      | 6.25      | 6.25        |
| RUNOFF VOLUME    | (mm)=      | 40.93     | 19.82     | 39.87       |
| TOTAL RAINFALL   | (mm)=      | 42.93     | 42.93     | 42.93       |
| RUNOFF COEFFICIE | ENT =      | 0.95      | 0.46      | 0.93        |
|                  |            |           |           |             |

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 88.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| RESERVOIR( 0515) <br>  IN= 2> OUT= 1 | OVERFLOW | IS OFF            |                 |         |  |
|--------------------------------------|----------|-------------------|-----------------|---------|--|
| DT= 5.0 min                          | OUTFLOW  | STORAGE           | OUTFLOW         | STORAGE |  |
|                                      |          | (ha.m.)<br>0.0000 | (cms)<br>0.0091 |         |  |
|                                      |          | 0.0157            | 0.0095          |         |  |
|                                      | 0.0033   | 0.0320            | 0.0100          | 0.2216  |  |
|                                      | 0.0044   | 0.0487            | 0.0104          | 0.2433  |  |
|                                      | 0.0053   | 0.0659            | 0.0109          | 0.2655  |  |
|                                      | 0.0061   | 0.0837            | 0.0113          | 0.2882  |  |
|                                      | 0.0068   | 0.1019            | 0.0116          | 0.3114  |  |
|                                      | 0.0074   | 0.1206            | 0.1520          | 0.3592  |  |
|                                      | 0.0080   | 0.1398            | 0.5654          | 0.4336  |  |
|                                      | 0.0086   | 0.1595            | 1.1316          | 0.5100  |  |
|                                      | AR       | EA QPEAK          | TPEAK           | R.V.    |  |
|                                      | (h       | ia) (cms)         | (hrs)           | (mm)    |  |
| INFLOW : ID= 2 ( 0                   | 150) 3.  | 810 0.39          | 99 6.25         | 39.87   |  |
| OUTFLOW: ID= 1 ( 0                   | 3.       | 810 0.00          | 08 12.25        | 39.06   |  |
|                                      |          |                   |                 |         |  |

PEAK FLOW REDUCTION [Qout/Qin](%)= 1.95

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## LangstaffRd EA\_Proposed\_MestDonWatershd 1.02 | 4.759 | 3.05 | 7.833 | 3.05 | 1 1.02 | 4.833 | 3.05 | 7.917 | 3.05 | 1 1.02 | 4.917 | 3.05 | 8.060 | 3.05 | 1 1.02 | 5.080 | 3.05 | 8.083 | 2.03 | 1 1.02 | 5.080 | 3.05 | 8.167 | 2.03 | 1 1.02 | 5.167 | 3.05 | 8.250 | 2.03 | 1 1.02 | 5.250 | 3.05 | 8.333 | 2.03 | 1 1.02 | 5.250 | 3.05 | 8.333 | 2.03 | 1 1.02 | 5.337 | 5.08 | 8.417 | 2.03 | 1 1.02 | 5.337 | 5.08 | 8.417 | 2.03 | 1 1.02 | 5.538 | 5.08 | 8.500 | 2.03 | 1 1.02 | 5.538 | 5.08 | 8.500 | 2.03 | 1 1.02 | 5.585 | 5.08 | 8.500 | 2.03 | 1 1.02 | 5.583 | 5.08 | 8.667 | 2.03 | 1 1.02 | 5.583 | 5.08 | 8.867 | 2.03 | 1 1.02 | 5.533 | 5.08 | 8.867 | 2.03 | 1 1.02 | 5.590 | 5.08 | 8.750 | 2.03 | 1 1.02 | 5.591 | 38.61 | 9.000 | 1.02 | 1 1.03 | 5.060 | 38.61 | 9.083 | 2.03 | 1 1.03 | 6.060 | 38.61 | 9.083 | 2.03 | 1 1.03 | 6.083 | 38.61 | 9.167 | 2.03 | 1 1.04 | 5.61 | 5.067 | 5.08 | 1.06 | 5.08 | 1 1.06 | 5.067 | 5.08 | 8.750 | 2.03 | 1 1.07 | 5.07 | 5.08 | 8.833 | 1 1.07 | 5.07 | 5.08 | 8.833 | 1 1.07 | 5.08 | 5.08 | 8.750 | 2.03 | 1 1.08 | 5.08 | 5.08 | 8.750 | 2.03 | 1 1.09 | 6.167 | 38.61 | 9.083 | 2.03 | 1 1.00 | 6.167 | 38.61 | 9.167 | 2.03 | 1 1.00 | 6.167 | 38.61 | 9.250 | 2.03 | 1 1.667 1.750 1.833 10.92 11.00 11.08 1.917 1.917 2.000 2.083 2.167 2.250 2.333 2.417 2.500 2.583 11.17 11.25 11.33 11.42 11.50 11.58 11.67 11.75 1.02 0.00 0.00 1.02 1.02 1.02 2.583 2.667 2.750 2.833 2.917 3.000 3.083 11.83 11.92 12.00 12.08 12.17 12.25 1.02 1.02 1.02 1.02 1.02

| Max.Eff.Inten.(r | nm/hr)= | 38.61     | 19.37      |             |
|------------------|---------|-----------|------------|-------------|
| over             | (min)   | 10.00     | 15.00      |             |
| Storage Coeff.   | (min)=  | 9.46 (ii) | 13.57 (ii) |             |
| Unit Hyd. Tpeak  | (min)=  | 10.00     | 15.00      |             |
| Unit Hyd. peak   | (cms)=  | 0.12      | 0.08       |             |
|                  |         |           |            | *TOTALS*    |
| PEAK FLOW        | (cms)=  | 0.08      | 0.01       | 0.084 (iii) |
| TIME TO PEAK     | (hrs)=  | 6.25      | 6.33       | 6.25        |
| RUNOFF VOLUME    | (mm)=   | 40.93     | 15.99      | 35.43       |
| TOTAL RAINFALL   | (mm)=   | 42.93     | 42.93      | 42.93       |
| RUNOFF COEFFICIE | ENT =   | 0.95      | 0.37       | 0.83        |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: CN\* = 83.0 Ia = Dep. Storage (Above) (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COFFFICIENT. (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |                     |                |       |
|-------------------|---------------------|----------------|-------|
| STANDHYD ( 0205)  | Area (ha)= 1.11     |                |       |
| ID= 1 DT= 5.0 min | Total Imp(%)= 77.00 | Dir. Conn.(%)= | 77.00 |
|                   |                     |                |       |

|               |       | IMPERVIOUS | PERVIOUS | (i) |
|---------------|-------|------------|----------|-----|
| Surface Area  | (ha)= | 0.85       | 0.26     |     |
| Dep. Storage  | (mm)= | 2.00       | 5.00     |     |
| Average Slope | (%)=  | 1.00       | 2.00     |     |
| Length        | (m)=  | 470.00     | 20.00    |     |
| Mannings n    | =     | 0.013      | 0.250    |     |

NOTE: RAINFALL WAS TRANSFORMED TO  $\,$  5.0 MIN. TIME STEP.

## LangstaffRd\_EA\_Proposed\_WestDonWatershd TIME SHIFT OF PEAK FLOW (min)=360.00 MAXIMUM STORAGE USED (ha.m.)= 0.1333 (min)=360.00 (ha.m.)= 0.1333

| ADD HYD ( 0440)                         |      |       |       |       |
|---|------|-------|-------|-------|
| 1 + 2 = 3                               | AREA | QPEAK | TPEAK | R.V.  |
|   | (ha) | (cms) | (hrs) | (mm)  |
| ID1= 1 ( 0430):                         | 0.99 | 0.102 | 6.25  | 39.61 |
| + ID2= 2 ( 0515):                       | 3.81 | 0.008 | 12.25 | 39.06 |
| ======================================= |      |       |       |       |
| ID = 3 ( 0440):                         | 4.80 | 0.108 | 6.25  | 39.18 |

|    | 10 = .   | ) د  | 6446  | , .          | 4.00   | ט    | . 100         | 0.25    | 39.10     |       |  |
|----|----------|------|-------|--------------|--------|------|---------------|---------|-----------|-------|--|
| NC | OTE: P   | EAK  | FLOWS | DO N         | OT INC | LUDE | BASEFI        | LOWS IF | ANY.      |       |  |
|    | OHYD (   |      |       | Area<br>Tota |        |      | 0.96<br>78.00 | Dir.    | Conn.(%)= | 78.00 |  |
|    |          |      |       |              | IMP    | ERVI | OUS           | PERVIO  | US (i)    |       |  |
| Su | irface i | Area |       | (ha)=        |        | 0.7  | 5             | 0.2     | 1 ` ′     |       |  |
| De | p. Sto   | rage |       | (mm)=        |        | 2.0  | 0             | 5.0     | 0         |       |  |
| Av | erage :  | Slop | e     | (%)=         |        | 1.0  | 0             | 2.0     | 0         |       |  |
| Le | ength    |      |       | (m)=         | 4      | 70.0 | 0             | 20.0    | 0         |       |  |
| Ma | annings  | n    |       | =            |        | 0.01 | 3             | 0.25    | 0         |       |  |
|    |          |      |       |              |        |      |               |         |           |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | ) HYETOGR | APH   |       |       |
|-------|-------|-------|----------|-----------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME    | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs     | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250     | 38.61 | 9.33  | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333     | 8.13  | 9.42  | 1.02  |
| 0.250 | 0.00  | 3.333 | 1.02     | 6.417     | 8.13  | 9.50  | 1.02  |
| 0.333 | 1.02  | 3.417 | 1.02     | 6.500     | 8.13  | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 1.02     | 6.583     | 8.13  | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03     | 6.667     | 8.13  | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03     | 6.750     | 8.13  | 9.83  | 1.02  |
| 0.667 | 1.02  | 3.750 | 2.03     | 6.833     | 3.05  | 9.92  | 1.02  |
| 0.750 | 1.02  | 3.833 | 2.03     | 6.917     | 3.05  | 10.00 | 1.02  |
| 0.833 | 1.02  | 3.917 | 2.03     | 7.000     | 3.05  | 10.08 | 1.02  |
| 0.917 | 1.02  | 4.000 | 2.03     | 7.083     | 3.05  | 10.17 | 1.02  |
| 1.000 | 1.02  | 4.083 | 1.02     | 7.167     | 3.05  | 10.25 | 1.02  |
| 1.083 | 0.00  | 4.167 | 1.02     | 7.250     | 3.05  | 10.33 | 1.02  |
| 1.167 | 0.00  | 4.250 | 1.02     | 7.333     | 3.05  | 10.42 | 1.02  |
| 1.250 | 0.00  | 4.333 | 3.05     | 7.417     | 3.05  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 3.05     | 7.500     | 3.05  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 3.05     | 7.583     | 2.03  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 3.05     | 7.667     | 2.03  | 10.75 | 1.02  |
| 1.583 | 1.02  | 4.667 | 3.05     | 7.750     | 2.03  | 10.83 | 1.02  |

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| ${\tt LangstaffRd\_EA\_Proposed\_WestDonWatershd}$ |      |       |         |                |       |       |      |  |
|--|------|-------|---------|----------------|-------|-------|------|--|
|  |      | TD    | NCTODMI | D HYETOGRA     | ADII  |       |      |  |
| TIME   | RAIN |       | RAIN    |                | RAIN  |       | RAIN |  |
| hrs  |      | hrs   |         | l' hrs         |       |       |      |  |
| 0.083  |      | 3.167 |         | 6.250          | 38.61 |       |      |  |
| 0.167  |      | 3.250 |         | 6.333          | 8.13  |       | 1.02 |  |
| 0.250  |      | 3.333 |         | 6.417          | 8.13  |       | 1.02 |  |
| 0.333  | 1 02 | 3.333 | 1.02    | 6.500          | 8.13  |       | 2.03 |  |
| 0.417  |      |       |         |                | 8.13  |       | 2.03 |  |
| 0.500  | 1.02 | 3.300 | 2.02    | 6.583          | 8.13  |       | 2.03 |  |
| 0.583  |      |       |         |                | 8.13  |       | 1.02 |  |
| 0.667  |      | 3.750 |         | 6.750          |       | 9.83  | 1.02 |  |
|  |      |       |         | 6.917          |       | 10.00 |      |  |
|  |      |       |         |                |       |       | 1.02 |  |
| 0.833  | 1.02 | 3.91/ | 2.03    | 7.000          | 3.05  |       | 1.02 |  |
| 0.917  |      | 4.000 |         | 7.083          |       | 10.17 | 1.02 |  |
| 1.000  |      | 4.083 |         | 7.167          |       |       | 1.02 |  |
| 1.083<br>1.167                                     | 0.00 | 4.167 | 1.02    | 7.250          |       | 10.33 | 1.02 |  |
|  |      | 4.250 | 1.02    | 7.333          |       | 10.42 | 1.02 |  |
| 1.250  | 0.00 | 4.333 | 3.05    | 7.417          | 3.05  |       | 1.02 |  |
| 1.333  |      | 4.417 |         | 7.500          |       | 10.58 | 1.02 |  |
| 1.417  |      |       |         | 7.583          | 2.03  |       |      |  |
| 1.500  | 1.02 | 4.583 | 3.05    | 7.667          | 2.03  |       | 1.02 |  |
|  |      |       |         |                |       | 10.83 | 1.02 |  |
|  |      | 4.750 | 3.05    | 7.833          | 3.05  |       | 1.02 |  |
| 1.750  |      | 4.833 |         | 7.917          |       | 11.00 | 1.02 |  |
| 1.833  |      |       |         | 8.000          |       | 11.08 | 1.02 |  |
| 1.917  | 1.02 | 5.000 | 3.05    | 8.083<br>8.167 | 2.03  |       | 1.02 |  |
| 2.000  | 1.02 | 5.083 | 3.05    | 8.16/          |       | 11.25 | 1.02 |  |
|  |      |       |         | 8.250          |       |       | 0.00 |  |
| 2.167  |      | 5.250 |         | 8.333          |       | 11.42 | 0.00 |  |
| 2.250  |      |       |         | 8.417          |       | 11.50 | 0.00 |  |
| 2.333  |      | 5.417 |         | 8.500          | 2.03  |       | 1.02 |  |
| 2.417  |      | 5.500 |         | 8.583          |       | 11.67 | 1.02 |  |
| 2.500  |      |       |         | 8.667          |       |       | 1.02 |  |
| 2.583  | 2.03 | 5.667 | 5.08    | 8.750          |       | 11.83 | 1.02 |  |
|  | 2.03 | 5./50 | 5.08    |                |       | 11.92 | 1.02 |  |
| 2.750  | 2.03 | 5.833 | 38.61   | 8.917          | 1.02  |       | 1.02 |  |
| 2.833  |      | 5.917 |         | 9.000          |       | 12.08 | 1.02 |  |
| 2.917  |      | 6.000 |         | 9.083          |       | 12.17 | 1.02 |  |
| 3.000  | 2.03 | 6.083 | 38.61   | 9.167          |       | 12.25 | 1.02 |  |
| 3.083  | 2.03 | 6.167 | 38.61   | 9.250          | 2.03  |       |      |  |
| Max.Eff.Inten.(mm/                                 | hr)= | 38.61 |         | 19.37          |       |       |      |  |
| over (m  |      | 10.00 |         | 15.00          |       |       |      |  |
| Storage Coeff. (m                                  | in)= | 9.46  | (ii)    | 13.66 (ii      | )     |       |      |  |

Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)= 9.46 (ii) 10.00 0.12 \*TOTALS\* 0.096 (iii) 6.25 35.18 42.93 PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 0.01 6.25 40.93 42.93 0.95 6.33 15.99 42.93 0.37

#### LangstaffRd\_EA\_Proposed\_WestDonWatershd

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 83.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COFFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

AREA (ha) 1.11 QPEAK (cms) 0.096 0.084 TPEAK (hrs) 6.25 R.V. (mm) 35.18 0.96 6.25 35.43 ID = 3 ( 0460): 2.07 0.180 6.25 35.30

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| RESERVOIR( 0525)| | IN= 2---> OUT= 1 | DT= 5.0 min OVERFLOW IS OFF OUTFLOW STORAGE OUTFI OW STORAGE STORAGE (ha.m.) 0.0000 0.0026 0.0084 0.0149 (cms) 0.0000 0.0274 0.0478 0.0619 (cms) 0.0733 0.0831 0.1449 0.0000 (ha.m.) 0.0214 0.0278 0.0374 TPEAK OPEAK R.V. AREA (ha) 2.070 INFLOW : ID= 2 ( 0460) OUTFLOW: ID= 1 ( 0525)

PEAK FLOW REDUCTION [Qout/Qin](%)= 41.39 TIME SHIFT OF PEAK FLOW (min)= 20.00 MAXIMUM STORAGE USED (ha.m.)= 0.0222

| CALIB | | STANDHYD ( 0190)| |ID= 1 DT= 5.0 min | Area (ha)= 0.86 Total Imp(%)= 57.00 Dir. Conn.(%)= 57.00 IMPERVIOUS PERVIOUS (i) (ha)= (mm)= (%)= (m)= 0.37 5.00 2.00 50.00 Surface Area 0.49 Dep. Storage Average Slope Length Mannings n 1.00

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- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB  <br>STANDHYD ( 0195) <br>ID= 1 DT= 5.0 min                     | Area<br>Total                  | (ha)=<br>Imp(%)=                                    | 0.79<br>75.00 | Dir. Conn.(%)=   | 75.6 |
|---|--------------------------------|---|---------------|--|------|
| Surface Area<br>Dep. Storage<br>Average Slope<br>Length<br>Mannings n | (ha)=<br>(mm)=<br>(%)=<br>(m)= | IMPERVIO<br>0.59<br>2.00<br>1.00<br>340.00<br>0.013 |               | PERVIOUS (i)<br>0.20<br>5.00<br>2.00<br>20.00<br>0.250 |      |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250   | 38.61 | 9.33  | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333   | 8.13  | 9.42  | 1.02  |
| 0.250 | 0.00  | 3.333 | 1.02     | 6.417   | 8.13  | 9.50  | 1.02  |
| 0.333 | 1.02  | 3.417 | 1.02     | 6.500   | 8.13  | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 1.02     | 6.583   | 8.13  | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03     | 6.667   | 8.13  | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03     | 6.750   | 8.13  | 9.83  | 1.02  |
| 0.667 | 1.02  | 3.750 | 2.03     | 6.833   | 3.05  | 9.92  | 1.02  |
| 0.750 | 1.02  | 3.833 | 2.03     | 6.917   | 3.05  | 10.00 | 1.02  |
| 0.833 | 1.02  | 3.917 | 2.03     | 7.000   | 3.05  | 10.08 | 1.02  |
| 0.917 | 1.02  | 4.000 | 2.03     | 7.083   | 3.05  | 10.17 | 1.02  |
| 1.000 | 1.02  | 4.083 | 1.02     | 7.167   | 3.05  | 10.25 | 1.02  |
| 1.083 | 0.00  | 4.167 | 1.02     | 7.250   | 3.05  | 10.33 | 1.02  |
| 1.167 | 0.00  | 4.250 | 1.02     | 7.333   | 3.05  | 10.42 | 1.02  |
| 1.250 | 0.00  | 4.333 | 3.05     | 7.417   | 3.05  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 3.05     | 7.500   | 3.05  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 3.05     | 7.583   | 2.03  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 3.05     | 7.667   | 2.03  | 10.75 | 1.02  |
| 1.583 | 1.02  | 4.667 | 3.05     | 7.750   | 2.03  | 10.83 | 1.02  |
| 1.667 | 1.02  | 4.750 | 3.05     | 7.833   | 3.05  | 10.92 | 1.02  |
| 1.750 | 1.02  | 4.833 | 3.05     | 7.917   | 3.05  | 11.00 | 1.02  |
| 1.833 | 1.02  | 4.917 | 3.05     | 8.000   | 3.05  | 11.08 | 1.02  |
| 1.917 | 1.02  | 5.000 | 3.05     | 8.083   | 2.03  | 11.17 | 1.02  |
| 2.000 | 1.02  | 5.083 | 3.05     | 8.167   | 2.03  | 11.25 | 1.02  |

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## LangstaffRd\_EA\_Proposed\_WestDonWatershd NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|                 |                 | TRA   | NSFORM | ED HYETOGRA | ΔPH   | _                  |       |
|-----------------|-----------------|-------|--------|-------------|-------|--------------------|-------|
| TIM             | E RAIN          |       | RAIN   |             | RAIN  |                    | RAIN  |
| hr              |                 |       |        |             | mm/hr |                    | mm/hr |
| 0.08            |                 | 3.167 |        | 6.250       | 38.61 |                    | 1.02  |
| 0.16            |                 | 3.250 |        | 6.333       | 8.13  |                    | 1.02  |
| 0.25            |                 | 3.333 |        | 6.417       | 8.13  |                    | 1.02  |
| 0.33            |                 | 3.417 |        | 6.500       | 8.13  |                    | 2.03  |
| 0.41            |                 | 3.500 |        | 6.583       | 8.13  |                    | 2.03  |
| 0.50            |                 | 3.583 |        | 6.667       | 8.13  |                    | 2.03  |
|                 |                 | 3.667 |        | 6.750       | 8.13  |                    | 1.02  |
| 0.58<br>0.66    |                 | 3.750 |        | 6.833       | 3.05  |                    | 1.02  |
|                 |                 |       |        |             |       |                    |       |
| 0.75            |                 | 3.833 |        | 6.917       |       | 10.00              | 1.02  |
| 0.83            |                 | 3.917 |        | 7.000       | 3.05  |                    | 1.02  |
| 0.91            |                 | 4.000 |        | 7.083       |       | 10.17              | 1.02  |
| 1.00            |                 | 4.083 |        | 7.167       |       | 10.25              | 1.02  |
| 1.08            |                 | 4.167 |        | 7.250       |       | 10.33              | 1.02  |
| 1.16            |                 | 4.250 |        | 7.333       |       | 10.42              | 1.02  |
| 1.25            |                 | 4.333 |        | 7.417       |       | 10.50              | 1.02  |
| 1.33            |                 | 4.417 |        | 7.500       |       | 10.58              | 1.02  |
| 1.41            |                 | 4.500 |        | 7.583       |       | 10.67              | 1.02  |
| 1.50            |                 | 4.583 |        | 7.667       |       | 10.75              | 1.02  |
| 1.58            |                 | 4.667 |        | 7.750       |       | 10.83              | 1.02  |
| 1.66            |                 | 4.750 |        | 7.833       |       | 10.92              | 1.02  |
| 1.75            |                 | 4.833 |        | 7.917       |       | 11.00              | 1.02  |
| 1.83            |                 | 4.917 |        | 8.000       |       | 11.08              | 1.02  |
| 1.91            |                 | 5.000 |        | 8.083       |       | 11.17              | 1.02  |
| 2.00            | 0 1.02          | 5.083 | 3.05   | 8.167       |       | 11.25              | 1.02  |
| 2.08            | 3 1.02          | 5.167 | 3.05   | 8.250       | 2.03  | 11.33              | 0.00  |
| 2.16            | 7 1.02          | 5.250 | 3.05   | 8.333       | 2.03  | 11.42              | 0.00  |
| 2.25            | 0 1.02          | 5.333 | 5.08   | 8.417       | 2.03  | 11.50              | 0.00  |
| 2.33            | 3 1.02          | 5.417 | 5.08   | 8.500       | 2.03  | 11.58              | 1.02  |
| 2.41            | 7 1.02          | 5.500 | 5.08   | 8.583       | 2.03  | 11.67              | 1.02  |
| 2.50            |                 | 5.583 |        | 8.667       | 2.03  | 11.75              | 1.02  |
| 2.58            |                 | 5.667 |        | 8.750       |       | 11.83              | 1.02  |
| 2.66            | 7 2.03          | 5.750 | 5.08   | 8.833       | 1.02  | 11.92              | 1.02  |
| 2.75            | 2.03            | 5.833 | 38.61  | 8.917       | 1.02  | 12.00              | 1.02  |
| 2.83            | 3 2.03          | 5.917 | 38.61  | 9.000       | 1.02  | 12.08              | 1.02  |
| 2.91            | 7 2.03          | 6.000 | 38.61  | 9.083       | 2.03  | 12.17              | 1.02  |
| 3.00            | 0 2.03          | 6.083 | 38.61  | 9.167       | 2.03  | 12.25              | 1.02  |
| 3.08            | 3 2.03          | 6.167 | 38.61  | 9.250       | 2.03  |                    |       |
| Max.Eff.Inten.( | nm/hr)-         | 38.61 |        | 17.44       |       |                    |       |
|                 | (min)           | 10.00 |        | 25.00       |       |                    |       |
| Storage Coeff.  | (min)=          | 7.79  | (33)   | 24.01 (ii)  |       |                    |       |
| Unit Hvd. Tpeak |                 | 10.00 | (11)   | 25.00       | ,     |                    |       |
| Unit Hyd. peak  |                 | 0.13  |        | 0.05        |       |                    |       |
| опте пуш. реак  | (cms)=          | 0.13  |        | 0.03        | ****  | TALS*              |       |
| PEAK FLOW       | (cms)=          | 0.05  |        | 0.01        |       | .059 (iii)         |       |
| TIME TO PEAK    | (hrs)=          | 6.25  |        | 6.50        |       | .039 (111)<br>6.25 |       |
| RUNOFF VOLUME   | (nrs)=<br>(mm)= | 40.93 |        | 15.99       |       | 0.19               |       |
| NUMBER VOLUME   | (11111)=        | 40.93 |        | 10.99       | 31    | 0.19               |       |
|                 |                 |       | Page   | 30          |       |                    |       |

|                  | Lange   | taffRd F | Δ Prono | sed WestDon | Waters | hd        |      |
|------------------|---------|----------|---------|-------------|--------|-----------|------|
| 2.08             |         |          |         |             |        | 11.33     | 0.00 |
| 2.16             |         |          |         |             | 2.03   |           | 0.00 |
| 2.256            |         |          | 5.08    | 8.417       | 2.03   |           | 0.00 |
| 2.33             | 3 1.02  | 5.417    | 5.08    | 8.500       | 2.03   | 11.58     | 1.02 |
| 2.41             | 7 1.02  | 5.500    | 5.08    | 8.583       | 2.03   | 11.67     | 1.02 |
| 2.500            | 1.02    | 5.583    | 5.08    | 8.667       | 2.03   | 11.75     | 1.02 |
| 2.583            | 3 2.03  | 5.667    | 5.08    | 8.750       | 2.03   | 11.83     | 1.02 |
| 2.66             | 7 2.03  | 5.750    | 5.08    | 8.833       | 1.02   | 11.92     | 1.02 |
| 2.756            | 2.03    | 5.833    | 38.61   | 8.917       | 1.02   | 12.00     | 1.02 |
| 2.83             | 3 2.03  | 5.917    | 38.61   | 9.000       | 1.02   | 12.08     | 1.02 |
| 2.91             | 7 2.03  | 6.000    | 38.61   | 9.083       | 2.03   | 12.17     | 1.02 |
| 3.000            | 2.03    | 6.083    | 38.61   | 9.167       | 2.03   | 12.25     | 1.02 |
| 3.08             | 3 2.03  | 6.167    | 38.61   | 9.250       | 2.03   | l         |      |
| Max.Eff.Inten.(r | nm/hr)= | 38.61    |         | 19.37       |        |           |      |
|                  | (min)   | 10.00    |         | 15.00       |        |           |      |
| Storage Coeff.   |         | 7.79     | (ii)    | 12.18 (ii)  |        |           |      |
| Unit Hyd. Tpeak  |         | 10.00    |         | 15.00       |        |           |      |
| Unit Hyd. peak   |         | 0.13     |         | 0.09        |        |           |      |
| , ,              | ` '     |          |         |             | *T0    | TALS*     |      |
| PEAK FLOW        | (cms)=  | 0.06     |         | 0.01        | 0      | .069 (iii | )    |
| TIME TO PEAK     | (hrs)=  | 6.25     |         | 6.33        |        | 6.25      |      |
| RUNOFF VOLUME    | (mm)=   | 40.93    |         | 15.99       | 3-     | 4.69      |      |
| TOTAL RAINFALL   | (mm)=   | 42.93    |         | 42.93       | 4      | 2.93      |      |
| RUNOFF COEFFICIE | ENT =   | 0.95     |         | 0.37        |        | 0.81      |      |
|                  |         |          |         |             |        |           |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0455)   | AREA | QPEAK | TPEAK | R.V.  |
|-------------------|------|-------|-------|-------|
| 1 + 2 = 3         | (ha) | (cms) | (hrs) | (mm)  |
| ID1= 1 ( 0190):   | 0.86 | 0.059 | 6.25  | 30.19 |
| + ID2= 2 ( 0195): | 0.79 | 0.069 | 6.25  | 34.69 |
| ID = 3 ( 0455):   | 1.65 | 0.128 | 6.25  | 32.34 |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| RESERVOIR( 0555) | OVERFLOW | IS OFF  |         |         |  |
|------------------|----------|---------|---------|---------|--|
| IN= 2> OUT= 1    |          |         |         |         |  |
| DT= 5.0 min      | OUTFLOW  | STORAGE | OUTFLOW | STORAGE |  |
|                  | (cms)    | (ha.m.) | (cms)   | (ha.m.) |  |
|                  | 0.0000   | 0.0000  | 0.0238  | 0.0199  |  |
|                  | 0.0104   | 0.0024  | 0.0268  | 0.0259  |  |

LangstaffRd\_EA\_Proposed\_WestDonWatershd 0.0079 | 0.0825 0.0139 | 0.0000 0.0346 0.0203

AREA (ha) 1.650 QPEAK TPEAK (cms) (hrs) 0.128 6.25 0.026 6.92 (mm) 32.34 32.31 INFLOW: ID= 2 ( 0455) OUTFLOW: ID= 1 ( 0555) 1.650

PEAK FLOW REDUCTION [Qout/Qin](%)= 20.36
TIME SHIFT OF PEAK FLOW (min)= 40.00
MAXIMUM STORAGE USED (ha.m.)= 0.0244

ADD HYD ( 0465)| 1 + 2 = 3 | AREA QPEAK (ha) (cms) 2.07 0.074 1.65 0.026 TPFAK (hrs) 6.58 6.92 (mm) 35.29 32.31 ID1= 1 ( 0525): 2.07 0.074 6.58 + ID2= 2 ( 0555): 1.65 0.026 6.92 ID = 3 ( 0465): 3.72 0.100 6.58 33.97

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY. 

\*\* SIMULATION:Run 03 \*\*

READ STORM | Filename: C:\Users\ray.zhao\AppD ata\Local\Temp\ e8da0adc-3b43-467d-984d-5ab4a7d3492c\526be1c0 Ptotal= 55.37 mm Comments: 5yr-12hrSCS

TIME RAIN | TIME hrs mm/hr | hrs 6.75 10.16 | 10.00 7.00 5.08 | 10.25 7.25 4.06 | 10.50 RAIN | TIME mm/hr | hrs 0.00 | 3.50 1.02 | 3.75 RAIN mm/hr 3.05 2.03 0.50 0.75 1.02 4.00 2.03 1.02 7.25 7.50 7.75 8.00 8.25 8.50 8.75 9.00 1.00 1.02 4.25 2.03 3.05 10.75 1.02 1.25 1.50 1.75 2.00 2.25 2.50 1.02 1.02 2.03 1.02 1.02 2.03 4.25 4.50 4.75 5.00 5.25 5.50 5.75 4.06 4.06 4.06 3.05 7.11 7.11 3.05 4.06 3.05 2.03 2.03 11.00 11.25 11.50 11.75 2.03 3.05 2.75 2.03 6.00 49.78 9.25 2.03 6.25 49.78 3.25 2.03 6.50 9.14 2.03

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Max.Eff.Inten.(mm/hr)= 49.78 29.56 over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 5.00 15.00 5.85 (ii) 10.07 (ii) 5.00 15.00 0.20 0.10 \*TOTALS\* 0.070 (iii) PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 0.06 6.25 53.37 55.37 6.33 24.78 6.25 45.36 55.37 RUNOFF COEFFICIENT

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 83.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

IMPERVIOUS PERVIOUS (i) Surface Area Dep. Storage Average Slope (ha)= (mm)= (%)= (m)= 0.42 2.00 1.00 250.00 Length Mannings n

0.013 NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

> ---- TRANSFORMED HYETOGRAPH
> RAIN | TIME RAIN | TIME R
> mm/hr | hrs mm/hr | hrs mm RAIN | TIME mm/hr | hrs mm/hr | 0.00 | 0.00 | 0.00 | mm/hr | 2.03 | mm/hr | hrs 2.03 | 6.250 2.03 | 6.333 3.05 | 6.417 3.05 | 6.583 2.03 | 6.667 2.03 | 6.667 2.03 | 6.833 2.03 | 6.917 2.03 | 7.000 2.03 | 7.083 2.03 | 7.167 hrs hrs 3.167 mm/hr 1.02 0.083 9.33 49.78 0.167 3.250 9.14 | 9.42 1.02 0.250 3.333 9.50 1.02 9.14 9.14 10.16 10.16 10.16 5.08 5.08 0.333 0.417 0.500 0.583 1.02 1.02 1.02 1.02 3.417 3.500 3.583 3.667 9.58 9.67 9.75 9.83 2.03 2.03 2.03 2.03 0.667 1.02 3.750 9.92 2.03 0.750 1.02 3.833 2.03 0.833 1.02 | 3.917 1.02 | 4.000 5.08 10.08 1.02 0 917 4.06 | 1 02 1.02 | 4.083

0.250

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|                   |       | -        | -     | . –            |       |
|-------------------|-------|----------|-------|----------------|-------|
|                   |       |          |       |                |       |
| CALIB             |       |          |       |                |       |
| STANDHYD ( 0165)  | Area  | (ha)=    | 0.60  |                |       |
| ID= 1 DT= 5.0 min | Total | Imp(%)=  | 72.00 | Dir. Conn.(%)= | 72.00 |
|                   |       |          |       |                |       |
|                   |       | IMPERVIO | OUS   | PERVIOUS (i)   |       |
| Surface Area      | (ha)= | 0.4      | 3     | 0.17           |       |
| Dep. Storage      | (mm)= | 2.0      | а     | 5.00           |       |
| Average Slope     | (%)=  | 1.0      | 9     | 2.00           |       |
| Length            | (m)=  | 250.0    | а     | 20.00          |       |
| Mannings n        | =     | 0.01     | 3     | 0.250          |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250   | 49.78 | 9.33  | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333   | 9.14  | 9.42  | 1.02  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417   | 9.14  | 9.50  | 1.02  |
| 0.333 | 1.02  | 3.417 | 3.05     | 6.500   | 9.14  | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05     | 6.583   | 10.16 | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03     | 6.667   | 10.16 | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03     | 6.750   | 10.16 | 9.83  | 2.03  |
| 0.667 | 1.02  | 3.750 | 2.03     | 6.833   | 5.08  | 9.92  | 2.03  |
| 0.750 | 1.02  | 3.833 | 2.03     | 6.917   | 5.08  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 2.03     | 7.000   | 5.08  | 10.08 | 1.02  |
| 0.917 | 1.02  | 4.000 | 2.03     | 7.083   | 4.06  | 10.17 | 1.02  |
| 1.000 | 1.02  | 4.083 | 2.03     | 7.167   | 4.06  | 10.25 | 1.02  |
| 1.083 | 1.02  | 4.167 | 2.03     | 7.250   | 4.06  | 10.33 | 1.02  |
| 1.167 | 1.02  | 4.250 | 2.03     | 7.333   | 3.05  | 10.42 | 1.02  |
| 1.250 | 1.02  | 4.333 | 4.06     | 7.417   | 3.05  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 4.06     | 7.500   | 3.05  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 4.06     | 7.583   | 3.05  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 4.06     | 7.667   | 3.05  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 4.06     | 7.750   | 3.05  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 4.06     | 7.833   | 4.06  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 4.06     | 7.917   | 4.06  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 4.06     | 8.000   | 4.06  | 11.08 | 1.02  |
| 1.917 | 1.02  | 5.000 | 4.06     | 8.083   | 3.05  | 11.17 | 1.02  |
| 2.000 | 1.02  | 5.083 | 3.05     | 8.167   | 3.05  | 11.25 | 1.02  |
| 2.083 | 1.02  | 5.167 | 3.05     | 8.250   | 3.05  | 11.33 | 1.02  |
| 2.167 | 1.02  | 5.250 | 3.05     | 8.333   | 2.03  | 11.42 | 1.02  |
| 2.250 | 1.02  | 5.333 | 7.11     | 8.417   | 2.03  | 11.50 | 1.02  |
| 2.333 | 2.03  | 5.417 | 7.11     | 8.500   | 2.03  | 11.58 | 1.02  |
| 2.417 | 2.03  | 5.500 | 7.11     | 8.583   | 2.03  | 11.67 | 1.02  |
| 2.500 | 2.03  | 5.583 | 7.11     | 8.667   | 2.03  | 11.75 | 1.02  |
| 2.583 | 2.03  | 5.667 | 7.11     | 8.750   | 2.03  | 11.83 | 1.02  |
| 2.667 | 2.03  | 5.750 | 7.11     | 8.833   | 3.05  | 11.92 | 1.02  |
| 2.750 | 2.03  | 5.833 | 49.78    | 8.917   | 3.05  | 12.00 | 1.02  |
| 2.833 | 2.03  | 5.917 | 49.78    | 9.000   | 3.05  | 12.08 | 1.02  |
| 2.917 | 2.03  | 6.000 | 49.78    | 9.083   | 2.03  | 12.17 | 1.02  |

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|            | Langs | taffRd E | A Propos | ed WestDo | onWaters | hd    |      |
|------------|-------|----------|----------|-----------|----------|-------|------|
| 1.083      | 1.02  | 4.167    | 2.03     | 7.250     | 4.06     | 10.33 | 1.02 |
| 1.167      | 1.02  | 4.250    | 2.03     | 7.333     | 3.05     | 10.42 | 1.02 |
| 1.250      | 1.02  | 4.333    | 4.06     | 7.417     | 3.05     | 10.50 | 1.02 |
| 1.333      | 1.02  | 4.417    | 4.06     | 7.500     | 3.05     | 10.58 | 1.02 |
| 1.417      | 1.02  | 4.500    | 4.06     | 7.583     | 3.05     | 10.67 | 1.02 |
| 1.500      | 1.02  | 4.583    | 4.06     | 7.667     | 3.05     | 10.75 | 1.02 |
| 1.583      | 2.03  | 4.667    | 4.06     | 7.750     | 3.05     | 10.83 | 2.03 |
| 1.667      | 2.03  | 4.750    | 4.06     | 7.833     | 4.06     | 10.92 | 2.03 |
| 1.750      | 2.03  | 4.833    | 4.06     | 7.917     | 4.06     | 11.00 | 2.03 |
| 1.833      | 1.02  | 4.917    | 4.06     | 8.000     | 4.06     | 11.08 | 1.02 |
| 1.917      | 1.02  | 5.000    | 4.06     | 8.083     | 3.05     | 11.17 | 1.02 |
| 2.000      | 1.02  | 5.083    | 3.05     | 8.167     | 3.05     | 11.25 | 1.02 |
| 2.083      | 1.02  | 5.167    | 3.05     | 8.250     | 3.05     | 11.33 | 1.02 |
| 2.167      | 1.02  | 5.250    | 3.05     | 8.333     | 2.03     | 11.42 | 1.02 |
| 2.250      | 1.02  | 5.333    | 7.11     | 8.417     | 2.03     | 11.50 | 1.02 |
| 2.333      | 2.03  | 5.417    | 7.11     | 8.500     | 2.03     | 11.58 | 1.02 |
| 2.417      | 2.03  | 5.500    | 7.11     | 8.583     | 2.03     | 11.67 | 1.02 |
| 2.500      | 2.03  | 5.583    | 7.11     | 8.667     | 2.03     | 11.75 | 1.02 |
| 2.583      | 2.03  | 5.667    | 7.11     | 8.750     | 2.03     | 11.83 | 1.02 |
| 2.667      | 2.03  | 5.750    | 7.11     | 8.833     | 3.05     | 11.92 | 1.02 |
| 2.750      | 2.03  | 5.833    | 49.78    | 8.917     | 3.05     | 12.00 | 1.02 |
| 2.833      | 2.03  | 5.917    | 49.78    | 9.000     | 3.05     | 12.08 | 1.02 |
| 2.917      | 2.03  | 6.000    | 49.78    | 9.083     | 2.03     | 12.17 | 1.02 |
| 3.000      | 2.03  | 6.083    | 49.78    | 9.167     | 2.03     | 12.25 | 1.02 |
| 3.083      | 2.03  | 6.167    | 49.78    | 9.250     | 2.03     | l     |      |
| Inten (mm/ | hr)=  | 49 78    |          | 36 58     |          |       |      |

Max.Eff.Inten.(mm/hr)= 5.00 5.85 (ii) 5.00 0.20 over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 10.00 7.15 (ii) PEAK FLOW (cms)= 0.059 (iii) PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 6.25 53.37 6.25 6.25 31.03 52.91 55.37

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
- CN\* = 89.0 Ia = Dep. Storage (Above)
  (ii) TIME STEP (OT) SHOULD BE SMALLER OR EQUAL
  THAN THE STORAGE COEFFICIENT.
  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB | STANDHYD ( 0180) | Area (ha)= 0.65 |ID=1 DT= 5.0 min | Total Imp(%)= 52.00 Dir. Conn.(%)= 52.00 IMPERVIOUS PERVIOUS (i) Surface Area (ha)= 0.31

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| (mm)= | 2.00         | 5.00                    |
|-------|--------------|-------------------------|
| (%)=  | 1.00         | 2.00                    |
| (m)=  | 65.83        | 40.00                   |
| =     | 0.013        | 0.250                   |
|       | (%)=<br>(m)= | (%)= 1.00<br>(m)= 65.83 |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR/   | ANSFORME | D HYETOGR | APH   |       |       |
|-------|-------|-------|----------|-----------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME    | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs     | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250     | 49.78 | 9.33  | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333     | 9.14  | 9.42  | 1.02  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417     | 9.14  | 9.50  | 1.02  |
| 0.333 | 1.02  | 3.417 | 3.05     | 6.500     | 9.14  | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05     | 6.583     | 10.16 | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03     | 6.667     | 10.16 | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03     | 6.750     | 10.16 | 9.83  | 2.03  |
| 0.667 | 1.02  | 3.750 | 2.03     | 6.833     | 5.08  | 9.92  | 2.03  |
| 0.750 | 1.02  | 3.833 | 2.03     | 6.917     | 5.08  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 2.03     | 7.000     | 5.08  | 10.08 | 1.02  |
| 0.917 | 1.02  | 4.000 | 2.03     | 7.083     | 4.06  | 10.17 | 1.02  |
| 1.000 | 1.02  | 4.083 | 2.03     | 7.167     | 4.06  | 10.25 | 1.02  |
| 1.083 | 1.02  | 4.167 | 2.03     | 7.250     | 4.06  | 10.33 | 1.02  |
| 1.167 | 1.02  | 4.250 | 2.03     | 7.333     | 3.05  | 10.42 | 1.02  |
| 1.250 | 1.02  | 4.333 | 4.06     | 7.417     | 3.05  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 4.06     | 7.500     | 3.05  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 4.06     | 7.583     | 3.05  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 4.06     | 7.667     | 3.05  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 4.06     | 7.750     | 3.05  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 4.06     | 7.833     | 4.06  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 4.06     | 7.917     | 4.06  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 4.06     | 8.000     | 4.06  | 11.08 | 1.02  |
| 1.917 | 1.02  | 5.000 | 4.06     | 8.083     | 3.05  | 11.17 | 1.02  |
| 2.000 | 1.02  | 5.083 | 3.05     | 8.167     | 3.05  | 11.25 | 1.02  |
| 2.083 | 1.02  | 5.167 | 3.05     | 8.250     | 3.05  | 11.33 | 1.02  |
| 2.167 | 1.02  | 5.250 | 3.05     | 8.333     | 2.03  | 11.42 | 1.02  |
| 2.250 | 1.02  | 5.333 | 7.11     | 8.417     | 2.03  | 11.50 | 1.02  |
| 2.333 | 2.03  | 5.417 | 7.11     | 8.500     | 2.03  | 11.58 | 1.02  |
| 2.417 | 2.03  | 5.500 | 7.11     | 8.583     | 2.03  | 11.67 | 1.02  |
| 2.500 | 2.03  | 5.583 | 7.11     | 8.667     | 2.03  | 11.75 | 1.02  |
| 2.583 | 2.03  | 5.667 | 7.11     | 8.750     | 2.03  | 11.83 | 1.02  |
| 2.667 | 2.03  | 5.750 | 7.11     | 8.833     | 3.05  | 11.92 | 1.02  |
| 2.750 | 2.03  | 5.833 | 49.78    | 8.917     | 3.05  | 12.00 | 1.02  |
| 2.833 | 2.03  | 5.917 | 49.78    | 9.000     | 3.05  | 12.08 | 1.02  |
| 2.917 | 2.03  | 6.000 | 49.78    | 9.083     | 2.03  | 12.17 | 1.02  |
| 3.000 | 2.03  | 6.083 | 49.78    | 9.167     | 2.03  | 12.25 | 1.02  |
| 3.083 | 2.03  | 6.167 | 49.78    | 9.250     | 2.03  |       |       |

Max.Eff.Inten.(mm/hr) = 49.78 28.42 over (min) 5.00 15.00 Storage Coeff. (min) = 2.63 (ii) 14.30 (ii) Unit Hyd. Tpeak (min) = 5.00 15.00

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|                        | ngstaffRd_E |       |            |      |            |      |
|------------------------|-------------|-------|------------|------|------------|------|
| 1.583 2.0              | 3   4.667   | 4.06  | 7.750      | 3.05 | 10.83      | 2.03 |
| 1.667 2.0              | 3   4.750   | 4.06  | 7.833      | 4.06 | 10.92      | 2.03 |
| 1.750 2.0              | 3   4.833   | 4.06  | 7.917      | 4.06 | 11.00      | 2.03 |
| 1.833 1.0              | 2   4.917   | 4.06  | 8.000      | 4.06 | 11.08      | 1.02 |
| 1.917 1.0              | 2   5.000   | 4.06  | 8.083      | 3.05 | 11.17      | 1.02 |
| 2.000 1.0              | 2   5.083   | 3.05  | 8.167      | 3.05 | 11.25      | 1.02 |
| 2.083 1.0              | 2   5.167   | 3.05  | 8.250      | 3.05 | 11.33      | 1.02 |
| 2.167 1.0              | 2   5.250   | 3.05  | 8.333      | 2.03 | 11.42      | 1.02 |
| 2.250 1.0              | 2   5.333   | 7.11  | 8.417      | 2.03 | 11.50      | 1.02 |
| 2.333 2.0              | 3   5.417   | 7.11  | 8.500      | 2.03 | 11.58      | 1.02 |
| 2.417 2.0              | 3   5.500   | 7.11  | 8.583      | 2.03 | 11.67      | 1.02 |
| 2.500 2.0              | 3   5.583   | 7.11  | 8.667      | 2.03 | 11.75      | 1.02 |
| 2.583 2.0              | 3   5.667   | 7.11  | 8.750      | 2.03 | 11.83      | 1.02 |
| 2.667 2.0              | 3   5.750   | 7.11  | 8.833      | 3.05 | 11.92      | 1.02 |
| 2.750 2.0              | 3   5.833   | 49.78 | 8.917      | 3.05 | 12.00      | 1.02 |
| 2.833 2.0              | 3   5.917   | 49.78 | 9.000      | 3.05 | 12.08      | 1.02 |
| 2.917 2.0              | 3   6.000   | 49.78 | 9.083      | 2.03 | 12.17      | 1.02 |
| 3.000 2.0              | 3 6.083     | 49.78 | 9.167      | 2.03 | 12.25      | 1.02 |
| 3.083 2.0              | 3   6.167   | 49.78 | 9.250      | 2.03 | İ          |      |
| Max.Eff.Inten.(mm/hr)= | 49.78       |       | 25.73      |      |            |      |
| over (min)             | 5.00        |       | 20.00      |      |            |      |
| Storage Coeff. (min)=  | 5.71        | (ii)  | 15.52 (ii) |      |            |      |
| Unit Hyd. Tpeak (min)= | 5.00        |       | 20.00      |      |            |      |
| Unit Hyd. peak (cms)=  | 0.20        |       | 0.07       |      |            |      |
|                        |             |       |            | *T0  | TALS*      |      |
| PEAK FLOW (cms)=       | 0.05        |       | 0.01       | 0    | .052 (iii) |      |
| TIME TO PEAK (hrs)=    | 6.25        |       | 6.42       |      | 5.25       |      |
| RUNOFF VOLUME (mm)=    | 53.37       |       | 21.52      | 4    | 4.44       |      |
| TOTAL RAINFALL (mm)=   | 55.37       |       | 55.37      | 5    | 5.37       |      |
| RUNOFF COEFFICIENT =   | 0.96        |       | 0.39       |      | 0.80       |      |
|                        |             |       |            |      |            |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 79.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0445)       |         |            |            |       |
|-----------------------|---------|------------|------------|-------|
| 1 + 2 = 3             | AREA    | OPEAK      | TPEAK      | R.V.  |
|                       | (ha)    | (cms)      | (hrs)      | (mm)  |
| ID1= 1 ( 0180):       | 0.65    | 0.064      | 6.25       | 39.63 |
| + ID2= 2 ( 0185):     | 0.47    | 0.052      | 6.25       | 44.44 |
| ============          |         |            |            |       |
| ID = 3 ( 0445):       | 1.12    | 0.116      | 6.25       | 41.65 |
| NOTE: PEAK FLOWS DO N | OT INCL | JDE BASEFL | .OWS IF AM | NY.   |

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| Unit Hyd. peak  | (cms)= | 0.29  | 0.08  |             |
|-----------------|--------|-------|-------|-------------|
|                 |        |       |       | *TOTALS*    |
| PEAK FLOW       | (cms)= | 0.05  | 0.02  | 0.064 (iii) |
| TIME TO PEAK    | (hrs)= | 6.25  | 6.33  | 6.25        |
| RUNOFF VOLUME   | (mm)=  | 53.37 | 24.78 | 39.63       |
| TOTAL RAINFALL  | (mm)=  | 55.37 | 55.37 | 55.37       |
| RUNOFF COEFFICI | ENT =  | 0.96  | 0.45  | 0.72        |

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |          |       |         |           |       |  |
|-------------------|-------|----------|-------|---------|-----------|-------|--|
| STANDHYD ( 0185)  | Area  | (ha)=    | 0.47  |         |           |       |  |
| ID= 1 DT= 5.0 min | Total | Imp(%)=  | 72.00 | Dir.    | Conn.(%)= | 72.00 |  |
|                   |       |          |       |         |           |       |  |
|                   |       | IMPERVIO | US    | PERVIOL | IS (i)    |       |  |
| Surface Area      | (ha)= | 0.34     | 1     | 0.13    | :         |       |  |
| Dep. Storage      | (mm)= | 2.00     | )     | 5.00    | )         |       |  |
| Average Slope     | (%)=  | 1.00     | )     | 2.00    | )         |       |  |
| Length            | (m)=  | 240.00   | )     | 20.00   | )         |       |  |
| Mannings n        | =     | 0.013    | ;     | 0.350   | )         |       |  |
|                   |       |          |       |         |           |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | ) HYETOGR | APH   |       |       |
|-------|-------|-------|----------|-----------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME    | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs     | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250     | 49.78 | 9.33  | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333     | 9.14  | 9.42  | 1.02  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417     | 9.14  | 9.50  | 1.02  |
| 0.333 | 1.02  | 3.417 | 3.05     | 6.500     | 9.14  | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05     | 6.583     | 10.16 | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03     | 6.667     | 10.16 | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03     | 6.750     | 10.16 | 9.83  | 2.03  |
| 0.667 | 1.02  | 3.750 | 2.03     | 6.833     | 5.08  | 9.92  | 2.03  |
| 0.750 | 1.02  | 3.833 | 2.03     | 6.917     | 5.08  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 2.03     | 7.000     | 5.08  | 10.08 | 1.02  |
| 0.917 | 1.02  | 4.000 | 2.03     | 7.083     | 4.06  | 10.17 | 1.02  |
| 1.000 | 1.02  | 4.083 | 2.03     | 7.167     | 4.06  | 10.25 | 1.02  |
| 1.083 | 1.02  | 4.167 | 2.03     | 7.250     | 4.06  | 10.33 | 1.02  |
| 1.167 | 1.02  | 4.250 | 2.03     | 7.333     | 3.05  | 10.42 | 1.02  |
| 1.250 | 1.02  | 4.333 | 4.06     | 7.417     | 3.05  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 4.06     | 7.500     | 3.05  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 4.06     | 7.583     | 3.05  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 4.06     | 7.667     | 3.05  | 10.75 | 1.02  |
|       |       |       |          |           |       |       |       |

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 ${\tt LangstaffRd\_EA\_Proposed\_WestDonWatershd}$ 

| ADD HYD ( 0450)                         |      |       |       |       |  |
|---|------|-------|-------|-------|--|
| 1 + 2 = 3                               | AREA | OPEAK | TPEAK | R.V.  |  |
| 1 2 1 2 - 3 1                           | (ha) | (cms) | (hrs) | (mm)  |  |
| ID1= 1 ( 0165):                         | 0.60 | 0.070 | 6.25  | 45.36 |  |
| + ID2= 2 ( 0170):                       | 0.43 | 0.059 | 6.25  | 52.91 |  |
| ======================================= |      |       |       |       |  |
| TD = 3 ( 0450):                         | 1.03 | 0.129 | 6.25  | 48.51 |  |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD ( 0450)                         |
|---|
| 3 + 2 = 1 AREA QPEAK TPEAK R.V.         |
| (ha) (cms) (hrs) (mm)                   |
| ID1= 3 ( 0450): 1.03 0.129 6.25 48.51   |
| + ID2= 2 ( 0445): 1.12 0.116 6.25 41.65 |
|   |
| ID = 1 ( 0450): 2.15 0.245 6.25 44.94   |

| NOTE: PEAK FLOWS                   | DO NOT IN | CLUDE B | ASEFLOWS  | IF ANY.   |         |  |
|------------------------------------|-----------|---------|-----------|-----------|---------|--|
| RESERVOIR( 0520) <br>IN= 2> OUT= 1 | OVERFLO   | W IS OF | F         |           |         |  |
| DT= 5.0 min                        | OUTFLOW   | ST0     | RAGE      | OUTFLOW   | STORAGE |  |
|                                    | (cms)     | (ha     | .m.)      | (cms)     | (ha.m.) |  |
|                                    |           |         |           | 0.0181    |         |  |
|                                    | 0.0081    | 0.0     | 9048 j    | 0.0203    | 0.0732  |  |
|                                    | 0.0123    | 0.0     | 0192      | 0.0224    | 0.1152  |  |
|                                    | 0.0155    | 0.0     | 0372      | 0.0000    | 0.0000  |  |
|                                    |           | AREA    | QPEAK     | TPEAK     | R.V.    |  |
|                                    |           | (ha)    | (cms)     | (hrs)     | (mm)    |  |
| INFLOW : ID= 2 ( 0-                |           |         |           |           |         |  |
| OUTFLOW: ID= 1 ( 0                 | 520)      | 2.150   | 0.019     | 8.08      | 44.87   |  |
| PEA                                | ( FLOW    | REDUCT  | ION [Qout | /Qin](%)= | 7.66    |  |
|                                    |           |         |           | (min)=1   |         |  |
|                                    |           |         |           | (hà.m.)=  |         |  |
|                                    |           |         |           |           |         |  |

| STANDHYD ( 0145) <br> ID= 1 DT= 5.0 min | Area<br>Total | (ha)= 3.<br>Imp(%)= 76. | 05<br>00 Dir. Conn.(%)= | 76.00 |  |
|---|---------------|-------------------------|-------------------------|-------|--|
|   |               | IMPERVIOUS              | PERVIOUS (i)            |       |  |
| Surface Area                            | (ha)=         | 2.32                    | 0.73                    |       |  |
| Dep. Storage                            | (mm)=         | 2.00                    | 5.00                    |       |  |
| Average Slope                           | (%)=          | 1.00                    | 2.00                    |       |  |
| Length                                  | (m)=          | 531.00                  | 40.00                   |       |  |

LangstaffRd\_EA\_Proposed\_WestDonWatershd = 0.013 0.250 Mannings n

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|                  |         | TR/   | ANSFORM | D HYETOGR | APH   |            |      |
|------------------|---------|-------|---------|-----------|-------|------------|------|
| TIME             | RAIN    |       | RAIN    |           |       |            | RAI  |
| hrs              | mm/hr   | hrs   | mm/hr   | ' hrs     | mm/hr | hrs        | mm/h |
| 0.083            | 0.00    | 3.167 | 2.03    | 6.250     | 49.78 | 9.33       | 1.02 |
| 0.167            | 7 0.00  | 3.250 | 2.03    | 6.333     | 9.14  | 9.42       | 1.02 |
| 0.256            | 0.00    | 3.333 | 3.05    | 6.417     | 9.14  | 9.50       | 1.02 |
| 0.333            | 1.02    | 3.417 | 3.05    | 6.500     | 9.14  | 9.58       | 2.03 |
| 0.417            | 7 1.02  | 3.500 | 3.05    | 6.583     | 10.16 | 9.67       | 2.03 |
| 0.500            | 1.02    | 3.583 | 2.03    | 6.667     | 10.16 | 9.75       | 2.03 |
| 0.583            | 3 1.02  | 3.667 |         | 6.750     | 10.16 | 9.83       | 2.03 |
| 0.667            | 7 1.02  | 3.750 | 2.03    | 6.833     | 5.08  | 9.92       | 2.03 |
| 0.756            | 1.02    | 3.833 | 2.03    | 6.917     | 5.08  | 10.00      | 2.03 |
| 0.833            | 1.02    | 3.917 | 2.03    | 7.000     | 5.08  | 10.08      | 1.02 |
| 0.917            | 7 1.02  | 4.000 | 2.03    | 7.083     | 4.06  | 10.17      | 1.02 |
| 1.000            |         | 4.083 |         | 7.167     | 4.06  | 10.25      | 1.02 |
| 1.083            | 1.02    | 4.167 | 2.03    | 7.250     | 4.06  | 10.33      | 1.02 |
| 1.167            | 7 1.02  | 4.250 | 2.03    | 7.333     | 3.05  | 10.42      | 1.02 |
| 1.256            | 1.02    | 4.333 | 4.06    | 7.417     | 3.05  | 10.50      | 1.02 |
| 1.333            |         | 4.417 |         | 7.500     | 3.05  |            | 1.02 |
| 1.417            | 7 1.02  | 4.500 | 4.06    | 7.583     | 3.05  | 10.67      | 1.02 |
| 1.500            | 1.02    | 4.583 | 4.06    | 7.667     | 3.05  | 10.75      | 1.02 |
| 1.583            |         | 4.667 |         | 7.750     | 3.05  |            | 2.03 |
| 1.667            | 7 2.03  | 4.750 | 4.06    | 7.833     | 4.06  | 10.92      | 2.03 |
| 1.756            |         | 4.833 |         | 7.917     | 4.06  | 11.00      | 2.03 |
| 1.833            | 1.02    | 4.917 | 4.06    | 8.000     | 4.06  | 11.08      | 1.02 |
| 1.917            | 7 1.02  | 5.000 | 4.06    | 8.083     | 3.05  | 11.17      | 1.02 |
| 2.000            |         | 5.083 |         | 8.167     | 3.05  |            | 1.02 |
| 2.083            | 3 1.02  | 5.167 | 3.05    | 8.250     | 3.05  | 11.33      | 1.02 |
| 2.167            |         | 5.250 |         | 8.333     | 2.03  |            | 1.02 |
| 2.256            |         | 5.333 |         | 8.417     | 2.03  |            | 1.02 |
| 2.333            |         | 5.417 |         |           | 2.03  |            | 1.02 |
| 2.417            |         | 5.500 | 7.11    |           | 2.03  |            | 1.02 |
| 2.500            |         | 5.583 | 7.11    |           | 2.03  |            | 1.02 |
| 2.583            |         | 5.667 |         | 8.750     | 2.03  |            | 1.02 |
| 2.667            |         | 5.750 |         |           | 3.05  |            | 1.02 |
| 2.756            |         |       |         | 8.917     | 3.05  |            | 1.02 |
| 2.833            |         | 5.917 |         |           | 3.05  |            | 1.02 |
| 2.917            |         |       |         | 9.083     | 2.03  |            | 1.02 |
| 3.000            |         | 6.083 |         |           | 2.03  |            | 1.02 |
| 3.083            | 2.03    | 6.167 | 49.78   | 9.250     | 2.03  |            |      |
| Max.Eff.Inten.(r | nm/hr)= | 49.78 |         | 31.75     |       |            |      |
|                  | (min)   | 10.00 |         | 25.00     |       |            |      |
| Storage Coeff.   | (min)=  | 9.20  | (ii)    | 20.36 (ii | )     |            |      |
| Unit Hyd. Tpeak  |         | 10.00 |         | 25.00     |       |            |      |
| Unit Hyd. peak   | (cms)=  | 0.12  |         | 0.05      |       |            |      |
|                  |         |       |         |           |       | ΓALS*      |      |
| PEAK FLOW        | (cms)=  | 0.31  |         | 0.04      | 0.    | .337 (iii) |      |
|                  |         |       |         |           |       |            |      |

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|                  | Langs   | taffRd_E | A_Propo | sed_WestDon | Waters | hd         |      |
|------------------|---------|----------|---------|-------------|--------|------------|------|
| 1.91             | 7 1.02  | 5.000    | 4.06    | 8.083       | 3.05   | 11.17      | 1.02 |
| 2.000            | 1.02    | 5.083    | 3.05    | 8.167       | 3.05   | 11.25      | 1.02 |
| 2.08             | 3 1.02  | 5.167    | 3.05    | 8.250       | 3.05   | 11.33      | 1.02 |
| 2.16             | 7 1.02  | 5.250    | 3.05    | 8.333       | 2.03   | 11.42      | 1.02 |
| 2.250            | 1.02    | 5.333    | 7.11    | 8.417       | 2.03   | 11.50      | 1.02 |
| 2.33             | 3 2.03  | 5.417    | 7.11    | 8.500       | 2.03   | 11.58      | 1.02 |
| 2.41             | 7 2.03  | 5.500    | 7.11    | 8.583       | 2.03   | 11.67      | 1.02 |
| 2.500            | 2.03    | 5.583    | 7.11    | 8.667       | 2.03   | 11.75      | 1.02 |
| 2.58             | 3 2.03  | 5.667    | 7.11    | 8.750       | 2.03   | 11.83      | 1.02 |
| 2.66             | 7 2.03  | 5.750    | 7.11    | 8.833       | 3.05   | 11.92      | 1.02 |
| 2.750            | 2.03    | 5.833    | 49.78   | 8.917       | 3.05   | 12.00      | 1.02 |
| 2.83             | 3 2.03  | 5.917    | 49.78   | 9.000       | 3.05   | 12.08      | 1.02 |
| 2.91             | 7 2.03  | 6.000    | 49.78   | 9.083       | 2.03   | 12.17      | 1.02 |
| 3.000            | 2.03    | 6.083    | 49.78   | 9.167       | 2.03   | 12.25      | 1.02 |
| 3.08             | 3 2.03  | 6.167    | 49.78   | 9.250       | 2.03   | l          |      |
|                  |         |          |         |             |        |            |      |
| Max.Eff.Inten.(r | mm/hr)= | 49.78    |         | 30.62       |        |            |      |
|                  | (min)   | 10.00    |         | 15.00       |        |            |      |
| Storage Coeff.   | (min)=  | 8.90     | (ii)    | 10.15 (ii)  |        |            |      |
| Unit Hyd. Tpeak  | (min)=  | 10.00    |         | 15.00       |        |            |      |
| Unit Hyd. peak   | (cms)=  | 0.12     |         | 0.10        |        |            |      |
|                  |         |          |         |             |        | TALS*      |      |
| PEAK FLOW        | (cms)=  | 0.19     |         | 0.00        |        | .188 (iii) | )    |
| TIME TO PEAK     | (hrs)=  | 6.25     |         | 6.33        |        | 5.25       |      |
| RUNOFF VOLUME    | (mm)=   | 53.37    |         | 25.69       |        | 3.09       |      |
| TOTAL RAINFALL   | (mm)=   | 55.37    |         | 55.37       |        | 5.37       |      |
| RUNOFF COEFFICI  | ENT =   | 0.96     |         | 0.46        | (      | 9.96       |      |
|                  |         |          |         |             |        |            |      |
|                  |         |          |         |             |        |            |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 84.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ID= 1 DT= 5.0 min | Total | Imp(%)=  | 91.00 | Dir.    | Conn.( |
|-------------------|-------|----------|-------|---------|--------|
|                   |       | IMPERVIO | OUS   | PERVIOL | JS (i) |
| Surface Area      | (ha)= | 1.16     | 5     | 0.11    | L `´   |
| Dep. Storage      | (mm)= | 2.00     | 9     | 5.00    | 9      |
| Average Slope     | (%)=  | 1.00     | 9     | 2.00    | 9      |
| Length            | (m)=  | 503.00   | 9     | 25.00   | 9      |
| Mannings n        | =     | 0.013    | 3     | 0.256   | 9      |
|                   |       |          |       |         |        |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ---TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN

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| TIME TO PEAK    | (hrs)= | 6.25  | 6.50  | 6.25  |
|-----------------|--------|-------|-------|-------|
| RUNOFF VOLUME   | (mm)=  | 53.37 | 27.66 | 47.20 |
| TOTAL RAINFALL  | (mm)=  | 55.37 | 55.37 | 55.37 |
| RUNOFF COEFFICI | ENT =  | 0.96  | 0.50  | 0.85  |
|                 |        |       |       |       |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 86.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |         |       |         |           |       |
|-------------------|-------|---------|-------|---------|-----------|-------|
| STANDHYD ( 0135)  | Area  | (ha)=   | 1.43  |         |           |       |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 99.00 | Dir.    | Conn.(%)= | 99.00 |
|                   |       |         |       |         |           |       |
|                   |       | IMPERVI | OUS   | PERVIOL | IS (i)    |       |
| Surface Area      | (ha)= | 1.4     | 2     | 0.01    |           |       |
| Dep. Storage      | (mm)= | 2.0     | 0     | 5.00    | )         |       |
| Average Slope     | (%)=  | 1.0     | 0     | 2.00    | )         |       |
| Length            | (m)=  | 503.0   | 0     | 30.00   | )         |       |
| Mannings n        | ` =   | 0.01    | 3     | 0.256   | )         |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       | TRANSFORMED HYETOGRAPH |       |       |        |       |       |       |  |  |  |  |  |
|-------|------------------------|-------|-------|--------|-------|-------|-------|--|--|--|--|--|
| TIME  | RAIN                   | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |  |  |  |  |
| hrs   | mm/hr                  | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |  |  |  |  |
| 0.083 | 0.00                   | 3.167 | 2.03  | 6.250  | 49.78 | 9.33  | 1.02  |  |  |  |  |  |
| 0.167 | 0.00                   | 3.250 | 2.03  | 6.333  | 9.14  | 9.42  | 1.02  |  |  |  |  |  |
| 0.250 | 0.00                   | 3.333 | 3.05  | 6.417  | 9.14  | 9.50  | 1.02  |  |  |  |  |  |
| 0.333 | 1.02                   | 3.417 | 3.05  | 6.500  | 9.14  | 9.58  | 2.03  |  |  |  |  |  |
| 0.417 | 1.02                   | 3.500 | 3.05  | 6.583  | 10.16 | 9.67  | 2.03  |  |  |  |  |  |
| 0.500 | 1.02                   | 3.583 | 2.03  | 6.667  | 10.16 | 9.75  | 2.03  |  |  |  |  |  |
| 0.583 | 1.02                   | 3.667 | 2.03  | 6.750  | 10.16 | 9.83  | 2.03  |  |  |  |  |  |
| 0.667 | 1.02                   | 3.750 | 2.03  | 6.833  | 5.08  | 9.92  | 2.03  |  |  |  |  |  |
| 0.750 | 1.02                   | 3.833 | 2.03  | 6.917  | 5.08  | 10.00 | 2.03  |  |  |  |  |  |
| 0.833 | 1.02                   | 3.917 | 2.03  | 7.000  | 5.08  | 10.08 | 1.02  |  |  |  |  |  |
| 0.917 | 1.02                   | 4.000 | 2.03  | 7.083  | 4.06  | 10.17 | 1.02  |  |  |  |  |  |
| 1.000 | 1.02                   | 4.083 | 2.03  | 7.167  | 4.06  | 10.25 | 1.02  |  |  |  |  |  |
| 1.083 | 1.02                   | 4.167 | 2.03  | 7.250  | 4.06  | 10.33 | 1.02  |  |  |  |  |  |
| 1.167 | 1.02                   | 4.250 | 2.03  | 7.333  | 3.05  | 10.42 | 1.02  |  |  |  |  |  |
| 1.250 | 1.02                   | 4.333 | 4.06  | 7.417  | 3.05  | 10.50 | 1.02  |  |  |  |  |  |
| 1.333 | 1.02                   | 4.417 | 4.06  | 7.500  | 3.05  | 10.58 | 1.02  |  |  |  |  |  |
| 1.417 | 1.02                   | 4.500 | 4.06  | 7.583  | 3.05  | 10.67 | 1.02  |  |  |  |  |  |
| 1.500 | 1.02                   | 4.583 | 4.06  | 7.667  | 3.05  | 10.75 | 1.02  |  |  |  |  |  |
| 1.583 | 2.03                   | 4.667 | 4.06  | 7.750  | 3.05  | 10.83 | 2.03  |  |  |  |  |  |
| 1.667 | 2.03                   | 4.750 | 4.06  | 7.833  | 4.06  | 10.92 | 2.03  |  |  |  |  |  |
| 1.750 | 2.03                   | 4.833 | 4.06  | 7.917  | 4.06  | 11.00 | 2.03  |  |  |  |  |  |
| 1.833 | 1.02                   | 4.917 | 4.06  | 8.000  | 4.06  | 11.08 | 1.02  |  |  |  |  |  |

| hr              |         |                | mm/hr | sed_WestDo | mm/hr        |                  | mm/hr |
|-----------------|---------|----------------|-------|------------|--------------|------------------|-------|
| 0.08            |         |                | 2.03  |            | 49.78        |                  | 1.02  |
| 0.16            |         | 3.250          | 2.03  |            | 9.14         |                  | 1.02  |
| 0.25            |         |                | 3.05  |            | 9.14         |                  | 1.02  |
| 0.33            |         | 3.417          | 3.05  |            | 9.14         |                  | 2.03  |
| 0.41            |         |                | 3.05  |            | 10.16        |                  | 2.03  |
| 0.50            |         |                |       | 6.667      | 10.16        |                  | 2.03  |
| 0.58            |         |                |       | 6.750      | 10.16        |                  | 2.03  |
| 0.66            |         | 3.750          | 2.03  |            | 5.08         |                  | 2.03  |
| 0.75            |         | 3.833          |       | 6.917      | 5.08         |                  | 2.03  |
| 0.83            |         | 3.917          | 2.03  |            | 5.08         |                  | 1.02  |
| 0.91            |         | 4.000          | 2.03  |            | 4.06         |                  | 1.02  |
| 1.00            |         | 4.083          | 2.03  |            | 4.06         |                  | 1.02  |
| 1.08            |         | 4.167          | 2.03  |            | 4.06         |                  | 1.02  |
| 1.16            |         | 4.250          |       | 7.230      | 3.05         |                  | 1.02  |
| 1.25            |         | 4.333          | 4.06  |            | 3.05         |                  | 1.02  |
| 1.33            |         | 4.417          | 4.06  |            | 3.05         |                  | 1.02  |
| 1.41            |         | 4.417          |       | 7.583      | 3.05         |                  | 1.02  |
|                 |         | 4.583          | 4.06  |            | 3.05         |                  | 1.02  |
| 1.50<br>1.58    |         | 4.565          | 4.06  |            | 3.05         |                  | 2.03  |
| 1.66            |         | 4.750          | 4.06  |            | 4.06         |                  | 2.03  |
| 1.00            |         | 4.730          | 4.06  |            | 4.06         |                  | 2.03  |
|                 |         | 4.833          | 4.06  |            | 4.06         |                  |       |
| 1.83<br>1.91    |         |                | 4.06  |            |              |                  | 1.02  |
|                 |         |                | 3.05  |            | 3.05<br>3.05 |                  | 1.02  |
| 2.00            |         |                |       |            | 3.05         |                  | 1.02  |
| 2.08<br>2.16    |         | 5.167<br>5.250 | 3.05  | 8.250      | 2.03         |                  | 1.02  |
| 2.16            |         |                |       |            | 2.03         |                  | 1.02  |
| 2.25            |         |                | 7.11  | 8.417      | 2.03         |                  | 1.02  |
|                 |         |                |       |            |              |                  |       |
| 2.41            |         |                | 7.11  |            | 2.03         |                  | 1.02  |
| 2.50            |         |                |       | 8.667      | 2.03         |                  | 1.02  |
| 2.58<br>2.66    |         |                | 7.11  | 8.750      | 2.03         |                  | 1.02  |
|                 |         |                |       |            | 3.05         |                  |       |
| 2.75            |         | 5.833          |       | 8.917      | 3.05         |                  | 1.02  |
| 2.83            |         |                | 49.78 |            | 3.05         |                  | 1.02  |
| 2.91<br>3.00    |         | 6.000          | 49.78 | 9.083      | 2.03         | 12.17<br>  12.25 | 1.02  |
| 3.08            |         | 6.083<br>6.167 |       | 9.167      | 2.03         |                  | 1.02  |
| Max.Eff.Inten.( | mm/hr)= | 49.78          |       | 29.56      |              |                  |       |
|                 | (min)   | 10.00          |       | 15.00      |              |                  |       |
| Storage Coeff.  | (min)=  |                | (ii)  | 11.69 (ii  | )            |                  |       |
| Unit Hyd. Tpeak |         | 10.00          | . ,   | 15.00      |              |                  |       |
| Unit Hyd. peak  | (cms)=  | 0.12           |       | 0.09       |              |                  |       |
|                 | . /     |                |       |            | *T0          | TALS*            |       |
| PEAK FLOW       | (cms)=  | 0.15           |       | 0.01       | 0            | .160 (iii        | )     |
| TIME TO PEAK    | (hrs)=  | 6.25           |       | 6.33       |              | 6.25             |       |
| RUNOFF VOLUME   | (mm)=   | 53.37          |       | 24.78      |              | 0.79             |       |
| TOTAL RAINFALL  | (mm)=   | 55.37          |       | 55.37      |              | 5.37             |       |
| RUNOFF COEFFICI |         | 0.96           |       | 0.45       |              | 0.92             |       |

LangstaffRd\_EA\_Proposed\_WestDonWatershd
CN\* = 83.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0420)| | 1 + 2 = 3 | QPEAK (cms) 0.188 0.160 R.V. (mm) 53.09 50.79 AREA TPEAK (ha) 1.43 1.27 (hrs) 6.25 6.25 ID = 3 ( 0420): 2.70 0.348 6.25 52.01

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| RESERVOIR( 0530)| | IN= 2---> OUT= 1 | DT= 5.0 min OVERFLOW IS OFF OUTFLOW (ha.m.) 0.0000 0.0072 0.0283 0.0553 (ha.m.) 0.0823 0.1093 (cms) 0.0000 (cms) 0.0122 0.0056 0.0084 0.0105 0.0382 0.0516 0.0000 TPEAK (hrs) 6.25 7.42 (ha) 2.700 2.700 (cms) 0.348 0.028 (mm) 52.01 51.89 INFLOW : ID= 2 ( 0420) OUTFLOW: ID= 1 ( 0530)

PEAK FLOW REDUCTION [Qout/Qin](%)= 7.91
TIME SHIFT OF PEAK FLOW (min)= 70.00
MAXIMUM STORAGE USED (ha.m.)= 0.0983

ADD HYD ( 0425)| 1 + 2 = 3 | QPEAK (cms) 0.337 0.028 R.V. (mm) 47.20 51.89 ARFA TPFAK (hrs) 6.25 7.42 ID = 3 ( 0425): 5.75 6.25 49.40 0.348

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| RESERVOIR( 0512)| | IN= 2---> OUT= 1 | OVERFLOW IS OFF

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|                  | Langs   | staffRd_E | A_Propos | sed_WestDon | Waters | hd         |      |
|------------------|---------|-----------|----------|-------------|--------|------------|------|
| 1.500            | 1.02    | 4.583     | 4.06     | 7.667       | 3.05   | 10.75      | 1.02 |
| 1.583            | 3 2.03  | 4.667     | 4.06     | 7.750       | 3.05   | 10.83      | 2.03 |
| 1.667            | 7 2.03  | 4.750     | 4.06     | 7.833       | 4.06   | 10.92      | 2.03 |
| 1.756            | 2.03    | 4.833     | 4.06     | 7.917       | 4.06   | 11.00      | 2.03 |
| 1.833            | 1.02    | 4.917     | 4.06     | 8.000       | 4.06   | 11.08      | 1.02 |
| 1.917            | 7 1.02  | 5.000     | 4.06     | 8.083       | 3.05   | 11.17      | 1.02 |
| 2.000            |         |           |          | 8.167       | 3.05   |            | 1.02 |
| 2.083            |         |           | 3.05     |             | 3.05   |            | 1.02 |
| 2.167            |         |           | 3.05     |             | 2.03   |            | 1.02 |
| 2.256            |         |           |          | 8.417       | 2.03   |            | 1.02 |
| 2.333            |         |           |          | 8.500       | 2.03   |            | 1.02 |
| 2.417            |         | 5.500     | 7.11     |             | 2.03   |            | 1.02 |
| 2.500            |         |           | 7.11     |             | 2.03   |            | 1.02 |
| 2.583            |         | 5.667     |          |             | 2.03   |            | 1.02 |
| 2.667            |         | 5.750     |          | 8.833       | 3.05   |            | 1.02 |
| 2.756            |         | 5.833     |          | 8.917       | 3.05   |            | 1.02 |
| 2.833            |         | 5.917     |          | 9.000       | 3.05   |            | 1.02 |
| 2.917            |         |           |          | 9.083       | 2.03   |            | 1.02 |
| 3.000            |         |           | 49.78    |             | 2.03   |            | 1.02 |
| 3.083            | 2.03    | 6.167     | 49.78    | 9.250       | 2.03   | l          |      |
| Max.Eff.Inten.(r | nm/hr)= | 49.78     |          | 29.56       |        |            |      |
| over             | (min)   | 5.00      |          | 15.00       |        |            |      |
| Storage Coeff.   | (min)=  | 5.99      | (ii)     | 10.39 (ii)  |        |            |      |
| Unit Hyd. Tpeak  | (min)=  | 5.00      |          | 15.00       |        |            |      |
| Unit Hyd. peak   | (cms)=  | 0.19      |          | 0.09        |        |            |      |
|                  |         |           |          |             | *T0    | TALS*      |      |
| PEAK FLOW        | (cms)=  | 0.06      |          | 0.01        | 0      | .072 (iii) |      |
| TIME TO PEAK     | (hrs)=  | 6.25      |          | 6.33        |        | 6.25       |      |
| RUNOFF VOLUME    | (mm)=   | 53.37     |          | 24.78       | 4      | 7.93       |      |
| TOTAL RAINFALL   | (mm)=   | 55.37     |          | 55.37       | 5      | 5.37       |      |
| RUNOFF COEFFICIE | NT =    | 0.96      |          | 0.45        |        | 0.87       |      |
|                  |         |           |          |             |        |            |      |
|                  |         |           |          |             |        |            |      |

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 83.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (OT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB                                   |               |                  |               |        |           |       |  |
|---|---------------|------------------|---------------|--------|-----------|-------|--|
| STANDHYD ( 0220) <br> ID= 1 DT= 5.0 min | Area<br>Total | (ha)=<br>Imp(%)= | 0.65<br>66.00 | Dir.   | Conn.(%)= | 66.00 |  |
|   |               | IMPERVIO         | US            | PERVIO | JS (i)    |       |  |
| Surface Area                            | (ha)=         | 0.43             |               | 0.22   | <u>)</u>  |       |  |
| Dep. Storage                            | (mm)=         | 2.00             |               | 5.00   | •         |       |  |
| Average Slope                           | (%)=          | 1.00             |               | 2.00   | 9         |       |  |
| Length                                  | (m)=          | 260.00           |               | 20.00  | 9         |       |  |
| Mannings n                              | =             | 0.013            |               | 0.256  | 9         |       |  |

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|  | Langet       | offed E  | N Bronor  | ed WestDo         | nHatone  | hd  |         |
|--|--------------|----------|-----------|-------------------|----------|---|---------|
| DT= 5.0 min                                |              |          |           | OUTFLO            |          |   |         |
| 7 51- 510 11211                            | (cms)        |          |           | (cms)             |          |   |         |
|  | à aga        | a a      | 0000      | 0 047             | 1 (      | 0.1003  |         |
|  | 0.000        | 1 0.     | 0165      | 0.047<br>0.063    | 6 6      | 0.1284  |         |
|  | 0.009        |          | 0331      | 0.076             | 3 6      | 0.1594  |         |
|  | 0.011        |          |           | 0.087             | a 6      |   |         |
|  | 0.013        |          | 0750      | 0.096             | 4 6      | 0.1934<br>0.2308  |         |
|  | *****        |          |           |                   |          |   |         |
|  |              | AREA     | OPEAK     | TPEA              | K        | R.V.  |         |
|  |              | (ha)     | (cms)     | TPEA<br>(hrs      | )        | (mm)  |         |
| INFLOW : ID= 2 ( 04                        | 25)          | 5.750    | 0.34      | 48 <sup>`</sup> 6 | .25      | 49.40   |         |
| INFLOW : ID= 2 ( 04<br>OUTFLOW: ID= 1 ( 05 | 12)          | 5.750    | 0.0       | 52 8              | .33      | 49.30   |         |
|  |              |          |           |                   |          |   |         |
| PEAK                                       | FLOW         | REDUCT   | ION [Qou  | ut/Qin](%         | )= 14.98 | 3   |         |
| TIME                                       | SHIFT 0      | F PEAK F | LOW       | (min              | )=125.00 | •   |         |
| MAXI                                       | MUM STO      | RAGE U   | SED       | (ha.m.            | )= 0.16  | 988   |         |
|  |              |          |           |                   |          |   |         |
|  |              |          |           |                   |          |   |         |
|  |              |          |           |                   |          |   |         |
| CALIB                                      |              |          |           |                   |          |   |         |
| STANDHYD ( 0215)                           | Area         | (ha)=    | 0.58      |                   |          |   |         |
| ID= 1 DT= 5.0 min                          | Total Im     | p(%)= 8  | 1.00 [    | Dir. Conn         | .(%)= 8  | 31.00   |         |
|  |              |          |           |                   |          |   |         |
|  |              | MPERVIOU | S PER     | RVIOUS (i         | )        |   |         |
| Surface Area (                             | ha)=         | 0.47     |           | 0.11              |          |   |         |
| Dep. Storage (                             | mm)=         | 2.00     |           | 5.00              |          |   |         |
| Average Slope                              | (%)=<br>(m)= | 1.00     |           | 2.00              |          |   |         |
|  |              |          |           | 30.00             |          |   |         |
| Mannings n                                 | =            | 0.013    | (         | 0.250             |          |   |         |
| NOTE: RAINFAL                              | L HAC TO     | ANCEODME | D TO 1    | C MTN             | TTME CT  | - n   |         |
| NOTE: RAINFAL                              | L WAS IR     | ANSFURME | U 10 :    | o.e min.          | ITME 210 | · .   |         |
|  |              |          |           |                   |          |   |         |
|  |              | TDA      | NC EODMEI | HYETOGR           | ADLI     |   |         |
| TIME                                       |              |          |           | TIME              |          |   | RAIN    |
| h  | (1           | In comme | man Harr  | ii baa            | / In     | i boo   | and the |
| 0.083                                      | 0.00         | 3.167    | 2.03      | 6.250             | 49.78    | 9.33  | 1.02    |
| 0.167                                      | 0.00         | 3.250    | 2.03      | 6.333             | 9.14     | 9.42  | 1.02    |
| 0.250                                      | 0.00         | 3.333    | 3.05      | 6.417             | 9.14     | 9.33<br>9.42<br>9.50<br>9.58<br>9.67<br>9.75<br>9.83<br>9.92        | 1.02    |
| 0.333                                      | 1.02         | 3.417    | 3.05      | 6.500             | 9.14     | 9.58  | 2.03    |
| 0.417                                      | 1.02         | 3.500    | 3.05      | 6.583             | 10.16    | 9.67  | 2.03    |
| 0.500                                      | 1.02         | 3.583    | 2.03      | 6.667             | 10.16    | 9.75  | 2.03    |
| 0.583                                      | 1.02         | 3.667    | 2.03      | 6.750             | 10.16    | 9.83  | 2.03    |
| 0.667                                      | 1.02         | 3.750    | 2.03      | 6.833             | 5.08     | 9.92  | 2.03    |
| 0.750                                      | 1.02         | 3.833    | 2.03      | 6.917             | 5.08     | 10.00   | 2.03    |
| 0.833                                      | 1.02         | 3.917    | 2.03      | 7.000             | 5.08     | 10.08   | 1.02    |
| 0.917                                      | 1.02         | 4.000    | 2.03      | 7.083             | 4.06     | 10.17   | 1.02    |
| 1.000                                      | 1.02         | 4.083    | 2.03      | 7.167             | 4.06     | 10.25   | 1.02    |
| 1.083                                      | 1.02         | 4.167    | 2.03      | 7.250             | 4.06     | 9.92<br>10.00<br>10.08<br>10.17<br>10.25<br>10.33<br>10.42<br>10.50 | 1.02    |
| 1.167                                      | 1.02         | 4.250    | 2.03      | 7.333             | 3.05     | 10.42   | 1.02    |
| 1.250                                      | 1.02         | 4.333    | 4.06      | 7.417             | 3.05     | 10.50   | 1.02    |
| 1.333                                      | 1.02         | 4.417    | 4.06      | 7.500             | 3.05     | 10.58   | 1.02    |

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 ${\tt LangstaffRd\_EA\_Proposed\_WestDonWatershd}$ NOTE

| NOTE:  | RAINFAL   | L WAS TE | RANSFORM | D TO  | 5.0 MIN.                         | TIME ST | EP.   |       |
|--|-----------|----------|----------|-------|----------------------------------|---------|-------|-------|
|  |           |          |          |       |                                  |         |       |       |
|  |           |          |          |       |                                  |         |       |       |
|  |           |          |          |       | ED HYETOGR                       |         |       |       |
|  | TIME      | RAIN     | TIME     | RAIN  | ' TIME                           | RAIN    | TIME  | RAIN  |
|  | hrs       | mm/hr    | hrs      | mm/hr | ' hrs                            | mm/hr   | hrs   | mm/hr |
|  | 0.083     | 0.00     | 3.167    | 2.03  | 6.250                            | 49.78   | 9.33  | 1.02  |
|  | 0.167     | 0.00     | 3.250    | 2.03  | 6.333                            | 9.14    | 9.42  | 1.02  |
|  | 0.250     | 0.00     | 3.333    | 3.05  | 6.417                            | 9.14    | 9.50  | 1.02  |
|  | 0.333     | 1.02     | 3.417    | 3.05  | 6.417<br>6.500<br>6.583<br>6.667 | 9.14    | 9.58  | 2.03  |
|  | 0.417     | 1.02     | 3.500    | 3.05  | 6.583                            | 10.16   | 9.67  | 2.03  |
|  | 0.500     | 1.02     | 3.583    | 2.03  | 6.667                            | 10.16   | 9.75  | 2.03  |
|  | 0.583     | 1.02     | 3.667    | 2.03  | 6.750                            | 10.16   | 9.83  | 2.03  |
|  | 0.667     | 1.02     | 3.750    | 2.03  | 6.833                            | 5.08    | 9.92  | 2.03  |
|  | 0.750     | 1.02     | 3.833    | 2.03  | 6.917<br>7.000                   | 5.08    | 10.00 | 2.03  |
|  | 0.833     | 1.02     | 3.917    | 2.03  | 7.000                            | 5.08    | 10.08 | 1.02  |
|  | 0.917     | 1.02     | 4.000    | 2.03  | 7.083                            | 4.06    | 10.17 | 1.02  |
|  | 1.000     | 1.02     | 4.083    | 2.03  | 7.167                            | 4.06    | 10.25 | 1.02  |
|  | 1.083     | 1.02     | 4.167    | 2.03  | 7.250                            | 4.06    | 10.33 | 1.02  |
|  | 1.167     | 1.02     | 4.250    | 2.03  | 7.250                            | 3.05    | 10.42 | 1.02  |
|  | 1.250     | 1.02     | 4.333    | 4.06  | 7.417                            | 3.05    | 10.50 | 1.02  |
|  | 1.333     | 1.02     | 4.417    | 4.06  | 7.500                            | 3.05    | 10.58 | 1.02  |
|  | 1.417     | 1.02     | 4.500    | 4.06  | 7.583                            | 3.05    | 10.67 | 1.02  |
|  | 1.500     | 1.02     | 4.583    | 4.06  | 7.667                            | 3.05    | 10.75 | 1.02  |
|  | 1.583     | 2.03     | 4.667    | 4.06  | 7.750                            | 3.05    | 10.83 | 2.03  |
|  | 1.667     | 2.03     | 4.750    | 4.06  | 7.750                            | 4.06    | 10.92 | 2.03  |
|  | 1.750     | 2.03     | 4.833    | 4.06  | 7.917                            | 4.06    | 11.00 | 2.03  |
|  | 1.833     | 1.02     | 4.917    | 4.06  | 7.917                            | 4.06    | 11.08 | 1.02  |
|  | 1.917     | 1.02     | 5.000    | 4.06  | 8.083                            | 3.05    | 11.17 | 1.02  |
|  | 2.000     | 1.02     | 5.083    | 3.05  | 8.083<br>8.167                   | 3.05    | 11.25 | 1.02  |
|  | 2.083     | 1.02     | 5.167    | 3.05  | 8.250                            | 3.05    | 11.33 | 1.02  |
|  | 2.167     | 1.02     | 5.250    | 3.05  | 8.333                            | 2.03    | 11.42 | 1.02  |
|  | 2.250     | 1.02     | 5.333    | 7.11  | 8.417                            | 2.03    | 11.50 | 1.02  |
|  | 2.333     | 2.03     | 5.417    | 7.11  | 8.500                            | 2.03    | 11.58 | 1.02  |
|  | 2.417     | 2.03     | 5.500    | 7.11  | 8.583                            | 2.03    | 11.67 | 1.02  |
|  | 2.500     | 2.03     | 5.583    | 7.11  | 8.667                            | 2.03    | 11.75 | 1.02  |
|  | 2.583     | 2.03     | 5.667    | 7.11  | 8.750                            | 2.03    | 11.83 | 1.02  |
|  | 2.667     | 2.03     | 5.750    | 7.11  | 8.833                            | 3.05    | 11.92 | 1.02  |
|  | 2.750     | 2.03     | 5.833    | 49.78 | 8.917<br>9.000                   | 3.05    | 12.00 | 1.02  |
|  | 2.833     | 2.03     | 5.917    | 49.78 | 9.000                            | 3.05    | 12.08 | 1.02  |
|  | 2.917     | 2.03     | 6.000    | 49.78 | 9.083                            | 2.03    | 12.17 | 1.02  |
|  | 3.000     | 2.03     | 6.083    | 49.78 | 9.167                            | 2.03    | 12.25 | 1.02  |
|  | 3.083     | 2.03     | 6.167    | 49.78 | 9.250                            | 2.03    | İ     |       |
| Max.Eff.Ir   | nten.(mm/ | hr)=     | 49.78    |       | 29.56                            |         |       |       |
| Max.Eff.Ir<br>Storage Co<br>Unit Hyd.<br>Unit Hyd. | over (m   | in)      | 5.00     |       | 15.00                            |         |       |       |
| Storage Co   | eff. (m   | in)=     | 5.99     | (ii)  | 10.71 (ii                        | )       |       |       |
| Unit Hyd.  | Tpeak (m  | in)=     | 5.00     |       | 15.00                            |         |       |       |
| Unit Hyd.<br>Unit Hyd.                             | peak (c   | ms)=     | 0.19     |       | 0.09                             |         |       |       |
|  |           | ,        |          |       |                                  | ****    | TALC* |       |

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0.06 6.25 53.37 0.01

PEAK FLOW TIME TO PEAK RUNOFF VOLUME

(cms)= (hrs)= (mm)=

\*TOTALS\* 0.073 (iii) 6.25 43.64

#### LangstaffRd\_EA\_Proposed\_WestDonWatershd 1)= 55.37 55.37 55.3 = 0.96 0.45 0.7 TOTAL RAINFALL (mm)= NT = RUNOFF COEFFICIENT

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: CN\* = 83.0 Ia = Dep. Storage (Above) (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COFFFICIENT. (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD ( 0470)| 1 + 2 = 3 AREA QPEAK (ha) 0.58 (cms) 0.072 (hrs) 6.25 (mm) 47.93 ID1= 1 ( 0215): + ID2= 2 ( 0220): 0.65 43.64 ID = 3 ( 0470): 1.23 6.25 45.67

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR( 0535) IN= 2---> OUT= 1 | DT= 5.0 min | OVERFLOW IS OFF OUTFLOW STORAGE OUTFI OW STORAGE (cms) 0.0000 0.0053 (ha.m.) 0.0000 0.0048 (cms) 0.0116 0.0131 0.0080 0.0154 0.0202 0.0639 0.0100 0.0261 0.0000 QPEAK (cms) 0.144 0.011 ΔRFΔ TPFΔK R V PEAK FLOW REDUCTION [Qout/Qin](%)=
TIME SHIFT OF PEAK FLOW (min)= (
MAXIMUM STORAGE USED (ha.m.)= (min)= 65.00 (ha.m.)= 0.0358

| CALIB | STANDHYD ( 0225) |ID= 1 DT= 5.0 min | Area (ha)= 0.60 Total Imp(%)= 83.00 Dir. Conn.(%)= 83.00 IMPERVIOUS PERVIOUS (i) (ha)= (mm)= (%)= (m)= 0.50 2.00 1.00 320.00 0.10 5.00 2.00 10.00 Surface Area Dep. Storage Average Slope Length

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# LangstaffRd\_EA\_Proposed\_WestDonWatershd 5)= 6.25 6.25 6.2 1)= 53.37 24.78 48.5 TIME TO PEAK (hrs)= RUNOFF VOLUME (mm)= TOTAL RAINFALL (mm)= RUNOFF COEFFICIENT = 55.37

0.88

TIME TO PEAK RUNOFF VOLUME TOTAL RAINFALL

| CALIB  <br>  STANDHYD ( 0230) <br> ID= 1 DT= 5.0 min | Area<br>Total | (ha)=<br>Imp(%)= | 0.70<br>66.00 | Dir. Conn.(%) | = 66.00 |
|--|---------------|------------------|---------------|---------------|---------|
|  |               | IMPERVIO         | OUS           | PERVIOUS (i)  |         |
| Surface Area   | (ha)=         | 0.46             | 5             | 0.24          |         |
| Dep. Storage   | (mm)=         | 2.00             | 9             | 5.00          |         |
| Average Slope  | (%)=          | 1.00             | 9             | 2.00          |         |
| Length   | (m)=          | 320.00           | 9             | 25.00         |         |
| Mannings n   | ` =           | 0.01             | 3             | 0.300         |         |
| · ·  |               |                  |               |               |         |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250   | 49.78 | 9.33  | 1.02  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333   | 9.14  | 9.42  | 1.02  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417   | 9.14  | 9.50  | 1.02  |
| 0.333 | 1.02  | 3.417 | 3.05     | 6.500   | 9.14  | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05     | 6.583   | 10.16 | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03     | 6.667   | 10.16 | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 2.03     | 6.750   | 10.16 | 9.83  | 2.03  |
| 0.667 | 1.02  | 3.750 | 2.03     | 6.833   | 5.08  | 9.92  | 2.03  |
| 0.750 | 1.02  | 3.833 | 2.03     | 6.917   | 5.08  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 2.03     | 7.000   | 5.08  | 10.08 | 1.02  |
| 0.917 | 1.02  | 4.000 | 2.03     | 7.083   | 4.06  | 10.17 | 1.02  |
| 1.000 | 1.02  | 4.083 | 2.03     | 7.167   | 4.06  | 10.25 | 1.02  |
| 1.083 | 1.02  | 4.167 | 2.03     | 7.250   | 4.06  | 10.33 | 1.02  |
| 1.167 | 1.02  | 4.250 | 2.03     | 7.333   | 3.05  | 10.42 | 1.02  |
| 1.250 | 1.02  | 4.333 | 4.06     | 7.417   | 3.05  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 4.06     | 7.500   | 3.05  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 4.06     | 7.583   | 3.05  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 4.06     | 7.667   | 3.05  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 4.06     | 7.750   | 3.05  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 4.06     | 7.833   | 4.06  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 4.06     | 7.917   | 4.06  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 4.06     | 8.000   | 4.06  | 11.08 | 1.02  |

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LangstaffRd\_EA\_Proposed\_WestDonWatershd = 0.013 0.250 Mannings n

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TRANSFORMED HYETOGRAPH ---MF RAIN | TIME RAIN | TIME RAIN | TIME RAIN | TIME hrs 9.33 9.42 mm/hr 0.00 mm/hr mm/hr | 0.083 3.167 2.03 6.250 6.333 6.417 6.500 6.583 6.667 6.750 6.833 6.917 7.000 7.083 7.167 7.250 7.333 7.417 49.78 1.02 0.167 0.00 3.250 2.03 1.02 3.250 3.333 3.417 3.500 3.583 3.667 3.750 9.42 9.50 9.58 9.67 9.75 9.83 9.92 0.250 0.333 0.417 0.500 0.583 0.00 1.02 1.02 1.02 1.02 2.03 2.03 2.03 1.02 2.03 10.16 2.03 0.667 1.02 2.03 2.03 0.750 1.02 3.833 2.03 5.08 10.00 2.03 0.833 1.02 3.917 0.917 1.000 1.083 1.167 1.02 1.02 1.02 1.02 10.17 10.25 10.33 10.42 4.000 4.083 4.167 4.250 4.333 4.417 4.500 4.583 4.667 4.750 4.833 4.917 1.02 4.06 1.250 3.05 10.50 1.02 7.500 7.583 7.667 7.750 7.833 7.917 8.008 8.167 8.250 8.333 8.417 8.500 8.583 8.667 8.750 8.750 9.000 9.003 9.163 9.163 1.333 1.02 4.06 3.05 10.58 1.02 3.05 3.05 3.05 4.06 4.06 4.06 1.417 1.02 4.06 10.67 1.02 1.41/ 1.500 1.583 1.667 1.750 1.833 1.917 1.02 2.03 2.03 2.03 1.02 4.06 4.06 4.06 4.06 4.06 10.67 10.75 10.83 10.92 11.00 11.08 1.02 5.000 4.06 3.05 3.05 11.17 1.02 2.000 1.02 3.05 11.25 1.02 2.000 2.083 2.167 2.250 2.333 2.417 2.500 2.583 11.25 11.33 11.42 11.50 11.58 11.67 11.75 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 2.03 2.03 2.03 2.03 5.167 5.250 5.333 5.417 5.500 5.583 5.667 5.750 5.833 5.917 6.000 6.083 6.167 3.05 3.05 7.11 7.11 7.11 7.11 7.11 3.05 2.03 2.03 2.03 2.03 2.03 2.03 11.83 2.667 2.03 7.11 3.05 11.92 1.02 2.750 2.03 49.78 3.05 12.00 1.02 2.833 2.917 3.000 3.083 2.03 2.03 2.03 2.03 2.03 49.78 49.78 49.78 49.78 49.78 3.05 2.03 2.03 2.03 12.08 12.17 12.25 1.02 Max.Eff.Inten.(mm/hr)= 49.78 29.56 over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 5.00 6.79 (ii) 10.00 8.94 (ii) 5.00 10.00 \*TOTALS\* 0.075 (iii) Page 50

|  |                  | Langs           | taffRd F | Δ Prono | sed_WestDon | Waters | hd         |      |
|--|------------------|-----------------|----------|---------|-------------|--------|------------|------|
|  | 1.917            |                 | 5.000    | 4.06    |             | 3.05   | 11.17      | 1.02 |
|  | 2.006            |                 | 5.083    | 3.05    |             | 3.05   | 11.25      | 1.02 |
|  | 2.083            |                 | 5.167    | 3.05    |             | 3.05   |            | 1.02 |
|  | 2.167            |                 | 5.250    | 3.05    |             | 2.03   |            | 1.02 |
|  | 2.256            | 1.02            | 5.333    | 7.11    | 8.417       | 2.03   | 11.50      | 1.02 |
|  | 2.333            | 3 2.03          | 5.417    | 7.11    | 8.500       | 2.03   | 11.58      | 1.02 |
|  | 2.417            | 7 2.03          | 5.500    | 7.11    | 8.583       | 2.03   | 11.67      | 1.02 |
|  | 2.500            | 2.03            | 5.583    | 7.11    | 8.667       | 2.03   | 11.75      | 1.02 |
|  | 2.583            | 3 2.03          | 5.667    | 7.11    | 8.750       | 2.03   | 11.83      | 1.02 |
|  | 2.667            | 7 2.03          | 5.750    | 7.11    | 8.833       | 3.05   | 11.92      | 1.02 |
|  | 2.756            | 2.03            | 5.833    | 49.78   | 8.917       | 3.05   | 12.00      | 1.02 |
|  | 2.833            | 3 2.03          | 5.917    | 49.78   | 9.000       | 3.05   | 12.08      | 1.02 |
|  | 2.917            | 7 2.03          | 6.000    | 49.78   | 9.083       | 2.03   | 12.17      | 1.02 |
|  | 3.000            | 2.03            | 6.083    | 49.78   | 9.167       | 2.03   | 12.25      | 1.02 |
|  | 3.083            | 3 2.03          | 6.167    | 49.78   | 9.250       | 2.03   |            |      |
|  | May FEE Taken /s | / la \          | 49.78    |         | 27.57       |        |            |      |
|  | Max.Eff.Inten.(n |                 | 5.00     |         | 20.00       |        |            |      |
|  | Storage Coeff.   | (min)<br>(min)= |          | (ii)    | 16.73 (ii)  |        |            |      |
|  | Unit Hyd. Tpeak  |                 | 5.00     | (11)    | 20.00       |        |            |      |
|  | Unit Hyd. peak   |                 | 0.18     |         | 0.06        |        |            |      |
|  | onit nyu. peak   | (CIIIS)-        | 0.10     |         | 0.00        | *****  | TALS*      |      |
|  | PEAK FLOW        | (cms)=          | 0.06     |         | 0.01        |        | .073 (iii) |      |
|  | TIME TO PEAK     | (hrs)=          | 6.25     |         | 6.42        |        | 5.25       |      |
|  | RUNOFF VOLUME    | (mm)=           | 53.37    |         | 23.08       |        | 3.06       |      |
|  |                  |                 | 55.37    |         | 55.37       |        | 5.37       |      |
|  | RUNOFF COEFFICIE |                 | 0.96     |         | 0.42        |        | 7.78       |      |
|  |                  |                 |          |         |             |        |            |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 81.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0475)  <br>1 + 2 = 3  <br>ID1= 1 ( 0225):<br>+ ID2= 2 ( 0230): | AREA<br>(ha)<br>0.60<br>0.70 | QPEAK<br>(cms)<br>0.075<br>0.073 | TPEAK<br>(hrs)<br>6.25<br>6.25 | R.V.<br>(mm)<br>48.51<br>43.06 |
|--|------------------------------|----------------------------------|--------------------------------|--------------------------------|
| ID = 3 ( 0475):  | 1.30                         | 0.149                            | 6.25                           | 45.57                          |
|  |                              |                                  |                                |                                |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| RESERVOIR( 0540) <br>  IN= 2> OUT= 1 | OVERFLOW         | IS OFF          |  |                  |                 |
|--------------------------------------|------------------|-----------------|--|------------------|-----------------|
| DT= 5.0 min                          | OUTFLOW<br>(cms) | STORAGE (ha.m.) |  | OUTFLOW<br>(cms) | STORAGE (ha.m.) |

LangstaffRd\_EA\_Proposed\_WestDonWatershd 0.0000 0.0000 | 0.0271 0.0 0.0118 0.0048 | 0.0306 0.0 0.0000 0.0271 0.0306 0.0367 0.0474 0.0184 0.0154 0.0415 0.0639

(ha) (cms) 0.149 (hrs) INFLOW: ID= 2 ( 0475) 1.300 OUTFLOW: ID= 1 ( 0540) 1.300 0.149 6.25 0.025 6.92 45.50

PEAK FLOW REDUCTION [Qout/Qin](%)= 16.53 TIME SHIFT OF PEAK FLOW (min)= 40.00 MAXIMUM STORAGE USED (ha.m.)= 0.0299

ADD HYD ( 0480)| 1 + 2 = 3 | ID1= 1 ( 0535): + ID2= 2 ( 0540): AREA QPEAK (ha) (cms) 1.23 0.011 1.30 0.025 R.V. (mm) 45.49 45.50 TPFAK (hrs) 7.33 6.92 ID = 3 ( 0480): 2.53 0.036 7.00 45.49

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

TMPERVTOUS PERVIOUS (i) IMPERVIOU 0.52 2.00 1.00 260.00 0.013 9.04 5.00 2.00 25.00 0.290 (ha)= (mm)= (%)= (m)= Surface Area Dep. Storage Average Slope Length Mannings n

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TRANSFORMED HYETOGRAPH

NSFORMED HYETOGR RAIN | TIME mm/hr | hrs 2.03 | 6.250 2.03 | 6.333 3.05 | 6.417 3.05 | 6.500 3.05 | 6.580 2.03 | 6.667 2.03 | 6.750 2.03 | 6.833 APH ---RAIN | TIME
mm/hr | hrs
49.78 | 9.33
9.14 | 9.42
9.14 | 9.50
9.14 | 9.58 TIME hrs 0.083 RAIN | TIME mm/hr | hrs 0.00 | 3.167 0.00 | 3.250 RAIN mm/hr 1.02 0.167 1.02 0.250 0.00 3.333 1.02 0.333 1.02 3,417 2.03 1.02 | 1.02 | 1.02 | 1.02 | 3.500 3.583 3.667 3.750 10.16 | 10.16 | 10.16 | 5.08 | 9.67 9.75 9.83 9.92 2.03 2.03 2.03 2.03 2.03 0.417 0.500

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 $LangstaffRd\_EA\_Proposed\_WestDonWatershd\\ |\,ID=\ 1\ DT=\ 5.0\ min\ | \quad Total\ Imp(\%)=\ 95.00 \quad Dir.\ Conn.(\%)=\ 95.00$ 

IMPERVIOUS PERVIOUS (i) Surface Area 0.41 2.00 0.02 5.00 Dep. Storage Average Slope Length Mannings n (mm)= (%)= (m)= 1 00 2 00

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

- TRANSFORMED HYETOGRAPH -NSFORMED HYETOGR.
RAIN | 'ITIME
mm/hr | hrs
2.03 | 6.250
2.03 | 6.333
3.05 | 6.417
3.05 | 6.500
3.05 | 6.583
2.03 | 6.667
2.03 | 6.6750
2.03 | 6.683
2.03 | 6.917
2.03 | 7.000
2.03 | 7.000
2.03 | 7.000
2.03 | 7.000 RAIN | TIME mm/hr | hrs 0.00 | 3.167 0.00 | 3.250 0.00 | 3.333 TTME RAIN | TIME mm/hr | hrs RAIN mm/hr 49.78 | 9.14 | 9.14 | 9.14 | hrs 0.083 0.167 0.250 9.58 0.333 1.02 3.417 2.03 0.417 1.02 3,500 10.16 2.03 10.16 10.16 10.16 5.08 5.08 5.08 4.06 4.06 1.02 1.02 1.02 1.02 1.02 0.500 0.583 3.583 2.03 3.583 3.667 3.750 3.833 3.917 4.000 0.583 0.667 0.750 0.833 1.02 0.917 1.02 1.02 1.000 1.02 4.083 2.03 7.167 10.25 1.02 4.083 4.167 4.250 4.333 4.417 4.500 4.583 4.667 4.750 1.083 1.02 2.03 7.250 4.06 1.02 2.03 2.03 4.06 4.06 4.06 4.06 3.05 3.05 3.05 3.05 3.05 3.05 3.05 1.02 1.02 1.02 1.02 7.236 7.333 7.417 7.500 7.583 1.02 1.02 1.02 1.02 1.167 1.500 1.583 1.02 7.667 4.06 1.667 2.03 4.06 7.833 7.917 4.06 10.92 2.03 4.06 4.06 3.05 3.05 3.05 2.03 1.750 2.03 4.833 4.06 11.00 2.03 1.02 1.02 1.02 1.02 4.917 5.000 5.083 5.167 4.06 4.06 3.05 3.05 8.000 8.083 8.167 8.250 1.833 11.08 1.02 3.05 | 8.250 3.05 | 8.333 7.11 | 8.417 7.11 | 8.580 7.11 | 8.583 7.11 | 8.667 7.11 | 8.750 7.11 | 8.833 49.78 | 9.080 49.78 | 9.080 49.78 | 9.083 49.78 | 9.167 49.78 | 9.250 2.167 1.02 5.250 11.42 1.02 2.250 1.02 5.333 2.03 11.50 1.02 2.333 2.03 5.417 2.03 11.58 1.02 2.417 2.03 2.03 1.02 2.03 2.03 2.03 3.05 3.05 3.05 2.03 2.03 2.03 2.03 2.03 2.03 1.02 1.02 1.02 1.02 5.583 11.75 5.667 5.750 5.833 12.08 2.833 2.03 5.917 1.02 2.917 2.03 6.000 1.02 3.000 2.03 | 6.083 2.03 | 12.25

```
LangstaffRd_EA_Proposed_WestDonWatershd
1.02 | 3.833 | 2.03 | 6.917 | 5.08 | 1
1.02 | 3.917 | 2.03 | 7.000 | 5.08 | 1
1.02 | 4.000 | 2.03 | 7.003 | 4.06 | 1
1.02 | 4.083 | 2.03 | 7.167 | 4.06 | 1
1.02 | 4.167 | 2.03 | 7.250 | 4.06 | 1
1.02 | 4.250 | 2.03 | 7.333 | 3.05 | 1
1.02 | 4.250 | 2.03 | 7.333 | 3.05 | 1
                                                    1.02 | 3.833
1.02 | 3.917
1.02 | 4.000
1.02 | 4.083
1.02 | 4.167
1.02 | 4.250
1.02 | 4.333
                             0.750
                                                                                                                                        5.08 | 10.00
5.08 | 10.08
                              0.833
                             0.917
1.000
1.083
1.167
                                                                                                                                                          10.17
10.25
10.33
10.42
                                                                                                                                                                                  1.02
1.02
1.02
1.02
                              1.250
                                                                                                                 7.417
                                                                                                                                         3.05
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                                                                                                                                                                                   1.02
                                                                      4.417
4.500
4.583
4.667
4.750
4.833
4.917
                              1.333
                                                    1.02
                                                                                                                                                          10.58
                                                                                                                                                                                   1.02
                              1.417
                                                    1.02
                                                                                               4.06
                                                                                                                 7.583
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7.750
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                             1.583
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                                                    1.02
                                                                       5.000
                                                                                               4.06
                                                                                                                                         3.05
                                                                                                                                                          11.17
                                                                                                                                                                                   1.02
                              2.000
                                                    1.02
                                                                       5.083
                                                                                               3.05
                                                                                                                                                          11.25
                                                                                                                                                                                   1.02
                                                                                                                8.167
8.250
8.333
8.417
8.500
8.583
8.667
8.750
                              2.083
                                                    1.02
                                                                       5.167
                                                                                               3.05
                                                                                                                                         3.05
                                                                                                                                                          11.33
                                                                                                                                                                                   1.02
                              2.167
                                                     1.02
                                                                       5.250
                                                                                                                                                          11.42
                             2.167
2.250
2.333
2.417
2.500
2.583
                                                    1.02
2.03
2.03
2.03
                                                                      5.333
5.417
5.500
5.583
                                                                                               7.11
7.11
7.11
7.11
                                                                                                                                                          11.50
11.58
11.67
11.75
                                                                       5.667
                                                    2.03
                                                                                               7.11
                                                                                                                                         2.03
                                                                                                                                                          11.83
                                                                                                                                                                                   1.02
                                                                      5.750
5.833
5.917
6.000
6.083
6.167
                                                                                                                8.833
8.917
9.000
9.083
9.167
9.250
                              2.667
                                                    2.03
                                                                                               7.11
                                                                                                                                         3.05
                                                                                                                                                                                   1.02
                              2.750
                                                    2.03
                                                                                           49.78
                                                                                                                                         3.05
                                                                                                                                                          12.00
                                                                                                                                                                                   1.02
                                                                                           49.78 |
49.78 |
49.78 |
49.78 |
49.78 |
                              2 833
                                                    2 03
                             2.833
2.917
3.000
3.083
                                                    2.03 |
2.03 |
2.03 |
2.03 |
                                                                                                                                                                                   1.02
 Max.Eff.Inten.(mm/hr)=
                                                                          49.78
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                                           5.00
5.99 (ii)
5.00
                                                                                                            10.00
                                                                                                              8.72 (ii)
                                                                            0.19
                                                                                                                                               *TOTALS*
0.075 (iii)
6.25
PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                                            0.07
                                                                                                              0.00
                                                                          6.25
53.37
55.37
                                                                                                                                                      0.93
(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN* = 87.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COFFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

| CALIB | | | STANDHYD ( 0160)| Area (ha)= 0.43

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LangstaffRd\_EA\_Proposed\_WestDonWatershd )= 49.78 36.58 ) 5.00 10.00 )= 5.99 (ii) 7.89 (ii) Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 5.00 0.19 0.13 \*TOTALS\* PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 0.058 (iii) 6.25 52.25 55.37 0.06 6.25 53.37 55.37 6.25 31.03 55.37 0.96

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 89.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COFFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD ( 0430) | 1 + 2 = 3 | R.V. (mm) 51.64 QPEAK (cms) 0.075 0.058 (ha) 0.56 (hrs) 6.25 ID1= 1 ( 0155): + ID2= 2 ( 0160): 6.25 0.43 52.25 ID = 3 ( 0430): 0.99 0.133 6.25 51.90

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB | STANDHYD ( 0150) |ID= 1 DT= 5.0 min Area (ha)= 3.81 Total Imp(%)= 95.00 Dir. Conn.(%)= 95.00 TMPERVIOUS PERVIOUS (i)

Surface Area Dep. Storage Average Slope (ha)= (mm)= (%)= (m)= 3.62 2.00 1.00 0.19 5.00 2.00 Length 150.00 Mannings n 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

RAIN 0.083 1.02

|           | Langs | taffRd E | A Propos | ed WestD | onWaters | hd    |      |
|-----------|-------|----------|----------|----------|----------|-------|------|
| 0.333     | 1.02  |          |          | 6.500    | 9.14     |       | 2.03 |
| 0.417     | 1.02  | 3.500    | 3.05     | 6.583    | 10.16    | 9.67  | 2.03 |
| 0.500     | 1.02  | 3.583    | 2.03     | 6.667    | 10.16    | 9.75  | 2.03 |
| 0.583     | 1.02  | 3.667    | 2.03     |          | 10.16    | 9.83  | 2.03 |
| 0.667     | 1.02  | 3.750    | 2.03     |          | 5.08     | 9.92  | 2.03 |
| 0.750     | 1.02  |          | 2.03     |          | 5.08     | 10.00 | 2.03 |
| 0.833     | 1.02  | 3.917    | 2.03     | 7.000    | 5.08     | 10.08 | 1.02 |
| 0.917     | 1.02  | 4.000    | 2.03     | 7.083    | 4.06     | 10.17 | 1.02 |
| 1.000     | 1.02  | 4.083    | 2.03     | 7.167    | 4.06     | 10.25 | 1.02 |
| 1.083     | 1.02  | 4.167    | 2.03     | 7.250    | 4.06     | 10.33 | 1.02 |
| 1.167     | 1.02  | 4.250    | 2.03     | 7.333    | 3.05     | 10.42 | 1.02 |
| 1.250     | 1.02  | 4.333    | 4.06     | 7.417    | 3.05     | 10.50 | 1.02 |
| 1.333     | 1.02  |          | 4.06     | 7.500    | 3.05     | 10.58 | 1.02 |
| 1.417     | 1.02  |          | 4.06     | 7.583    | 3.05     | 10.67 | 1.02 |
| 1.500     | 1.02  | 4.583    | 4.06     |          | 3.05     | 10.75 | 1.02 |
| 1.583     | 2.03  | 4.667    | 4.06     | 7.750    | 3.05     | 10.83 | 2.03 |
| 1.667     | 2.03  | 4.750    | 4.06     | 7.833    | 4.06     | 10.92 | 2.03 |
| 1.750     | 2.03  |          | 4.06     |          | 4.06     |       | 2.03 |
| 1.833     | 1.02  |          | 4.06     |          | 4.06     |       | 1.02 |
| 1.917     | 1.02  |          | 4.06     |          | 3.05     |       | 1.02 |
| 2.000     | 1.02  |          | 3.05     |          | 3.05     |       | 1.02 |
| 2.083     | 1.02  |          | 3.05     |          | 3.05     |       | 1.02 |
| 2.167     | 1.02  |          | 3.05     |          | 2.03     |       | 1.02 |
| 2.250     | 1.02  |          | 7.11     | 8.417    | 2.03     | 11.50 | 1.02 |
| 2.333     | 2.03  |          | 7.11     | 8.500    | 2.03     | 11.58 | 1.02 |
| 2.417     | 2.03  |          | 7.11     | 8.583    | 2.03     | 11.67 | 1.02 |
| 2.500     | 2.03  |          | 7.11     | 8.667    | 2.03     | 11.75 | 1.02 |
| 2.583     | 2.03  |          | 7.11     | 8.750    | 2.03     | 11.83 | 1.02 |
| 2.667     | 2.03  |          | 7.11     | 8.833    | 3.05     | 11.92 | 1.02 |
| 2.750     | 2.03  |          | 49.78    | 8.917    | 3.05     | 12.00 | 1.02 |
| 2.833     | 2.03  | 5.917    | 49.78    | 9.000    | 3.05     | 12.08 | 1.02 |
| 2.917     | 2.03  | 6.000    | 49.78    |          | 2.03     | 12.17 | 1.02 |
| 3.000     | 2.03  | 6.083    | 49.78    |          | 2.03     | 12.25 | 1.02 |
| 3.083     | 2.03  | 6.167    | 49.78    | 9.250    | 2.03     | l     |      |
| nten.(mm/ | hr)=  | 49.78    |          | 35.30    |          |       |      |
| over (m   |       | 5 00     |          | 10 00    |          |       |      |

Max.Eff.Inten.(mm/hr)= over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)= 5.00 4.31 (ii) 5.00 0.23 10.00 7.18 (ii) 10.00 0.14 \*TOTALS\* PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 0.50 6.25 53.37 55.37 0.02 0.517 (iii) 6.25 52.20 55.37 6.25 29.85 55.37 0.54 0.96

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: CN\* = 88.0 Ia = Dep. Storage (Above) (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

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LangstaffRd\_EA\_Proposed\_WestDonWatershd NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

NSFORMED HYETOGRAPH ---RAIN | TIME RAIN | mm/hr | hrs mm/hr | 2.03 | 6.250 | 49.78 | 2.03 | 6.333 | 9.14 | 3.05 | 6.500 | 9.14 | 3.05 | 6.500 | 9.14 | 3.05 | 6.500 | 9.14 | 3.05 | 6.500 | 9.14 | 3.05 | 6.500 | 9.14 | 3.05 | 6.667 | 10.16 | 2.03 | 6.667 | 10.16 | 2.03 | 6.667 | 10.16 | 2.03 | 6.750 | 10.16 | 2.03 | 6.750 | 10.16 | 2.03 | 6.750 | 10.16 | 2.03 | 7.000 | 5.08 | 2.03 | 7.000 | 5.08 | 2.03 | 7.000 | 5.08 | 2.03 | 7.000 | 5.08 | 2.03 | 7.000 | 5.08 | 2.03 | 7.250 | 4.06 | 2.03 | 7.250 | 4.06 | 2.03 | 7.333 | 3.05 | 4.06 | 7.500 | 3.05 | 4.06 | 7.500 | 3.05 | 4.06 | 7.500 | 3.05 | 4.06 | 7.500 | 3.05 | 4.06 | 7.500 | 3.05 | 4.06 | 7.500 | 3.05 | 4.06 | 7.657 | 3.05 | 4.06 | 7.750 | 3.05 | 4.06 | 7.750 | 3.05 | 4.06 | 7.833 | 4.06 | 7.917 | 4.06 | 7.833 | 4.06 | 7.917 | 4.06 | 7.833 | 4.06 | 7.917 | 4.06 | 8.000 | 4.06 | 8.000 | 4.06 | 8.000 | 4.06 | 8.000 | 4.06 | 8.000 | 4.06 | 8.000 | 4.06 | 6.000 | 4.06 | 8.000 | 4.06 | 6.000 | 4.06 | 8.000 | 4.06 | 6.000 | 4.06 | 6.000 | 4.06 | 6.000 | 4.06 | 6.000 | 4.06 | 6.000 | 4.06 | 6.000 | 4.06 | 6.000 | 4.06 | 6.000 | 4.06 | 6.000 | 4.06 | 6.000 | 4.06 | 6.000 | 4.06 | 6.000 | 4.06 | 6.000 | 4.06 | 6.000 | 4.06 | 6.000 | 4.06 | 6.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.000 | 4.0 - TRANSFORMED HYETOGRAPH TTMF RAIN | TIME RATN | TTMF RATN 7IME hrs 9.33 9.42 9.50 9.58 0.083 0.167 0.250 0.333 mm/hr | 0.00 | 0.00 | 0.00 | 1.02 | 3.167 3.250 3.333 3.417 3.500 3.583 mm/hr 1.02 1.02 1.02 2.03 0.417 1.02 9.67 9.75 2.03 2.03 1.02 1.02 1.02 1.02 1.02 1.02 0.583 3.667 3.750 3.833 3.917 4.000 4.083 4.167 4.250 4.333 4.417 4.500 4.583 4.667 4.750 4.833 9.83 2.03 0.583 0.667 0.750 0.833 0.917 1.000 1.083 1.02 10.33 1.167 1.02 1.02 1.167 1.250 1.333 1.417 1.500 1.583 1.667 1.02 1.02 1.02 1.02 1.02 2.03 2.03 10.42 10.50 10.58 10.67 10.75 10.83 10.92 1.02 1.02 1.02 1.02 1.02 2.03 2.03 4.66 | 7.917 4.06 | 8.080 3.05 | 8.167 3.05 | 8.157 3.05 | 8.337 7.11 | 8.437 7.11 | 8.583 7.11 | 8.667 7.11 | 8.833 49.78 | 8.917 49.78 | 9.837 49.78 | 9.837 49.78 | 9.837 49.78 | 9.837 49.78 | 9.837 49.78 | 9.837 49.78 | 9.837 49.78 | 9.837 49.78 | 9.837 49.78 | 9.837 1.750 2.03 1.02 11.00 2.03 1.833 4.917 11.08 5.000 5.083 5.167 5.250 5.333 5.417 3.05 3.05 3.05 2.03 2.03 2.03 11.08 11.17 11.25 11.33 11.42 11.50 11.58 1.917 2.000 2.083 2.167 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 2.250 2.333 2.03 2.417 2.03 5.500 5.583 2.03 11.67 1.02 2.03 2.03 11.75 1.02 5.583 5.667 5.750 5.833 5.917 6.000 6.083 2.03 | 2.03 | 3.05 | 3.05 | 3.05 | 2.03 | 2.03 | 2.03 2.03 2.03 2.03 2.03 2.03 11.83 11.92 12.00 12.08 12.17 1.02 1.02 1.02 1.02 2.583 2.917 1.02 2.03 12.25 1.02 3.083 2.03 | 6.167 2.03

Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 49.78 10.00 8.55 (ii) 10.00 0.12 29.56 15.00 12.26 (ii) 15.00 0.09 \*TOTALS\* PEAK FLOW TIME TO PEAK RUNOFF VOLUME (cms)= (hrs)= (mm)= 0.112 (iii) 6.25 47.07 0.10 0.01 6.25 53.37 6.33

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# LangstaffRd\_EA\_Proposed\_WestDonWatershd (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| RESERVOIR( 0515   | <br>)   OV   | ERELOW 1   | S OFF   |   |   |                        |  |
|---|--|--|---|---|---|------------------------|--|
| IN= 2> OUT= 1   |  | LKFLOW 1   | .5 0 г г  |   |   |                        |  |
| DT= 5.0 min   |  | TELOW  | STORAGE   | 1 0   | UTFLOW  | STORAGE                |  |
| DI = 3.0 IIIII  | (  | rme)   | (ham)   | '   |   |                        |  |
|   | 9  | aaaa   | (ha.m.)<br>0.0000   | i i   | 0 0001  | (ha.m.)<br>0.1797      |  |
|   |  | .0013  | 0.0000  | i i   | 0.0095  | 0.2004                 |  |
|   | a  | 0013   | 0.0137  | i i   | 0.0055  | 0.2216                 |  |
|   | a  | .0044  | 0.0320  | i   | 0.0104  | 0.2433                 |  |
|   | a  | 0053   | 0.0407  | i i   | 0.0104  | 0.2455                 |  |
|   | a  | .0061  | 0.0033  | i   | 0.0103<br>0.0113  | 0.2655<br>0.2882       |  |
|   | a  | 0001   | 0.0037  | i i   | 0.0115  | 0.2002                 |  |
|   | a  | 0074   | 0.1015  | i i   | 0.1520  | 0.3114<br>0.3592       |  |
|   |  |  | 0.1398  | i   | 0.1520  | 0.4336                 |  |
|   | 0.   | .0086  | 0.1595  | i   | 0.5654<br>1.1316  | 0.5100                 |  |
|   |  |  |   |   |   |                        |  |
|   |  | ARE  | A QP  | EAK   | TPEAK   | R.V.                   |  |
| INFLOW : ID= 2  | ( 0450)  | (na  | i) (c   | ms)   | (nrs)   | (mm)                   |  |
| INFLOW : ID= 2  | ( 0150)  | 3.8  | 310   | 0.51/   | 6.25  | 52.20                  |  |
| OUTFLOW: ID= 1  | ( 6313)  | 5.0  | 10  | 0.005   | 12.23   | 31.33                  |  |
|   | TIME SHIF<br>MAXIMUM   | FT OF PE<br>STORAGE                                  | AK FLOW<br>USED   | (   | (min)=36<br>ha.m.)=   | 1.75<br>0.00<br>0.1768 |  |
|   | TIME SHIF  | FT OF PE<br>STORAGE                                  | AK FLOW<br>USED   | (   | (min)=36<br>ha.m.)=   | 0.00<br>0.1768         |  |
| ADD HYD ( 0440  | <br><br>)  |  | EAK FLOW<br>USED  |   | (min)=36<br>ha.m.)=   | 0.00<br>0.1768         |  |
| ADD HYD ( 0440  | <br><br>)  |  | EAK FLOW<br>USED  |   | (min)=36<br>ha.m.)=   | 0.00<br>0.1768         |  |
| ADD HYD ( 0440<br>1 + 2 = 3   | <br><br>)  |  | EAK FLOW<br>USED  |   | (min)=36<br>ha.m.)=   | 0.00<br>0.1768         |  |
| ADD HYD ( 0440<br>1 + 2 = 3   | <br><br>)  |  | EAK FLOW<br>USED  |   | (min)=36<br>ha.m.)=   | 0.00<br>0.1768         |  |
| 1 + 2 = 3<br>ID1= 1 (<br>+ ID2= 2 (   |  | AREA<br>(ha)<br>0.99<br>3.81                         | QPEAK (cms) 0.133 0.009   | TPEA<br>(hrs<br>6.25<br>12.25   | (min)=36<br>ha.m.)=<br><br>K R.V<br>) (mn<br>51.96<br>51.39             | 0.00<br>0.1768         |  |
| 1 + 2 = 3<br>ID1= 1 (   |  | AREA<br>(ha)<br>0.99<br>3.81                         | QPEAK (cms) 0.133 0.009   | TPEA<br>(hrs<br>6.25<br>12.25   | (min)=36<br>ha.m.)=<br>K R.V<br>) (mn<br>51.96<br>51.39                 | 0.00<br>0.1768         |  |
| 1 + 2 = 3<br>ID1= 1 (<br>+ ID2= 2 (   | 0430):<br>0515):<br>0440):   | AREA<br>(ha)<br>0.99<br>3.81                         | QPEAK (cms) 0.133 0.009 0.140   | TPEA<br>(hrs<br>6.25<br>12.25   | (min)=36<br>ha.m.)=<br><br>K R.V<br>) (mn<br>51.96<br>51.39<br>=======5 | 0.00<br>0.1768         |  |
| 1 + 2 = 3  ID1= 1 ( + ID2= 2 ( + ID2= 2 ID = 3 ( + ID2= 3 ID = 3 |  | AREA<br>(ha)<br>0.99<br>3.81                         | QPEAK (cms) 0.133 0.009 0.140   | TPEA<br>(hrs<br>6.25<br>12.25   | (min)=36<br>ha.m.)=<br><br>K R.V<br>) (mn<br>51.96<br>51.39<br>=======5 | 0.00<br>0.1768         |  |
| 1 + 2 = 3  ID1= 1 ( + ID2= 2 ( ========  ID = 3 (  NOTE: PEAK F   |  | AREA<br>(ha)<br>0.99<br>3.81                         | QPEAK (cms) 0.133 0.009 0.140   | TPEA<br>(hrs<br>6.25<br>12.25   | (min)=36<br>ha.m.)=<br><br>K R.V<br>) (mn<br>51.96<br>51.39<br>=======5 | 0.00<br>0.1768         |  |
| 1 + 2 = 3  ID1= 1 ( + ID2= 2 (  |  | AREA<br>(ha)<br>0.99<br>3.81<br>4.80                 | QPEAK (cms) (0.009 0.140)   | TPEA<br>(hrs<br>6.25<br>12.25<br>6.25                                     | (min)=36<br>ha.m.)=<br><br>K R.V<br>) (mn<br>51.96<br>51.39<br>=======5 | 0.00<br>0.1768         |  |
| 1 + 2 = 3  ID1= 1 ( + ID2= 2 ( ========== ID = 3 (  NOTE: PEAK F  CALIB STANDHYD ( 0210   | 0430):<br>0430):<br>0515):<br>0440):<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400:<br>0400: | AREA<br>(ha)<br>0.99<br>3.81<br>4.80<br>DT INCLU     | QPEAK (cms) 0.133 0.009 0.140 IDE BASEF   | TPEA<br>(hrs<br>6.25<br>12.25<br><br>6.25                                 | (min)=36<br>ha.m.)=<br>   | .0.00<br>0.1768        |  |
| 1 + 2 = 3  ID1= 1 ( + ID2= 2 (  | 0430):<br>   | AREA<br>(ha)<br>0.99<br>3.81<br>4.80<br>DT INCLU     | QPEAK (cms) 0.133 0.009 0.140 IDE BASEF   | TPEA<br>(hrs<br>6.25<br>12.25<br><br>6.25                                 | (min)=36<br>ha.m.)=<br>   | .0.00<br>0.1768        |  |
| 1 + 2 = 3  ID1= 1 ( + ID2= 2 (  | 0430):<br>   | AREA<br>(ha)<br>0.99<br>3.81<br><br>4.80<br>DT INCLU | QPEAK (cms) 0.133 0.009 0.140 DDE BASEF 0.96 0.78.00  | TPEA<br>(hrs<br>6.25<br>12.25<br>6.25<br>LOWS IF                          | (min)=36<br>ha.m.)=<br>   | .0.00<br>0.1768        |  |
| 1 + 2 = 3  ID1= 1 ( + ID2= 2 (  | 0440): LOWS DO NO  | AREA (ha) 0.99 3.81 4.80 DT INCLL (ha)               | QPEAK (cms) 0.133 0.009 0.140 UDE BASEF 78.00   | TPEA (hrs 6.25 12.25 6.25 LOWS IF   | (min)=36 ha.m.)=  K R.W.) (mn 51.96 51.96 51.36 Conn.(%) US (i)         | .0.00<br>0.1768        |  |
| 1 + 2 = 3  ID1= 1 (   |  | AREA (ha) 0.99 3.81 4.80 OT INCLL (ha) 1 Imp(%)      | QPEAK (cms) 0.133 0.009 0.140 USED 0.440 USED 0.5 0.009 0.5 0.5 0.5 0.5 0.5 0.75 0.75 0.75 0.75 | TPEA (hrs 6.25 12.25 6.25 LOWS IF   | (min)=36 ha.m.)=  K R.V. ) (mm 51.96 51.96 51.36 51.56 ANY Conn.(%)     | .0.00<br>0.1768        |  |
| 1 + 2 = 3  ID1= 1 (   |  | AREA (ha) 0.99 3.81 4.80 OT INCLL (ha) 1 Imp(%)      | QPEAK (cms) 0.133 0.009 0.140 USED 0.440 USED 0.5 0.009 0.5 0.5 0.5 0.5 0.5 0.75 0.75 0.75 0.75 | TPEA<br>(hrs<br>6.25<br>12.25<br>6.25<br>LOWS IF<br>Dir.<br>PERVIO<br>0.2 | (min)=36 ha.m.)=  K R.V. ) (mm 51.96 51.96 51.36                        | .0.00<br>0.1768        |  |
| + ID2= 2 ( ) ID = 3 ( ) NOTE: PEAK F  CALIB STANDHYD ( 0210 ID= 1 DT= 5.0 min   |  | AREA (ha) 0.99 3.81 4.80 OT INCLL (ha) 1 Imp(%)      | QPEAK (cms) 0.133 0.009 0.140 USED 0.440 USED 0.5 0.009 0.5 0.5 0.5 0.5 0.5 0.75 0.75 0.75 0.75 | TPEA (hrs 6.25 12.25  | (min)=36 ha.m.)=  K R.V. ) (mm 51.96 51.96 51.36                        | .0.00<br>0.1768        |  |

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LangstaffRd\_EA\_Proposed\_WestDonWatershd n) = 55.37 55.37 55.3 = 0.96 0.45 0.8 TOTAL RAINFALL (mm) = RUNOFF COEFFICIENT =

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CAL TB | STANDHYD ( 0205)| |ID= 1 DT= 5.0 min | Area (ha)= 1.11 Total Imp(%)= 77.00 Dir. Conn.(%)= 77.00 IMPERVIOUS PERVIOUS (i) Surface Area 0.85 2.00 1.00 0.26 5.00 2.00 Dep. Storage Average Slope Length Mannings n (mm) = (%) = (m) = 470.00 0.013 20.00 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |      |       |      | HYETOGR |       |       |      |
|-------|------|-------|------|---------|-------|-------|------|
| TIME  |      | TIME  |      | ' TIME  |       |       | RAIN |
| hrs   |      | hrs   |      | ' hrs   |       | hrs   |      |
| 0.083 |      | 3.167 |      |         |       | 9.33  | 1.02 |
| 0.167 |      | 3.250 |      |         |       |       | 1.02 |
| 0.250 | 0.00 | 3.333 | 3.05 |         | 9.14  | 9.50  | 1.02 |
| 0.333 | 1.02 | 3.417 | 3.05 | 6.500   | 9.14  | 9.58  | 2.03 |
| 0.417 | 1.02 | 3.500 | 3.05 | 6.583   | 10.16 | 9.67  | 2.03 |
| 0.500 | 1.02 | 3.583 | 2.03 | 6.667   | 10.16 | 9.75  | 2.03 |
| 0.583 | 1.02 | 3.667 | 2.03 | 6.750   | 10.16 | 9.83  | 2.03 |
| 0.667 | 1.02 | 3.750 | 2.03 | 6.833   | 5.08  | 9.92  | 2.03 |
| 0.750 | 1.02 | 3.833 | 2.03 | 6.917   | 5.08  | 10.00 | 2.03 |
| 0.833 | 1.02 | 3.917 | 2.03 | 7.000   | 5.08  | 10.08 | 1.02 |
| 0.917 | 1.02 | 4.000 | 2.03 | 7.083   | 4.06  | 10.17 | 1.02 |
| 1.000 | 1.02 | 4.083 | 2.03 | 7.167   | 4.06  | 10.25 | 1.02 |
| 1.083 | 1.02 | 4.167 | 2.03 | 7.250   | 4.06  | 10.33 | 1.02 |
| 1.167 | 1.02 | 4.250 | 2.03 | 7.333   | 3.05  | 10.42 | 1.02 |
| 1.250 | 1.02 | 4.333 | 4.06 | 7.417   | 3.05  | 10.50 | 1.02 |
| 1.333 | 1.02 | 4.417 | 4.06 | 7.500   | 3.05  | 10.58 | 1.02 |
| 1.417 | 1.02 | 4.500 | 4.06 | 7.583   | 3.05  | 10.67 | 1.02 |
| 1.500 | 1.02 | 4.583 | 4.06 | 7.667   | 3.05  | 10.75 | 1.02 |
| 1.583 | 2.03 | 4.667 | 4.06 | 7.750   | 3.05  | 10.83 | 2.03 |
| 1.667 | 2.03 | 4.750 | 4.06 | 7.833   | 4.06  | 10.92 | 2.03 |
| 1.750 | 2.03 | 4.833 | 4.06 | 7.917   | 4.06  | 11.00 | 2.03 |
| 1.833 | 1.02 | 4.917 | 4.06 | 8.000   | 4.06  | 11.08 | 1.02 |
| 1.917 | 1.02 | 5.000 | 4.06 | 8.083   | 3.05  | 11.17 | 1.02 |
| 2.000 | 1.02 | 5.083 | 3.05 | 8.167   | 3.05  | 11.25 | 1.02 |
|       |      |       | Page | 60      |       |       |      |
|       |      |       |      |         |       |       |      |

|           |          | Lange   | r+affDd E      | A Brono | sed_WestDo                 | nklatono | hd            |     |
|-----------|----------|---------|----------------|---------|----------------------------|----------|---------------|-----|
|           | 2.083    | 1 02    | 5 167          | 4_Propo | l g 250                    | 3 A5     | nu<br>  11 33 | 1.0 |
|           | 2.167    | 1 02    | 5 250          | 3 05    | 8.250                      | 2 03     | 111.33        | 1.0 |
|           |          | 1 02    | 5 333          | 7 11    | 8.417                      | 2 03     | 11 50         | 1.0 |
|           |          |         |                |         | 8.500                      |          |               |     |
|           |          |         |                |         | 8.583                      |          |               |     |
|           | 2.500    | 2.03    | 5.583          | 7.11    | 8.667                      | 2.03     | 11.75         | 1.0 |
|           | 2.583    | 2.03    | 5.667          | 7.11    | 8.667<br>8.750<br>8.833    | 2.03     | 11.83         | 1.0 |
|           | 2.667    | 2.03    | 5.750          | 7.11    | 8.833                      | 3.05     | 11.92         | 1.0 |
|           | 2.750    | 2.03    | 5.833          | 49.78   | 8.917                      | 3.05     | 12.00         | 1.0 |
|           | 2.833    | 2.03    | 5.917          | 49.78   | 9.000                      | 3.05     | 12.08         | 1.0 |
|           | 2.917    | 2.03    | 6.000          | 49.78   | 9.083                      | 2.03     | 12.17         | 1.0 |
|           | 3.000    | 2.03    | 6.083          | 49.78   | 9.167                      | 2.03     | 12.25         | 1.0 |
|           | 3.083    | 2.03    | 6.167          | 49.78   | 9.083<br>9.167<br>9.250    | 2.03     | l             |     |
| Max.Eff.I | nten.(mm | /hr)=   | 49.78          |         | 29.56                      |          |               |     |
|           | over (   | min)    | 10.00          |         | 15.00                      |          |               |     |
| Storage C | neff. (  | min)=   | 8.55           | (ii)    | 12.34 (ii                  | )        |               |     |
| Unit Hvd. | Tneak (  | min)=   | 10.00          | (/      | 15.00                      | ,        |               |     |
| Unit Hvd. | peak (   | cms)=   | 0.12           |         | 12.34 (ii<br>15.00<br>0.08 |          |               |     |
|           | , ,      | /       |                |         |                            | *T0      | TALS*         |     |
| PEAK FLOW | (        | cms)=   | 0.11           |         | 0.02                       | 0        | .129 (iii     | i)  |
| TIME TO P | EAK (    | hrs)=   | 6.25           |         | 6.33                       |          | 5.25          |     |
| RUNOFF VO | LUME     | (mm)=   | 53.37<br>55.37 |         | 24.78                      | 4        | 5.79          |     |
| TOTAL RAI | NFALL    | (mm)=   | 55.37          |         | 55.37                      | 5        | 5.37          |     |
| RUNOFF CO | EFFICIEN | T =     | 0.96           |         | 0.45                       |          | 0.85          |     |
|           |          |         | ED FOR PE      |         | LOSSES:<br>(Above)         |          |               |     |
|           |          |         | LD BE SMA      |         | R EQUAL                    |          |               |     |
|           |          |         | EFFICIENT      |         |                            |          |               |     |
| (iii) PEA | K FLOW D | OES NOT | INCLUDE E      | ASEFLO  | N IF ANY.                  |          |               |     |
|           |          |         |                |         |                            |          |               |     |

| · | YD ( 04<br>2 = 3<br>ID1= 1 (<br>ID2= 2 ( |        | AREA<br>(ha)<br>1.11<br>0.96 | QPEAK<br>(cms)<br>0.129<br>0.112 | TPEAK<br>(hrs)<br>6.25<br>6.25 | R.V.<br>(mm)<br>46.79<br>47.07 |  |
|---|--|--------|------------------------------|----------------------------------|--------------------------------|--------------------------------|--|
|   | ID = 3 (                                 | 0460): | 2.07                         | 0.241                            | 6.25                           | 46.92                          |  |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| RESERVOIR( 0525) <br>  IN= 2> OUT= 1 | OVERFLOW I                           | S OFF                                  |                                      |  |
|--------------------------------------|--------------------------------------|--|--------------------------------------|--|
| DT= 5.0 min                          | OUTFLOW<br>(cms)<br>0.0000<br>0.0274 | STORAGE<br>(ha.m.)<br>0.0000<br>0.0026 | OUTFLOW<br>(cms)<br>0.0733<br>0.0831 | STORAGE<br>(ha.m.)<br>0.0214<br>0.0278 |

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|  |            | +- CCD4 F |         |   |        |           |      |
|--|------------|-----------|---------|---|--------|-----------|------|
| 1.917  |            |           |         | sed_WestDon   |        |           | 4 00 |
|  |            |           |         | 8.083   |        |           |      |
| 2.000  | 1.02       | 5.083     | 3.05    | 8.167   | 3.05   | 11.25     | 1.02 |
| 2.08:  | 1.02       | 5.16/     | 3.05    | 8.250   | 3.05   | 11.33     | 1.02 |
| 2.167  | 1.02       | 5.250     | 3.05    | 8.333   | 2.03   | 11.42     | 1.02 |
| 2.256  | 1.02       | 5.333     | 7.11    | 8.41/   | 2.03   | 11.50     | 1.02 |
| 2.33:  | 2.03       | 5.41/     | 7.11    | 8.500   | 2.03   | 11.58     | 1.02 |
| 2.417  | 2.03       | 5.500     | 7.11    | 8.583   | 2.03   | 11.6/     | 1.02 |
| 2.506  | 2.03       | 5.583     | 7.11    | 8.66/   | 2.03   | 11.75     | 1.02 |
| 2.583  | 2.03       | 5.66/     | 7.11    | 8.167<br>  8.250<br>  8.333<br>  8.417<br>  8.500<br>  8.583<br>  8.667<br>  8.750<br>  8.833 | 2.03   | 11.83     | 1.02 |
| 2.667  | 2.03       | 5./50     | /.11    | 8.833   | 3.05   | 11.92     | 1.02 |
| 2./56  | 2.03       | 5.833     | 49.78   | 8.917<br>9.000<br>9.083   | 3.05   | 12.00     | 1.02 |
| 2.833  | 2.03       | 5.91/     | 49.78   | 9.000   | 3.05   | 12.08     | 1.02 |
| 2.917  | 2.03       | 6.000     | 49.78   | 9.083   | 2.03   | 12.1/     | 1.02 |
| 3.000  | 2.03       | 0.083     | 49.78   | 9.167   | 2.03   | 12.25     | 1.02 |
| 3.083  | 2.03       | 6.16/     | 49.78   | 9.250   | 2.03   | l         |      |
| Max.Eff.Inten.(n   | m/hr)=     | 49 78     |         | 28 42   |        |           |      |
| over<br>Storage Coeff.<br>Unit Hyd. Tpeak<br>Unit Hyd. peak  | (min)      | 5 00      |         | 25 00   |        |           |      |
| Storage Coeff  | (min)=     | 7 04      | (ii)    | 20 38 (ii)  |        |           |      |
| Unit Hyd Tneak   | (min)=     | 5 00      | (11)    | 25 00   |        |           |      |
| Unit Hyd neak  | (cms)=     | 0 17      |         | 0 05  |        |           |      |
|  |            |           |         |   | *T0    | TALS*     |      |
| PEAK FLOW<br>TIME TO PEAK<br>RUNOFF VOLUME<br>TOTAL RAINFALL | (cms)=     | 0.07      |         | 0.02  |        | .081 (iii | )    |
| TIME TO PEAK   | (hrs)=     | 6.25      |         | 6.50  |        | 5.25      | ,    |
| RUNOFF VOLUME  | (mm)=      | 53.37     |         | 24.78   | 4:     | 1.06      |      |
| TOTAL RAINFALL   | (mm)=      | 55.37     |         | 55.37   | 51     | 5 37      |      |
| RUNOFF COEFFICIE   | NT =       | 0.96      |         | 0.45  |        | 0.74      |      |
|  |            |           |         |   |        |           |      |
|  |            |           |         |   |        |           |      |
| <ul><li>(i) CN PROCEDU</li></ul>                             |            |           |         |   |        |           |      |
|  | 3.0 Ia     |           |         |   |        |           |      |
| (ii) TIME STEP   |            |           |         | R EQUAL   |        |           |      |
| THAN THE S   |            |           |         |   |        |           |      |
| (iii) PEAK FLOW  | DOES NOT   | INCLUDE E | BASEFLO | IF ANY.   |        |           |      |
|  |            |           |         |   |        |           |      |
|  |            |           |         |   |        |           |      |
| ALTB I   |            |           |         |   |        |           |      |
| TANDHYD ( 0195)  | Area       | (ha)=     | 0.79    |   |        |           |      |
| = 1 DT= 5.0 min  | Total Tr   | mp(%)= 7  | 75.00   | Dir. Conn.  | (%)=   | 75.00     |      |
|  |            |           |         |   | ()     |           |      |
|  |            | IMPERVIOL | JS PI   | RVIOUS (i)  |        |           |      |
| Surface Area   | (ha)=      | 0.59      |         | 0.20  |        |           |      |
| Dep. Storage   | (mm)=      | 2.00      |         | 5.00  |        |           |      |
| Dep. Storage<br>Average Slope                                | (%)=       | 1.00      |         | 2.00  |        |           |      |
| Length   | (m)=       | 340.00    |         | 20.00   |        |           |      |
| Length<br>Mannings n   | ` =        | 0.013     |         | 0.250   |        |           |      |
|  |            |           |         |   |        |           |      |
| NOTE: RAINE  | ALL WAS TI | RANSFORME | D TO    | 5.0 MIN. T  | IME ST | EP.       |      |
|  |            |           |         |   |        |           |      |

---- TRANSFORMED HYETOGRAPH ---TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN

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AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
INFLOW: ID= 2 ( 0460) 2.0070 0.241 6.25 46.92
OUTFLOW: ID= 1 ( 0525) 2.070 0.103 6.50 46.91

PEAK FLOW REDUCTION [Qout/Qin](%)= 42.89
TIME SHIFT OF PEAK FLOW (min)= 15.00
MAXIMUM STORAGE USED (ha.m.)= 0.0310

| CALIB             |       |         |       |                |       |
|-------------------|-------|---------|-------|----------------|-------|
| STANDHYD ( 0190)  | Area  | (ha)=   | 0.86  |                |       |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 57.00 | Dir. Conn.(%)= | 57.00 |
|                   |       |         |       |                |       |
|                   |       | IMPERVI | OUS   | PERVIOUS (i)   |       |
| Surface Area      | (ha)= | 0.4     | 9     | 0.37           |       |
| Dep. Storage      | (mm)= | 2.0     | 0     | 5.00           |       |
| Average Slope     | (%)=  | 1.0     | 0     | 2.00           |       |
| Length            | (m)=  | 340.0   | 0     | 50.00          |       |
| Mannings n        | ` =   | 0.01    | 3     | 0.250          |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       | TRANSFORMED HYETOGRAPH |       |       |        |       |       |       |  |  |  |
|-------|------------------------|-------|-------|--------|-------|-------|-------|--|--|--|
| TIME  | RAIN                   | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |  |  |
| hrs   | mm/hr                  | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |  |  |
| 0.083 | 0.00                   | 3.167 | 2.03  | 6.250  | 49.78 | 9.33  | 1.02  |  |  |  |
| 0.167 | 0.00                   | 3.250 | 2.03  | 6.333  | 9.14  | 9.42  | 1.02  |  |  |  |
| 0.250 | 0.00                   | 3.333 | 3.05  | 6.417  | 9.14  | 9.50  | 1.02  |  |  |  |
| 0.333 | 1.02                   | 3.417 | 3.05  | 6.500  | 9.14  | 9.58  | 2.03  |  |  |  |
| 0.417 | 1.02                   | 3.500 | 3.05  | 6.583  | 10.16 | 9.67  | 2.03  |  |  |  |
| 0.500 | 1.02                   | 3.583 | 2.03  | 6.667  | 10.16 | 9.75  | 2.03  |  |  |  |
| 0.583 | 1.02                   | 3.667 | 2.03  | 6.750  | 10.16 | 9.83  | 2.03  |  |  |  |
| 0.667 | 1.02                   | 3.750 | 2.03  | 6.833  | 5.08  | 9.92  | 2.03  |  |  |  |
| 0.750 | 1.02                   | 3.833 | 2.03  | 6.917  | 5.08  | 10.00 | 2.03  |  |  |  |
| 0.833 | 1.02                   | 3.917 | 2.03  | 7.000  | 5.08  | 10.08 | 1.02  |  |  |  |
| 0.917 | 1.02                   | 4.000 | 2.03  | 7.083  | 4.06  | 10.17 | 1.02  |  |  |  |
| 1.000 | 1.02                   | 4.083 | 2.03  | 7.167  | 4.06  | 10.25 | 1.02  |  |  |  |
| 1.083 | 1.02                   | 4.167 | 2.03  | 7.250  | 4.06  | 10.33 | 1.02  |  |  |  |
| 1.167 | 1.02                   | 4.250 | 2.03  | 7.333  | 3.05  | 10.42 | 1.02  |  |  |  |
| 1.250 | 1.02                   | 4.333 | 4.06  | 7.417  | 3.05  | 10.50 | 1.02  |  |  |  |
| 1.333 | 1.02                   | 4.417 | 4.06  | 7.500  | 3.05  | 10.58 | 1.02  |  |  |  |
| 1.417 | 1.02                   | 4.500 | 4.06  | 7.583  | 3.05  | 10.67 | 1.02  |  |  |  |
| 1.500 | 1.02                   | 4.583 | 4.06  | 7.667  | 3.05  | 10.75 | 1.02  |  |  |  |
| 1.583 | 2.03                   | 4.667 | 4.06  | 7.750  | 3.05  | 10.83 | 2.03  |  |  |  |
| 1.667 | 2.03                   | 4.750 | 4.06  | 7.833  | 4.06  | 10.92 | 2.03  |  |  |  |
| 1.750 | 2.03                   | 4.833 | 4.06  | 7.917  | 4.06  | 11.00 | 2.03  |  |  |  |
| 1.833 | 1.02                   | 4.917 | 4.06  | 8.000  | 4.06  | 11.08 | 1.02  |  |  |  |

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|                    | Langs | taffRd_E | A_Propos | sed_WestDo | nWaters | hd        |      |
|--------------------|-------|----------|----------|------------|---------|-----------|------|
| hrs                | mm/hr | hrs      | mm/hr    | hrs        | mm/hr   | hrs       | mm/h |
| 0.083              | 0.00  | 3.167    | 2.03     | 6.250      | 49.78   |           | 1.02 |
| 0.167              | 0.00  | 3.250    | 2.03     | 6.333      | 9.14    | 9.42      | 1.02 |
| 0.250              | 0.00  | 3.333    | 3.05     | 6.417      | 9.14    | 9.50      | 1.02 |
| 0.333              | 1.02  | 3.417    | 3.05     | 6.500      | 9.14    | 9.58      | 2.03 |
| 0.417              | 1.02  | 3.500    | 3.05     | 6.583      | 10.16   |           | 2.03 |
| 0.500              | 1.02  | 3.583    | 2.03     | 6.667      | 10.16   | 9.75      | 2.03 |
| 0.583              | 1.02  | 3.667    | 2.03     | 6.750      | 10.16   | 9.83      | 2.03 |
| 0.667              |       | 3.750    |          | 6.833      | 5.08    |           | 2.03 |
| 0.750              |       | 3.833    | 2.03     |            | 5.08    |           | 2.03 |
| 0.833              | 1.02  |          | 2.03     |            | 5.08    |           | 1.02 |
| 0.917              |       | 4.000    | 2.03     |            | 4.06    |           | 1.02 |
| 1.000              |       | 4.083    | 2.03     | 7.167      | 4.06    |           | 1.02 |
| 1.083              | 1.02  | 4.167    | 2.03     | 7.250      | 4.06    | 10.33     | 1.02 |
| 1.167              |       | 4.250    | 2.03     |            | 3.05    |           | 1.02 |
| 1.250              |       | 4.333    | 4.06     |            | 3.05    |           | 1.02 |
| 1.333              |       | 4.417    | 4.06     |            | 3.05    |           | 1.02 |
| 1.417              |       | 4.500    |          | 7.583      | 3.05    |           | 1.02 |
| 1.500              |       | 4.583    | 4.06     |            | 3.05    |           | 1.02 |
| 1.583              |       | 4.667    | 4.06     |            | 3.05    |           | 2.03 |
| 1.667              |       | 4.750    | 4.06     |            | 4.06    |           | 2.03 |
| 1.750              |       | 4.833    | 4.06     |            | 4.06    |           | 2.03 |
| 1.833              |       | 4.917    | 4.06     |            | 4.06    |           | 1.02 |
| 1.917              | 1.02  |          | 4.06     |            | 3.05    |           | 1.02 |
| 2.000              |       | 5.083    | 3.05     |            | 3.05    |           | 1.02 |
| 2.083              |       | 5.167    |          | 8.250      | 3.05    |           | 1.02 |
| 2.167              | 1.02  |          | 3.05     |            | 2.03    |           | 1.02 |
| 2.250              | 1.02  |          |          | 8.417      | 2.03    |           | 1.02 |
| 2.333              | 2.03  |          | 7.11     |            | 2.03    |           | 1.02 |
| 2.417              |       | 5.500    | 7.11     |            | 2.03    |           | 1.02 |
| 2.500              | 2.03  |          | 7.11     |            | 2.03    |           | 1.02 |
| 2.583              | 2.03  |          | 7.11     |            | 2.03    |           | 1.02 |
| 2.667              |       | 5.750    |          | 8.833      | 3.05    |           | 1.02 |
| 2.750              |       | 5.833    | 49.78    |            | 3.05    |           | 1.02 |
| 2.833              |       | 5.917    | 49.78    |            | 3.05    |           | 1.02 |
| 2.917              | 2.03  |          | 49.78    |            | 2.03    |           | 1.02 |
| 3.000              | 2.03  |          | 49.78    |            | 2.03    |           | 1.02 |
| 3.083              | 2.03  | 6.167    | 49.78    | 9.250      | 2.03    |           |      |
| Max.Eff.Inten.(mm/ |       | 49.78    |          | 29.56      |         |           |      |
| over (m            |       | 5.00     |          | 15.00      |         |           |      |
|                    | in)=  | 7.04     |          | 11.00 (ii  | )       |           |      |
| Unit Hyd. Tpeak (m |       | 5.00     |          | 15.00      |         |           |      |
| Unit Hyd. peak (c  | ms)=  | 0.17     |          | 0.09       | *T01    | TALS*     |      |
| PEAK FLOW (c       | ms)=  | 0.08     |          | 0.01       |         | .093 (iii | ١    |
|                    | rs)=  | 6.25     |          | 6.33       |         | 5.25      | ,    |
|                    | mm)=  | 53.37    |          | 24.78      |         | 5.22      |      |
|                    | mm)=  | 55.37    |          | 55.37      |         | 5.37      |      |
|                    |       |          |          |            |         |           |      |

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

LangstaffRd\_EA\_Proposed\_WestDonWatershd
CN\* = 83.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0455)| | 1 + 2 = 3 | AREA QPEAK TPEAK R.V. (ha) 0.86 0.79 (cms) 0.081 0.093 (hrs) 6.25 6.25 (mm) 41.06 46.22 ID1= 1 ( 0190): + ID2= 2 ( 0195): ID = 3 ( 0455): 1.65 0.174 6.25 43.53

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR( 0555)| IN= 2---> OUT= 1 | DT= 5.0 min | OVERFLOW IS OFF OUTFLOW STORAGE (cms) 0.0000 (ha.m.) (cms) 0.0238 (ha.m.) 0.0199 0.0000 0.0104 0.0024 0.0268 0.0259 0 0162 0 0079 0 0825 0 0346 0.0139 (cms) 0.174 0.055 (hrs) (ha) 1.650 (mm) 43.53 INFLOW : ID= 2 ( 0455) OUTFLOW: ID= 1 ( 0555) 1.650 6.67 43.50

PEAK FLOW REDUCTION [Qout/Qin](%)= 31.63
TIME SHIFT OF PEAK FLOW (min)= 25.00
MAXIMUM STORAGE USED (ha.m.)= 0.0303

ADD HYD ( 0465)| 1 + 2 = 3 | ARFA QPEAK TPFAK R.V. (cms) 0.103 0.055 (hrs) 6.50 6.67 ID1= 1 ( 0525): + ID2= 2 ( 0555): ID = 3 ( 0465): 3.72 6.58 0.156 45.40

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

\*\*\*\*\*\*\*\*\* \*\* SIMULATION:Run 04 \*\*

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|       | Langs | taffRd_E | A_Propos | ed_WestD | onWaters | hd    |      |
|-------|-------|----------|----------|----------|----------|-------|------|
| 0.917 | 1.02  | 4.000    | 3.05     | 7.083    | 5.08     | 10.17 | 2.03 |
| 1.000 | 1.02  | 4.083    | 2.03     | 7.167    | 5.08     | 10.25 | 2.03 |
| 1.083 | 1.02  | 4.167    | 2.03     | 7.250    | 5.08     | 10.33 | 1.02 |
| 1.167 | 1.02  | 4.250    | 2.03     | 7.333    | 4.06     | 10.42 | 1.02 |
| 1.250 | 1.02  | 4.333    | 5.08     | 7.417    | 4.06     | 10.50 | 1.02 |
| 1.333 | 1.02  | 4.417    | 5.08     | 7.500    | 4.06     | 10.58 | 1.02 |
| 1.417 | 1.02  | 4.500    | 5.08     | 7.583    | 4.06     | 10.67 | 1.02 |
| 1.500 | 1.02  | 4.583    | 4.06     | 7.667    | 4.06     | 10.75 | 1.02 |
| 1.583 | 2.03  | 4.667    | 4.06     | 7.750    | 4.06     | 10.83 | 2.03 |
| 1.667 | 2.03  | 4.750    | 4.06     | 7.833    | 4.06     | 10.92 | 2.03 |
| 1.750 | 2.03  | 4.833    | 4.06     | 7.917    | 4.06     | 11.00 | 2.03 |
| 1.833 | 1.02  | 4.917    | 4.06     | 8.000    | 4.06     | 11.08 | 1.02 |
| 1.917 | 1.02  | 5.000    | 4.06     | 8.083    | 3.05     | 11.17 | 1.02 |
| 2.000 | 1.02  | 5.083    | 5.08     | 8.167    | 3.05     | 11.25 | 1.02 |
| 2.083 | 1.02  | 5.167    | 5.08     | 8.250    | 3.05     | 11.33 | 1.02 |
| 2.167 | 1.02  | 5.250    | 5.08     | 8.333    | 3.05     | 11.42 | 1.02 |
| 2.250 | 1.02  |          | 7.11     | 8.417    | 3.05     | 11.50 | 1.02 |
| 2.333 | 3.05  | 5.417    | 7.11     | 8.500    | 3.05     | 11.58 | 1.02 |
| 2.417 | 3.05  | 5.500    | 7.11     | 8.583    | 2.03     | 11.67 | 1.02 |
| 2.500 | 3.05  | 5.583    | 8.13     | 8.667    | 2.03     | 11.75 | 1.02 |
| 2.583 |       | 5.667    | 8.13     |          | 2.03     |       | 2.03 |
| 2.667 | 2.03  | 5.750    | 8.13     | 8.833    | 3.05     | 11.92 | 2.03 |
| 2.750 | 2.03  | 5.833    | 56.90    |          | 3.05     | 12.00 | 2.03 |
| 2.833 | 3.05  | 5.917    | 56.90    | 9.000    | 3.05     | 12.08 | 1.02 |
| 2.917 | 3.05  | 6.000    | 56.90    | 9.083    | 2.03     |       | 1.02 |
| 3.000 | 3.05  | 6.083    | 57.91    | 9.167    | 2.03     | 12.25 | 1.02 |
| 3.083 | 2.03  | 6.167    | 57.91    | 9.250    | 2.03     |       |      |
| * (   | han)  | F7 01    |          | 7 00     |          |       |      |

57.91 5.00 5.51 (ii) 5.00 0.20 Max.Eff.Inten.(mm/hr)= over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 10.00 9.48 (ii) 10.00 0.12 \*TOTALS\* PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 0.07 0.01 0.084 (iii) 6.25 61.75 63.75 0.97 6.25 6.25 31.16 63.75 0.49 53.18

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

(1) CN\* PROCEDURE SELECTED FOR FEATURES LOSSES.

CN\* = 83.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB | CALIB | STANDHYD ( 0170)| |ID= 1 DT= 5.0 min | Area (ha)= 0.43 Total Imp(%)= 98.00 Dir. Conn.(%)= 98.00

LangstaffRd\_EA\_Proposed\_WestDonWatershd

Filename: C:\Users\ray.zhao\AppD ata\Local\Temp\ e8da@adc-3bd3-467d-984d-5ab4a7d3492c\c585f216 Comments: 10yr-12hrSCS READ STORM RAIN | TIME TIME RAIN TIME RAIN | TIME mm/hr | hrs RAIN 11ME hrs 6.75 7.00 7.25 7.50 7.75 8.00 8.25 hrs mm/hr hrs mm/hr mm/hr 11.18 | 0.25 0.00 3.50 3.05 10.00 2.03 0.25 0.50 0.75 1.00 1.25 1.50 1.75 3.50 3.75 4.00 4.25 4.50 4.75 5.00 2.03 3.05 2.03 5.08 4.06 4.06 5.08 | 5.08 | 4.06 | 4.06 | 4.06 | 10.25 10.50 10.75 11.00 2.03 1.02 1.02 2.03 1.02 1.02 11.25 1.02 2.03 3.05 11.50 1.02 5.00 5.25 5.50 5.75 6.00 6.25 6.50 8.25 8.50 8.75 9.00 9.25 9.50 9.75 2.00 1.02 5.08 7.11 3.05 11.75 1.02 2.25 1.02 2.03 12.00

2.50 2.75 3.00 3.25 3.05 | 2.03 | 3.05 | 2.03 | 8.13 | 56.90 | 57.91 | 11.18 | 3.05 | 2.03 | 2.03 | 2.03 |

12.25

1.02

| CALIB | | STANDHYD ( 0165) | |ID= 1 DT= 5.0 min |

Area (ha)= 0.60 Total Imp(%)= 72.00 Dir. Conn.(%)= 72.00

IMPERVIOUS PERVIOUS (i) 0.43 2.00 1.00 250.00 0.013 0.17 5.00 2.00 Surface Area (ha)= Dep. Storage Average Slope Length Mannings n (mm)= (%)= (m)=

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TRANSFORMED HYETOGRAPH | ISFORMED HYETOGR RAIN | TIME | IMP | TIME | 2.03 | 6.250 | 2.03 | 6.333 | 3.05 | 6.417 | 3.05 | 6.500 | 3.05 | 6.583 | 2.03 | 6.667 | 2.03 | 6.650 | 2.03 | 6.650 | 3.05 | 6.917 | 3.05 | 7.000 TIME hrs 3.167 3.250 3.333 3.417 TTMF RATN I RAIN | TIME RATN 0.083 0.167 0.250 0.333 MM/hr 0.00 0.00 0.00 1.02 MM/hr 57.91 11.18 11.18 hrs 9.33 9.42 9.50 9.58 mm/hi 2.03 2.03 2.03 2.03 9.67 9.75 9.83 9.92 10.00 10.08 0.417 1.02 3.500 3.583 11.18 2.03 0.500 1.02 11.18 2.03 0.583 0.667 0.750 0.833 2.03 2.03 2.03 1.02 11.18 | 11.18 | 5.08 | 5.08 | 5.08 | 2.03 2.03 2.03 2.03 2.03 3.667 3.750 3.833 3.917

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LangstaffRd\_EA\_Proposed\_WestDonWatershd
IMPERVIOUS PERVIOUS (i)

IMPERVIOUS 0.42 2.00 urface Area 0.01 Dep. Storage Average Slope (mm)= (%)= 5.00 1.00 2.00 Length Mannings n (m)= 250.00 20.00 0.013 0 250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       |       |       | HYETOGR |       |       |       |
|-------|-------|-------|-------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN  |         | RAIN  |       | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr | ' hrs   |       | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03  | 6.250   | 57.91 | 9.33  | 2.03  |
| 0.167 | 0.00  | 3.250 | 2.03  | 6.333   | 11.18 | 9.42  | 2.03  |
| 0.250 | 0.00  | 3.333 | 3.05  | 6.417   | 11.18 | 9.50  | 2.03  |
| 0.333 | 1.02  | 3.417 | 3.05  | 6.500   | 11.18 | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05  |         | 11.18 | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03  |         | 11.18 | 9.75  | 2.03  |
| 0.583 | 2.03  | 3.667 | 2.03  | 6.750   | 11.18 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 2.03  | 6.833   | 5.08  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 3.05  | 6.917   | 5.08  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 3.05  | 7.000   | 5.08  | 10.08 | 2.03  |
| 0.917 | 1.02  | 4.000 | 3.05  | 7.083   | 5.08  | 10.17 | 2.03  |
| 1.000 | 1.02  | 4.083 | 2.03  | 7.167   | 5.08  | 10.25 | 2.03  |
| 1.083 | 1.02  | 4.167 | 2.03  | 7.250   | 5.08  | 10.33 | 1.02  |
| 1.167 | 1.02  | 4.250 | 2.03  | 7.333   | 4.06  | 10.42 | 1.02  |
| 1.250 | 1.02  | 4.333 | 5.08  | 7.417   | 4.06  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 5.08  | 7.500   | 4.06  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 5.08  | 7.583   | 4.06  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 4.06  | 7.667   | 4.06  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 4.06  | 7.750   | 4.06  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 4.06  | 7.833   | 4.06  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 4.06  | 7.917   | 4.06  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 4.06  | 8.000   | 4.06  | 11.08 | 1.02  |
| 1.917 | 1.02  | 5.000 | 4.06  | 8.083   | 3.05  | 11.17 | 1.02  |
| 2.000 | 1.02  | 5.083 | 5.08  |         | 3.05  | 11.25 | 1.02  |
| 2.083 | 1.02  | 5.167 | 5.08  | 8.250   | 3.05  | 11.33 | 1.02  |
| 2.167 | 1.02  | 5.250 | 5.08  | 8.333   | 3.05  | 11.42 | 1.02  |
| 2.250 | 1.02  | 5.333 | 7.11  | 8.417   | 3.05  | 11.50 | 1.02  |
| 2.333 | 3.05  | 5.417 | 7.11  | 8.500   | 3.05  | 11.58 | 1.02  |
| 2.417 | 3.05  | 5.500 | 7.11  | 8.583   | 2.03  | 11.67 | 1.02  |
| 2.500 | 3.05  | 5.583 | 8.13  | 8.667   | 2.03  | 11.75 | 1.02  |
| 2.583 | 2.03  | 5.667 | 8.13  | 8.750   | 2.03  | 11.83 | 2.03  |
| 2.667 | 2.03  | 5.750 | 8.13  | 8.833   | 3.05  | 11.92 | 2.03  |
| 2.750 | 2.03  | 5.833 | 56.90 | 8.917   | 3.05  | 12.00 | 2.03  |
| 2.833 | 3.05  | 5.917 | 56.90 | 9.000   | 3.05  | 12.08 | 1.02  |
| 2.917 | 3.05  | 6.000 | 56.90 | 9.083   | 2.03  | 12.17 | 1.02  |
| 3.000 | 3.05  | 6.083 | 57.91 | 9.167   | 2.03  | 12.25 | 1.02  |
| 3.083 | 2.03  | 6.167 | 57.91 | 9.250   | 2.03  |       |       |

Max.Eff.Inten.(mm/hr)= 57 91 10.00

# LangstaffRd\_EA\_Proposed\_WestDonWatershd Storage Coeff. (min)= 5 51 (ii) 6 73 (ii)

| Storage Coeff.   | (min)= | 5.51 (11) | 6./3 (11) |             |
|------------------|--------|-----------|-----------|-------------|
| Unit Hyd. Tpeak  | (min)= | 5.00      | 10.00     |             |
| Unit Hyd. peak   | (cms)= | 0.20      | 0.14      |             |
|                  |        |           |           | *TOTALS*    |
| PEAK FLOW        | (cms)= | 0.07      | 0.00      | 0.068 (iii) |
| TIME TO PEAK     | (hrs)= | 6.25      | 6.25      | 6.25        |
| RUNOFF VOLUME    | (mm)=  | 61.75     | 38.29     | 61.27       |
| TOTAL RAINFALL   | (mm)=  | 63.75     | 63.75     | 63.75       |
| RUNOFF COEFFICIE | ENT =  | 0.97      | 0.60      | 0.96        |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 89.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |         |       |        |           |       |  |
|-------------------|-------|---------|-------|--------|-----------|-------|--|
| STANDHYD ( 0180)  | Area  | (ha)=   | 0.65  |        |           |       |  |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 52.00 | Dir.   | Conn.(%)= | 52.00 |  |
|                   |       | ,       |       |        | ,         |       |  |
|                   |       | IMPERVI | OUS   | PERVIO | JS (i)    |       |  |
| Surface Area      | (ha)= | 0.3     | 1     | 0.3    | 1 ` ′     |       |  |
| Dep. Storage      | (mm)= | 2.0     | 9     | 5.00   | 9         |       |  |
| Average Slope     | `(%)= | 1.0     | 9     | 2.00   | a         |       |  |
| Length            | (m)=  | 65.8    |       | 40.00  | a         |       |  |
|                   | ` '   | 0.01    | -     | 0.25   | -         |       |  |
| Mannings n        | =     | 0.01    | •     | Ø. 25  | 9         |       |  |
|                   |       |         |       |        |           |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       | TRANSFORMED HYETOGRAPH |       |       |        |       |       |       |  |  |  |  |
|-------|------------------------|-------|-------|--------|-------|-------|-------|--|--|--|--|
| TIME  | RAIN                   | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |  |  |  |
| hrs   | mm/hr                  | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |  |  |  |
| 0.083 | 0.00                   | 3.167 | 2.03  | 6.250  | 57.91 | 9.33  | 2.03  |  |  |  |  |
| 0.167 | 0.00                   | 3.250 | 2.03  | 6.333  | 11.18 | 9.42  | 2.03  |  |  |  |  |
| 0.250 | 0.00                   | 3.333 | 3.05  | 6.417  | 11.18 | 9.50  | 2.03  |  |  |  |  |
| 0.333 | 1.02                   | 3.417 | 3.05  | 6.500  | 11.18 | 9.58  | 2.03  |  |  |  |  |
| 0.417 | 1.02                   | 3.500 | 3.05  | 6.583  | 11.18 | 9.67  | 2.03  |  |  |  |  |
| 0.500 | 1.02                   | 3.583 | 2.03  | 6.667  | 11.18 | 9.75  | 2.03  |  |  |  |  |
| 0.583 | 2.03                   | 3.667 | 2.03  | 6.750  | 11.18 | 9.83  | 2.03  |  |  |  |  |
| 0.667 | 2.03                   | 3.750 | 2.03  | 6.833  | 5.08  | 9.92  | 2.03  |  |  |  |  |
| 0.750 | 2.03                   | 3.833 | 3.05  | 6.917  | 5.08  | 10.00 | 2.03  |  |  |  |  |
| 0.833 | 1.02                   | 3.917 | 3.05  | 7.000  | 5.08  | 10.08 | 2.03  |  |  |  |  |
| 0.917 | 1.02                   | 4.000 | 3.05  | 7.083  | 5.08  | 10.17 | 2.03  |  |  |  |  |
| 1.000 | 1.02                   | 4.083 | 2.03  | 7.167  | 5.08  | 10.25 | 2.03  |  |  |  |  |
| 1.083 | 1.02                   | 4.167 | 2.03  | 7.250  | 5.08  | 10.33 | 1.02  |  |  |  |  |
| 1.167 | 1.02                   | 4.250 | 2.03  | 7.333  | 4.06  | 10.42 | 1.02  |  |  |  |  |
| 1.250 | 1.02                   | 4.333 | 5.08  | 7.417  | 4.06  | 10.50 | 1.02  |  |  |  |  |
| 1.333 | 1.02                   | 4.417 | 5.08  | 7.500  | 4.06  | 10.58 | 1.02  |  |  |  |  |
| 1.417 | 1.02                   | 4.500 | 5.08  | 7.583  | 4.06  | 10.67 | 1.02  |  |  |  |  |

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## ${\tt LangstaffRd\_EA\_Proposed\_WestDonWatershd}$

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250   | 57.91 | 9.33  | 2.03  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333   | 11.18 | 9.42  | 2.03  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417   | 11.18 | 9.50  | 2.03  |
| 0.333 | 1.02  | 3.417 | 3.05     | 6.500   | 11.18 | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05     | 6.583   | 11.18 | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03     | 6.667   | 11.18 | 9.75  | 2.03  |
| 0.583 | 2.03  | 3.667 | 2.03     | 6.750   | 11.18 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 2.03     | 6.833   | 5.08  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 3.05     | 6.917   | 5.08  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 3.05     | 7.000   | 5.08  | 10.08 | 2.03  |
| 0.917 | 1.02  | 4.000 | 3.05     | 7.083   | 5.08  | 10.17 | 2.03  |
| 1.000 | 1.02  | 4.083 | 2.03     | 7.167   | 5.08  | 10.25 | 2.03  |
| 1.083 | 1.02  | 4.167 | 2.03     | 7.250   | 5.08  | 10.33 | 1.02  |
| 1.167 | 1.02  | 4.250 | 2.03     | 7.333   | 4.06  | 10.42 | 1.02  |
| 1.250 | 1.02  | 4.333 | 5.08     | 7.417   | 4.06  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 5.08     | 7.500   | 4.06  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 5.08     | 7.583   | 4.06  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 4.06     | 7.667   | 4.06  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 4.06     | 7.750   | 4.06  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 4.06     | 7.833   | 4.06  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 4.06     | 7.917   | 4.06  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 4.06     | 8.000   | 4.06  | 11.08 | 1.02  |
| 1.917 | 1.02  | 5.000 | 4.06     | 8.083   | 3.05  | 11.17 | 1.02  |
| 2.000 | 1.02  | 5.083 | 5.08     | 8.167   | 3.05  | 11.25 | 1.02  |
| 2.083 | 1.02  | 5.167 | 5.08     | 8.250   | 3.05  | 11.33 | 1.02  |
| 2.167 | 1.02  | 5.250 | 5.08     | 8.333   | 3.05  | 11.42 | 1.02  |
| 2.250 | 1.02  | 5.333 | 7.11     | 8.417   | 3.05  | 11.50 | 1.02  |
| 2.333 | 3.05  | 5.417 | 7.11     | 8.500   | 3.05  | 11.58 | 1.02  |
| 2.417 | 3.05  | 5.500 | 7.11     | 8.583   | 2.03  | 11.67 | 1.02  |
| 2.500 | 3.05  | 5.583 | 8.13     | 8.667   | 2.03  | 11.75 | 1.02  |
| 2.583 | 2.03  | 5.667 | 8.13     | 8.750   | 2.03  | 11.83 | 2.03  |
| 2.667 | 2.03  | 5.750 | 8.13     | 8.833   | 3.05  | 11.92 | 2.03  |
| 2.750 | 2.03  | 5.833 | 56.90    | 8.917   | 3.05  | 12.00 | 2.03  |
| 2.833 | 3.05  | 5.917 | 56.90    | 9.000   | 3.05  | 12.08 | 1.02  |
| 2.917 | 3.05  | 6.000 | 56.90    | 9.083   | 2.03  | 12.17 | 1.02  |
| 3.000 | 3.05  | 6.083 | 57.91    | 9.167   | 2.03  | 12.25 | 1.02  |
| 3.083 | 2.03  | 6.167 | 57.91    | 9.250   | 2.03  |       |       |

0.01 6.33 0.063 (iii) 6.25 Page 71

\*TOTALS\*

57.91 32.68 5.00 15.00 5.37 (ii) 10.23 (ii) 5.00 15.00 0.21 0.09

Max.Eff.Inten.(mm/hr)= over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)=

PEAK FLOW (cms)= TIME TO PEAK (hrs)=

|               |          | Langs                  | taffRd F         | A Propo | sed WestDon   | Waters | hd                 |      |
|---------------|----------|------------------------|------------------|---------|---|--------|--------------------|------|
|               | 1.500    | 1 02                   | I 4 E02          | 4 06    | 1 7 667   | 1 06   | 10.75              | 1.02 |
|               | 1.583    | 2.03                   | 4.667            | 4.06    | 7.750<br>7.750<br>7.833<br>7.917  | 4.06   | 10.83              | 2.03 |
|               | 1.667    | 2.03                   | 4.750            | 4.06    | 7.833   | 4.06   | 10.92              | 2.03 |
|               | 1.750    | 2.03                   | 4.833            | 4.06    | 7.917   | 4.06   | 11.00              | 2.03 |
|               | 1.833    | 1.02                   | 4.91/            | 4.06    | 8.000   | 4.06   | 11.08              | 1.02 |
|               | 2 000    | 1.02                   | 5.000            | 4.06    | 8.083   | 3.05   | 11.1/              | 1.02 |
|               | 2.000    | 1.02                   | 5 167            | 5.00    | 8 250   | 3.05   | 11.23              | 1 02 |
|               | 2.167    | 1.02                   | 5.250            | 5.08    | 8.333   | 3.05   | 11.42              | 1.02 |
|               | 2.250    | 1.02                   | 5.333            | 7.11    | 8.417   | 3.05   | 11.50              | 1.02 |
|               | 2.333    | 3.05                   | 5.417            | 7.11    | 8.500   | 3.05   | 11.58              | 1.02 |
|               | 2.417    | 3.05                   | 5.500            | 7.11    | 8.583   | 2.03   | 11.67              | 1.02 |
|               | 2.500    | 3.05                   | 5.583            | 8.13    | 8.667   | 2.03   | 11.75              | 1.02 |
|               | 2.583    | 2.03                   | 5.667            | 8.13    | 8.750   | 2.03   | 11.83              | 2.03 |
|               | 2.667    | 2.03                   | 5.750            | 8.13    | 8.833   | 3.05   | 11.92              | 2.03 |
|               | 2.750    | 2.03                   | 5.833            | 56.90   | 8.917   | 3.05   | 12.00              | 2.03 |
|               | 2.833    | 3.05                   | 5.91/            | 56.90   | 9.000   | 3.05   | 12.08              | 1.02 |
|               | 3 000    | 3.05                   | 6.000<br>  6.083 | 57 91   | 9.003   | 2.03   | 12.17              | 1.02 |
|               | 3 083    | 2 03                   | 6 167            | 57 91   | 9.107   | 2.03   | 12.23              | 1.02 |
|               | 3.003    | 2.03                   | 01107            | 37.132  | 7.917<br>8.000<br>8.083<br>8.167<br>8.250<br>8.333<br>8.417<br>8.500<br>8.583<br>8.667<br>8.750<br>8.833<br>8.917<br>9.000<br>9.083<br>9.167<br>9.250 | 2.03   | '                  |      |
| Max.Eff.      | Inten.(m | m/hr)=                 | 57.91            |         | 35.79   |        |                    |      |
|               | over     | (min)                  | 5.00             |         | 15.00   |        |                    |      |
| Storage       | Coeff.   | (min)=                 | 2.47             | (ii)    | 13.12 (ii)  |        |                    |      |
| Unit Hyd      | I. Tpeak | (min)=                 | 5.00             |         | 15.00   |        |                    |      |
| Unit Hyd      | l. peak  | (cms)=                 | 0.29             |         | 35.79<br>15.00<br>13.12 (ii)<br>15.00<br>0.08   |        |                    |      |
| DEAK EL       |          | (                      | 0.05             |         | 0.00  | *10    | TALS*              |      |
| TIME TO       | M DEAV   | (cms)=<br>(hrs)=       | 0.05<br>6.25     |         | 0.02<br>6.33  |        | .077 (iii)<br>5.25 |      |
| PLINOEE V     | OLUME    | (III'S)-               | 61 75            |         | 31.16   |        | 7.06               |      |
| TOTAL RA      | TNFALL   | (mm)=                  | 63.75            |         | 63.75   |        | 3.75               |      |
| RUNOFF (      | OEFFICIE | (mm)=<br>(mm)=<br>NT = | 0.97             |         | 0.49  |        | 0.74               |      |
|               |          |                        |                  |         |   |        |                    |      |
| ***** WARNING | : STORAG | E COEFF. 1             | IS SMALLE        | R THAN  | TIME STEP!  |        |                    |      |
|               |          |                        |                  |         |   |        |                    |      |
|               |          | RE SELECTE             |                  |         |   |        |                    |      |
|               |          | 3.0 Ia<br>(DT) SHOUL   |                  |         |   |        |                    |      |
|               |          | TORAGE COE             |                  |         | LQUAL   |        |                    |      |
|               |          | DOES NOT 1             |                  |         | I TF ANY.   |        |                    |      |
| (/            |          |                        |                  |         |   |        |                    |      |
|               |          |                        |                  |         |   |        |                    |      |
|               |          |                        |                  |         |   |        |                    |      |
| CALIB         |          |                        |                  |         |   |        |                    |      |
| STANDHYD (    | 0185)    | Area                   | (ha)=            | 0.47    |   |        |                    |      |
| ID= 1 DT= 5.  | 0 min    | lotal in               | np(%)= /         | 2.00    | Dir. Conn.  | (%)=   | /2.00              |      |
|               |          |                        | IMDER//TOU       | IS DE   | RVIOUS (i)  |        |                    |      |
| Surface       | Area     |                        | 0.34             |         | 0.13  |        |                    |      |
|               | rage     | (mm)=                  | 2.00             |         | 5.00  |        |                    |      |
| Average       | Slope    | (%)=                   | 2.00<br>1.00     |         | 2.00  |        |                    |      |
| Length        |          |                        | 240.00           |         | 20.00   |        |                    |      |
| Mannings      | n        |                        | 0.013            |         | 0.350   |        |                    |      |
|               |          |                        |                  | _       |   |        |                    |      |
|               |          |                        |                  | Page    | /0  |        |                    |      |

|                  | Lang  | staffRd_EA_P | roposed_WestDor | Watershd |
|------------------|-------|--------------|-----------------|----------|
| RUNOFF VOLUME    | (mm)= | 61.75        | 27.34           | 52.11    |
| TOTAL RAINFALL   | (mm)= | 63.75        | 63.75           | 63.75    |
| RUNOFF COFFETCTI | NT =  | 0.97         | 0.43            | 0.82     |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 79.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0445)                         |      |       |       |       |
|---|------|-------|-------|-------|
| 1 + 2 = 3                               | AREA | QPEAK | TPEAK | R.V.  |
|   | (ha) | (cms) | (hrs) | (mm)  |
| ID1= 1 ( 0180):                         | 0.65 | 0.077 | 6.25  | 47.06 |
| + ID2= 2 ( 0185):                       | 0.47 | 0.063 | 6.25  | 52.11 |
| ======================================= |      |       |       |       |
| ID = 3 (0445):                          | 1.12 | 0.141 | 6.25  | 49.18 |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD ( 0450)  <br>  1 + 2 = 3  <br> | AREA<br>(ha)<br>0.60<br>0.43 | QPEAK<br>(cms)<br>0.084<br>0.068 | TPEAK<br>(hrs)<br>6.25<br>6.25 | R.V.<br>(mm)<br>53.18<br>61.27 |
|--|------------------------------|----------------------------------|--------------------------------|--------------------------------|
| ============                           |                              |                                  |                                |                                |
| ID = 3 ( 0450):                        | 1.03                         | 0.152                            | 6.25                           | 56.56                          |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD ( 0450)                         |      |       |       |       |
|---|------|-------|-------|-------|
| 3 + 2 = 1                               | AREA | QPEAK | TPEAK | R.V.  |
|   | (ha) | (cms) | (hrs) | (mm)  |
| ID1= 3 ( 0450):                         | 1.03 | 0.152 | 6.25  | 56.56 |
| + ID2= 2 ( 0445):                       | 1.12 | 0.141 | 6.25  | 49.18 |
| ======================================= |      |       |       |       |
| ID = 1 ( 0450):                         | 2.15 | 0.293 | 6.25  | 52.71 |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| RESERVOIR( 0520) | OVERFLOW 1 | IS OFF  |   |         |         |
|------------------|------------|---------|---|---------|---------|
| IN= 2> OUT= 1    |            |         |   |         |         |
| DT= 5.0 min      | OUTFLOW    | STORAGE | - | OUTFLOW | STORAGE |
|                  | (cms)      | (ha.m.) | ĺ | (cms)   | (ha.m.) |

| Langstaff | Rd_EA_Propos | ed_WestDonWat | tershd |
|-----------|--------------|---------------|--------|
| 0.0000    | 0.0000       | 0.0181        | 0.0552 |
| 0.0081    | 0.0048       | 0.0203        | 0.0732 |
| 0.0123    | 0.0192       | 0.0224        | 0.1152 |
| 0.0155    | 0.0372       | 0.0000        | 0.0000 |

(cms) 0.293 0.020 (ha) 2.150 (hrs) 6.25 (mm) 52.71 INFLOW : ID= 2 ( 0450) OUTFLOW: ID= 1 ( 0520) 2.150 8.08 52.65

|                   |       |          |       |         |           |       | - |
|-------------------|-------|----------|-------|---------|-----------|-------|---|
|                   |       |          |       |         |           |       |   |
| CALIB             |       |          |       |         |           |       |   |
| STANDHYD ( 0145)  | Area  | (ha)=    | 3.05  |         |           |       |   |
| ID= 1 DT= 5.0 min | Total | Imp(%)=  | 76.00 | Dir.    | Conn.(%)= | 76.00 |   |
|                   |       |          |       |         |           |       |   |
|                   |       | IMPERVIO | OUS   | PERVIOL | JS (i)    |       |   |
| Surface Area      | (ha)= | 2.32     | 2     | 0.73    | 3         |       |   |
| Dep. Storage      | (mm)= | 2.00     | 9     | 5.00    | 9         |       |   |
| Average Slope     | (%)=  | 1.00     | 9     | 2.00    | 9         |       |   |
| Length            | (m)=  | 531.00   | )     | 40.00   | 9         |       |   |
| Mannings n        | ` =   | 0.013    | 3     | 0.256   | 9         |       |   |
|                   |       |          |       |         |           |       |   |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TRANSFORMED HYETOGRAPH |       |       |       |        |       |       |       |  |  |  |
|------------------------|-------|-------|-------|--------|-------|-------|-------|--|--|--|
| TIME                   | RAIN  | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |  |  |
| hrs                    | mm/hr | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |  |  |
| 0.083                  | 0.00  | 3.167 | 2.03  | 6.250  | 57.91 | 9.33  | 2.03  |  |  |  |
| 0.167                  | 0.00  | 3.250 | 2.03  | 6.333  | 11.18 | 9.42  | 2.03  |  |  |  |
| 0.250                  | 0.00  | 3.333 | 3.05  | 6.417  | 11.18 | 9.50  | 2.03  |  |  |  |
| 0.333                  | 1.02  | 3.417 | 3.05  | 6.500  | 11.18 | 9.58  | 2.03  |  |  |  |
| 0.417                  | 1.02  | 3.500 | 3.05  | 6.583  | 11.18 | 9.67  | 2.03  |  |  |  |
| 0.500                  | 1.02  | 3.583 | 2.03  | 6.667  | 11.18 | 9.75  | 2.03  |  |  |  |
| 0.583                  | 2.03  | 3.667 | 2.03  | 6.750  | 11.18 | 9.83  | 2.03  |  |  |  |
| 0.667                  | 2.03  | 3.750 | 2.03  | 6.833  | 5.08  | 9.92  | 2.03  |  |  |  |
| 0.750                  | 2.03  | 3.833 | 3.05  | 6.917  | 5.08  | 10.00 | 2.03  |  |  |  |
| 0.833                  | 1.02  | 3.917 | 3.05  | 7.000  | 5.08  | 10.08 | 2.03  |  |  |  |
| 0.917                  | 1.02  | 4.000 | 3.05  | 7.083  | 5.08  | 10.17 | 2.03  |  |  |  |
| 1.000                  | 1.02  | 4.083 | 2.03  | 7.167  | 5.08  | 10.25 | 2.03  |  |  |  |
| 1.083                  | 1.02  | 4.167 | 2.03  | 7.250  | 5.08  | 10.33 | 1.02  |  |  |  |
| 1.167                  | 1.02  | 4.250 | 2.03  | 7.333  | 4.06  | 10.42 | 1.02  |  |  |  |
| 1.250                  | 1.02  | 4.333 | 5.08  | 7.417  | 4.06  | 10.50 | 1.02  |  |  |  |
| 1.333                  | 1.02  | 4.417 | 5.08  | 7.500  | 4.06  | 10.58 | 1.02  |  |  |  |
| 1.417                  | 1.02  | 4.500 | 5.08  | 7.583  | 4.06  | 10.67 | 1.02  |  |  |  |
| 1.500                  | 1.02  | 4.583 | 4.06  | 7.667  | 4.06  | 10.75 | 1.02  |  |  |  |
| 1.583                  | 2.03  | 4.667 | 4.06  | 7.750  | 4.06  | 10.83 | 2.03  |  |  |  |
| 1.667                  | 2.03  | 4.750 | 4.06  | 7.833  | 4.06  | 10.92 | 2.03  |  |  |  |

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|       |       | IR    | ANSFORME | ) HYE I OGR | APH   | -     |       |
|-------|-------|-------|----------|-------------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME      | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs       | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250       | 57.91 | 9.33  | 2.03  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333       | 11.18 | 9.42  | 2.03  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417       | 11.18 | 9.50  | 2.03  |
| 0.333 | 1.02  | 3.417 | 3.05     | 6.500       | 11.18 | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05     | 6.583       | 11.18 | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03     | 6.667       | 11.18 | 9.75  | 2.03  |
| 0.583 | 2.03  | 3.667 | 2.03     | 6.750       | 11.18 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 2.03     | 6.833       | 5.08  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 3.05     | 6.917       | 5.08  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 3.05     | 7.000       | 5.08  | 10.08 | 2.03  |
| 0.917 | 1.02  | 4.000 | 3.05     | 7.083       | 5.08  | 10.17 | 2.03  |
| 1.000 | 1.02  | 4.083 | 2.03     | 7.167       | 5.08  | 10.25 | 2.03  |
| 1.083 | 1.02  | 4.167 | 2.03     | 7.250       | 5.08  | 10.33 | 1.02  |
| 1.167 | 1.02  | 4.250 | 2.03     | 7.333       | 4.06  | 10.42 | 1.02  |
| 1.250 | 1.02  | 4.333 | 5.08     | 7.417       | 4.06  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 5.08     | 7.500       | 4.06  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 5.08     | 7.583       | 4.06  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 4.06     | 7.667       | 4.06  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 4.06     | 7.750       | 4.06  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 4.06     | 7.833       | 4.06  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 4.06     | 7.917       | 4.06  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 4.06     | 8.000       | 4.06  | 11.08 | 1.02  |
| 1.917 | 1.02  | 5.000 | 4.06     | 8.083       | 3.05  | 11.17 | 1.02  |
| 2.000 | 1.02  | 5.083 | 5.08     | 8.167       | 3.05  | 11.25 | 1.02  |
| 2.083 | 1.02  | 5.167 | 5.08     | 8.250       | 3.05  | 11.33 | 1.02  |
| 2.167 | 1.02  | 5.250 | 5.08     | 8.333       | 3.05  | 11.42 | 1.02  |
| 2.250 | 1.02  | 5.333 | 7.11     | 8.417       | 3.05  | 11.50 | 1.02  |
| 2.333 | 3.05  | 5.417 | 7.11     | 8.500       | 3.05  | 11.58 | 1.02  |
| 2.417 | 3.05  | 5.500 | 7.11     | 8.583       | 2.03  | 11.67 | 1.02  |
| 2.500 | 3.05  | 5.583 | 8.13     | 8.667       | 2.03  | 11.75 | 1.02  |
| 2.583 | 2.03  | 5.667 | 8.13     | 8.750       | 2.03  | 11.83 | 2.03  |
| 2.667 | 2.03  | 5.750 | 8.13     | 8.833       | 3.05  | 11.92 | 2.03  |
| 2.750 | 2.03  | 5.833 | 56.90    | 8.917       | 3.05  | 12.00 | 2.03  |
| 2.833 | 3.05  | 5.917 | 56.90    | 9.000       | 3.05  | 12.08 | 1.02  |
| 2.917 | 3.05  | 6.000 | 56.90    | 9.083       | 2.03  | 12.17 | 1.02  |
| 3.000 | 3.05  | 6.083 | 57.91    | 9.167       | 2.03  | 12.25 | 1.02  |
| 3.083 | 2.03  | 6.167 | 57.91    | 9.250       | 2.03  |       |       |

| Max.Eff.Inten.(mm/hr)= | 57.91     | 38.29     |             |
|------------------------|-----------|-----------|-------------|
| over (min)             | 10.00     | 10.00     |             |
| Storage Coeff. (min)=  | 8.38 (ii) | 9.55 (ii) |             |
| Unit Hyd. Tpeak (min)= | 10.00     | 10.00     |             |
| Unit Hyd. peak (cms)=  | 0.12      | 0.12      |             |
|                        |           |           | *TOTALS*    |
| PEAK FLOW (cms)=       | 0.22      | 0.00      | 0.220 (iii) |
| TIME TO PEAK (hrs)=    | 6.25      | 6.25      | 6.25        |
| RUNOFF VOLUME (mm)=    | 61.75     | 32.22     | 61.46       |
| TOTAL RAINFALL (mm)=   | 63.75     | 63.75     | 63.75       |
| RUNOFF COEFFICIENT =   | 0.97      | 0.51      | 0.96        |

Natershd
4.06 | 11.00
4.06 | 11.01
1.08
3.05 | 11.17
3.05 | 11.25
3.05 | 11.33
3.05 | 11.30
3.05 | 11.50
3.05 | 11.50
3.05 | 11.50
3.05 | 11.50
3.05 | 11.25
2.03 | 11.67
2.03 | 11.20
3.05 | 12.08
3.05 | 12.08
3.05 | 12.08 1.750 1.833 1.917 2.000 2.083 2.167 2.250 2.333 2.03 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 | 1.02 | 1.02 | 1.02 | 1.02 | 3.05 | 3.05 | 2.03 | 2.03 | 2.03 | 3.05 | 3.05 | 3.05 | 3.05 | 3.05 | 3.05 | 2.03 | 2.417 2.500 2.583 2.667 2.750 2.833 2.917 1.02 1.02 2.03 2.03 2.03 1.02 1.02 1.02 3.000 3.083 Max.Eff.Inten.(mm/hr)= over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)= 57.91 10.00 8.66 (ii) 10.00 0.12 39.56 20.00 18.88 (ii) 20.00 0.06 \*TOTALS\* 0.403 (iii) 6.25 55.21 63.75 0.87 PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 0.36 0.05 6.25 61.75 63.75 0.97 6.42 34.48 63.75 0.54

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 86.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |         |       |         |           |       |
|-------------------|-------|---------|-------|---------|-----------|-------|
| STANDHYD ( 0135)  | Area  | (ha)=   | 1.43  |         |           |       |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 99.00 | Dir.    | Conn.(%)= | 99.00 |
|                   |       |         |       |         |           |       |
|                   |       | IMPERVI | OUS   | PERVIOL | JS (i)    |       |
| Surface Area      | (ha)= | 1.4     | 2     | 0.01    | 1         |       |
| Dep. Storage      | (mm)= | 2.0     | 9     | 5.00    | 9         |       |
| Average Slope     | (%)=  | 1.0     | Э     | 2.00    | 9         |       |
| Length            | (m)=  | 503.0   | Э     | 30.00   | 9         |       |
| Mannings n        | ` =   | 0.01    | 3     | 0.256   | 9         |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

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- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
- (1) CN\* PROCEDURE SELECTED FOR FEXTURES GASSONS.

  (CN\* = 84.0 Ia = Dep. Storage (Above.)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |      |       |      |      |           |       |
|-------------------|------|-------|------|------|-----------|-------|
| STANDHYD ( 0140)  | Area | (ha)= | 1.27 |      |           |       |
| ID= 1 DT= 5.0 min |      |       |      | Dir. | Conn.(%)= | 91.00 |

|               |       | IMPERVIOUS | PERVIOUS ( | (i |
|---------------|-------|------------|------------|----|
| Surface Area  | (ha)= | 1.16       | 0.11       | `  |
| Dep. Storage  | (mm)= | 2.00       | 5.00       |    |
| Average Slope | (%)=  | 1.00       | 2.00       |    |
| Length        | (m)=  | 503.00     | 25.00      |    |
| Mannings n    | =     | 0.013      | 0.250      |    |
|               |       |            |            |    |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250   | 57.91 | 9.33  | 2.03  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333   | 11.18 | 9.42  | 2.03  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417   | 11.18 | 9.50  | 2.03  |
| 0.333 | 1.02  | 3.417 | 3.05     | 6.500   | 11.18 | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05     | 6.583   | 11.18 | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03     | 6.667   | 11.18 | 9.75  | 2.03  |
| 0.583 | 2.03  | 3.667 | 2.03     | 6.750   | 11.18 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 2.03     | 6.833   | 5.08  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 3.05     | 6.917   | 5.08  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 3.05     | 7.000   | 5.08  | 10.08 | 2.03  |
| 0.917 | 1.02  | 4.000 | 3.05     | 7.083   | 5.08  | 10.17 | 2.03  |
| 1.000 | 1.02  | 4.083 | 2.03     | 7.167   | 5.08  | 10.25 | 2.03  |
| 1.083 | 1.02  | 4.167 | 2.03     | 7.250   | 5.08  | 10.33 | 1.02  |
| 1.167 | 1.02  | 4.250 | 2.03     | 7.333   | 4.06  | 10.42 | 1.02  |
| 1.250 | 1.02  | 4.333 | 5.08     | 7.417   | 4.06  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 5.08     | 7.500   | 4.06  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 5.08     | 7.583   | 4.06  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 4.06     | 7.667   | 4.06  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 4.06     | 7.750   | 4.06  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 4.06     | 7.833   | 4.06  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 4.06     | 7.917   | 4.06  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 4.06     | 8.000   | 4.06  | 11.08 | 1.02  |
| 1.917 | 1.02  | 5.000 | 4.06     | 8.083   | 3.05  | 11.17 | 1.02  |
| 2.000 | 1.02  | 5.083 | 5.08     | 8.167   | 3.05  | 11.25 | 1.02  |
| 2.083 | 1.02  | 5.167 | 5.08     | 8.250   | 3.05  | 11.33 | 1.02  |
| 2.167 | 1.02  | 5.250 | 5.08     | 8.333   | 3.05  | 11.42 | 1.02  |
| 2.250 | 1.02  | 5.333 | 7.11     | 8.417   | 3.05  | 11.50 | 1.02  |

| 2.333<br>2.417   | Langstaff<br>3.05   5.4<br>3.05   5.5   | Rd_EA_Prop<br>117 7.1<br>500 7.1 | osed_WestD<br>1   8.500<br>1   8.583 | onWaters<br>3.05<br>2.03 | hd<br>11.58<br>11.67      | 1.02                 |
|--|---|----------------------------------|--------------------------------------|--------------------------|---------------------------|----------------------|
| 2.500<br>2.583<br>2.667  | 3.05   5.5<br>2.03   5.6<br>2.03   5.7  | 8.1<br>667 8.1<br>750 8.1        | 8   8.667<br>3   8.750<br>3   8.833  | 2.03<br>2.03<br>3.05     | 11.75<br>11.83<br>11.92   | 1.02<br>2.03<br>2.03 |
| 2.750<br>2.833<br>2.917<br>3.000   | Langstaff 3.05   5.4 3.05   5.5 3.05   5.5 2.03   5.6 2.03   5.6 3.05   6.6 3.05   6.6 2.03   6.6 | 333 56.9<br>917 56.9<br>900 56.9 | 8.917<br>9   9.000<br>9   9.083      | 3.05<br>3.05<br>2.03     | 12.00<br>12.08<br>12.17   | 2.03<br>1.02<br>1.02 |
| 3.083 Max.Eff.Inten.(mm/h  | 2.03   6.1<br>r)= 57  | .91                              | 37.09                                | 2.03                     |                           |                      |
| Max.Eff.Inten.(mm/h<br>over (mi<br>Storage Coeff. (mi<br>Unit Hyd. Tpeak (mi<br>Unit Hyd. peak (cm | n) 16<br>n)= 8<br>n)= 16  | 0.00<br>3.38 (ii)<br>0.00        | 15.00<br>11.00 (i<br>15.00<br>0.09   | i)                       |                           |                      |
| PEAK FLOW (cm<br>TIME TO PEAK (hr<br>RUNOFF VOLUME (m<br>TOTAL RAINFALL (m<br>RUNOFF COEFFICIENT   |   |                                  |                                      | *10                      | ALS*<br>188 (iii)<br>5.25 | )                    |
| TOTAL RAINFALL (m  | m)= 63<br>= 6   | 3.75<br>3.97                     | 63.75<br>0.49                        | 6:                       | 3.75<br>3.93              |                      |
| (i) CN PROCEDURE<br>CN* = 83.0<br>(ii) TIME STEP (DT<br>THAN THE STOR<br>(iii) PEAK FLOW DOE       | Ia = De<br>) SHOULD BE<br>AGE COEFFIC   | p. Storag<br>SMALLER<br>SIENT.   | e (Above)<br>OR EQUAL                |                          |                           |                      |
| ADD HYD ( 0420)  |   |                                  |                                      |                          |                           |                      |
| 1 + 2 = 3  <br>  1 + 2 = 1  <br>  ID1= 1 ( 0135):  | AREA<br>(ha)  | QPEAK<br>(cms)                   | TPEAK<br>(hrs)                       | R.V.<br>(mm)             |                           |                      |
| ID1= 1 ( 0135):<br>+ ID2= 2 ( 0140):   | 1.43<br>1.27  | 0.220<br>0.188                   | 6.25<br>6.25                         | 51.46<br>59.00           |                           |                      |
| ID = 3 ( 0420):  |   |                                  |                                      |                          |                           |                      |
| NOTE: PEAK FLOWS D   | O NOT INCLU   | JDE BASEFL                       | OWS IF ANY                           |                          |                           |                      |
| RESERVOIR( 0530) <br>  IN= 2> OUT= 1   |   |                                  |                                      |                          |                           |                      |
| DT- 50 min   | (cms)<br>0.0000   | (ha.m.)<br>0.0000                | (cms                                 | ) (ha                    | i.m.)<br>3.0823           |                      |
|  | 0.0084<br>0.0105  | 0.0283<br>0.0553                 | 0.03<br>0.05<br>0.00                 | 16 6<br>90 6             | 0.1598<br>0.0000          |                      |

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LangstaffRd\_EA\_Proposed\_WestDonWatershd = 0.013 0.250 Mannings n

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```
NSFORMED HYETOGRANN | * TIME m/hr | * TIME m/hr | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TIME n. | * TI
                                                                                                                                                 TRANSFORMED HYETOGRAPH -
                                                                                                                                TIME
hrs
3.167
3.250
                                                                                                                                                                                                                                                 APH ----
RAIN | TIME
mm/hr | hrs
57.91 | 9.33
11.18 | 9.42
11.18 | 9.50
                                                                                             RAIN |
                                                                                                                                                                                                                                                                                                                                       RATN
                                                     hrs
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0.167
                                                                                                                                                                                                                                                                                                                                    mm/hr
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                                                     3.083
                                                                                             2.03 | 6.167
                                                                                                                                                                                                                                                       2.03
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                                                                                                        5.00 10.00
5.64 (ii) 9.78 (ii)
5.00 10.00
                                                                                                                                        0.20
                                                                                                                                                                                                        0.11
                                                                                                                                                                                                                                                                 *TOTALS*
```

0.08

PEAK FLOW (cms)=

0.01

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0.085 (iii)

(ha)= (mm)= (%)= (m)= 0.47 2.00 1.00 260.00 0.11 5.00 2.00 Surface Area Dep. Storage Average Slope Length 30.00 Page 78 LangstaffRd\_EA\_Proposed\_WestDonWatershd
TIME TO PEAK (hrs)= 6.25 6.25 6.25
RUNOFF VOLUME (mm)= 61.75 31.16 55.30
TOTAL RAINFALL (mm)= 63.75 63.75 63.75
RUNOFF COEFFICIENT = 0.97 ^ - -(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 83.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COFFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY. | CALIB | | STANDHYD ( 0220) | |ID= 1 DT= 5.0 min | Area (ha)= 0.65 Total Imp(%)= 66.00 Dir. Conn.(%)= 66.00 IMPERVIOUS PERVIOUS (i) 0.43 2.00 1.00 260.00 0.013 Surface Area (ha)= 0.22 5.00 2.00 Dep. Storage Average Slope Length (mm)= (%)= (m)= Mannings n NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP. NSFORMED HYETOGR RAIN | TIME mm/hr | hrs 2.03 | 6.250 2.03 | 6.333 3.05 | 6.417 3.05 | 6.500 3.05 | 6.500 3.05 | 6.500 3.05 | 6.500 3.05 | 6.750 2.03 | 6.750 2.03 | 6.750 2.03 | 6.750 3.05 | 7.000 3.05 | 7.000 3.05 | 7.000 3.05 | 7.000 3.05 | 7.000 3.05 | 7.000 3.05 | 7.000 3.05 | 7.000 3.05 | 7.000 3.05 | 7.000 3.05 | 7.000 3.05 | 7.000 3.05 | 7.000 3.05 | 7.000 3.05 | 7.000 TRANSFORMED HYFTOGRAPH -RAIN | mm/hr | 0.00 | 0.00 | TIME hrs 3.167 RAIN | TIME mm/hr | hrs 57.91 | 9.33 TIME RATN 0.167 3.250 11.18 2.03 0.250 0.00 3.333 11.18 2.03 0.333 1.02 3.417 11.18 9.58 9.67 2.03 0.417 1.02 11.18 2.03 0.500 0.583 0.667 0.750 3.583 3.667 3.750 3.833 3.917 11.18 11.18 5.08 5.08 9.75 9.83 9.92 10.00 1.02 2.03 2.03 2.03 2.03 0.833 1.02 1.02 | 3.917 1.02 | 4.000 1.02 | 4.083 1.02 | 4.167 1.02 | 4.250 1.02 | 4.333 1.02 | 4.417 1.02 | 4.583 2.03 | 4.667 2.03 | 4.750 2.03 | 4.833 1.02 | 4.917 5.08 10.08 2.03 0.917 5.08 10.17 2.03 1.000 5.08 10.25 2.03 7.250 7.333 7.417 7.500 7.583 7.667 1.083 2.03 5.08 10.33 1.02 2.03 2.03 5.08 5.08 5.08 4.06 1.167 1.250 1.333 1.417 1.500 4.06 4.06 4.06 4.06 4.06 10.42 10.50 10.58 10.67 1.02 1.02 1.02 1.02

LangstaffRd\_EA\_Proposed\_WestDonWatershd QPEAK TPEAK (cms) (hrs)

0.408 0.039

(hrs) 6.25 7.33 (mm) 55.21

6.25

60.18

57.54

STORAGE

(ha.m.) 0.1003 0.1284 0.1594

0.1934

0.2308

R V

OUTFLOW

(cms) 0.0471 0.0636 0.0763

0.0870

0.0964

TΡΕΔΚ

PEAK | FLOW | REDUCTION | [Qout/Qin](%) = | 9.48 | TIME | SHIFT OF | PEAK | FLOW | (min) = | 65.00 | MAXIMUM | STORAGE | USED | (ha.m.) = | 0.1109

(cms) 0.403

STORAGE

(ha.m.) 0.0000 0.0165 0.0331

0.0526

AREA

0.0526 | 0.0750 |

PEAK FLOW REDUCTION [Qout/Qin](%)= 15.40 TIME SHIFT OF PEAK FLOW (min)=125.00 MAXIMUM STORAGE USED (ha.m.)= 0.1292

Area (ha)= 0.58 Total Imp(%)= 81.00 Dir. Conn.(%)= 81.00 IMPERVIOUS PERVIOUS (i)

QPEAK

AREA (ha)

(ha)

3.05 2.70 0.039

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

(cms) 0.0000 0.0071 0.0098

0.0119

0.0138

OVERFLOW IS OFF OUTELOW

ID = 3 ( 0425): 5.75 0.415

INFLOW : ID= 2 ( 0420) OUTFLOW: ID= 1 ( 0530)

ADD HYD ( 0425) | 1 + 2 = 3 |

RESERVOIR( 0512)| IN= 2---> OUT= 1 | DT= 5.0 min

| CALIB | | STANDHYD ( 0215) |ID= 1 DT= 5.0 min |

ID1= 1 ( 0145): + ID2= 2 ( 0530):

4 96 Page 80

4.06 İ

4.06

1.583

1.667

1 750

1.833

7.750 7.833 7.917 8.000

10.75

11.08

4.06 10.83

4.06 10.92

4 96 11 00 1.02

2.03

2.03

|            | 1.917    | 1.02 | 5.000 | 4.06  | 8.083      | 3.05 | 11.17      | 1.6 |
|------------|----------|------|-------|-------|------------|------|------------|-----|
|            | 2.000    | 1.02 | 5.083 | 5.08  | 8.167      | 3.05 | 11.25      | 1.6 |
|            | 2.083    | 1.02 | 5.167 | 5.08  | 8.250      | 3.05 | 11.33      | 1.6 |
|            | 2.167    | 1.02 | 5.250 | 5.08  | 8.333      | 3.05 | 11.42      | 1.6 |
|            | 2.250    | 1.02 | 5.333 | 7.11  | 8.417      | 3.05 | 11.50      | 1.6 |
|            |          |      | 5.417 |       | 8.500      |      | 11.58      | 1.6 |
|            | 2.417    | 3.05 | 5.500 | 7.11  | 8.583      | 2.03 | 11.67      | 1.6 |
|            | 2.500    | 3.05 | 5.583 | 8.13  | 8.667      | 2.03 | 11.75      | 1.6 |
|            | 2.583    | 2.03 | 5.667 | 8.13  | 8.750      | 2.03 | 11.83      | 2.6 |
|            | 2.667    |      | 5.750 |       | 8.833      | 3.05 |            |     |
|            |          |      | 5.833 |       | 8.917      | 3.05 |            | 2.6 |
|            |          |      | 5.917 |       | 9.000      |      | 12.08      | 1.6 |
|            |          |      | 6.000 |       | 9.083      |      | 12.17      |     |
|            | 3.000    |      |       |       | 9.167      |      | 12.25      | 1.6 |
|            | 3.083    | 2.03 | 6.167 | 57.91 | 9.250      | 2.03 |            |     |
| Max.Eff.In | ten.(mm/ | hr)= | 57.91 |       | 37.09      |      |            |     |
|            | over (m  |      | 5.00  |       | 15.00      |      |            |     |
|            |          |      |       |       | 10.08 (ii) |      |            |     |
| Unit Hyd.  |          |      | 5.00  |       | 15.00      |      |            |     |
| Unit Hyd.  | peak (c  | ms)= | 0.20  |       | 0.10       |      |            |     |
|            |          |      |       |       |            |      | TALS*      |     |
| PEAK FLOW  |          | ms)= | 0.07  |       | 0.02       |      | .086 (iii) |     |
| TIME TO PE |          |      |       |       | 6.33       |      | 5.25       |     |
| RUNOFF VOL |          |      | 61.75 |       | 31.16      |      | 1.35       |     |
| TOTAL RAIN |          | mm)= | 63.75 |       | 63.75      |      | 3.75       |     |
|            | FFICIENT | =    | 0.97  |       | 0.49       | 6    | 0.81       |     |

- CN\* = 83.0 i a = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COEFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

|                                | -                |            |           |       |  |
|--------------------------------|------------------|------------|-----------|-------|--|
| ADD HYD ( 0470)<br>  1 + 2 = 3 |                  | OPEAK      | TPEAK     | R.V.  |  |
|                                | - (ha)           | (cms)      | (hrs)     | (mm)  |  |
| ID1= 1 ( 0                     |                  | 0.085      | 6.25      | 55.93 |  |
| + ID2= 2 ( 0                   | 220): 0.65       | 0.086      | 6.25      | 51.35 |  |
| ID = 3 ( 0                     | 470): 1.23       | 0.171      | 6.25      | 53.51 |  |
| NOTE: PEAK FI                  | OWS DO NOT TNCLL | IDE BASEFI | OWS TE AM | IY.   |  |

| IN= 2> OUT= 1  <br>  DT= 5.0 min |                                  |  |
|----------------------------------|----------------------------------|--|
| (cms) (ha.m.)                    | OUTFLOW STORAGE<br>(cms) (ha.m.) |  |

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|                  | Langs  | taffRd_E | A_Propo | sed_WestDon | Waters | hd         |      |
|------------------|--------|----------|---------|-------------|--------|------------|------|
| 1.750            | 2.03   | 4.833    | 4.06    | 7.917       | 4.06   | 11.00      | 2.03 |
| 1.833            | 1.02   | 4.917    | 4.06    | 8.000       | 4.06   | 11.08      | 1.02 |
| 1.917            | 1.02   | 5.000    | 4.06    | 8.083       | 3.05   | 11.17      | 1.02 |
| 2.000            | 1.02   | 5.083    | 5.08    | 8.167       | 3.05   | 11.25      | 1.02 |
| 2.083            | 1.02   | 5.167    | 5.08    | 8.250       | 3.05   | 11.33      | 1.02 |
| 2.167            | 1.02   | 5.250    | 5.08    | 8.333       | 3.05   | 11.42      | 1.02 |
| 2.250            | 1.02   | 5.333    | 7.11    | 8.417       | 3.05   | 11.50      | 1.02 |
| 2.333            | 3.05   | 5.417    | 7.11    | 8.500       | 3.05   | 11.58      | 1.02 |
| 2.417            | 3.05   | 5.500    | 7.11    | 8.583       | 2.03   | 11.67      | 1.02 |
| 2.500            | 3.05   | 5.583    | 8.13    | 8.667       | 2.03   | 11.75      | 1.02 |
| 2.583            | 2.03   | 5.667    | 8.13    | 8.750       | 2.03   | 11.83      | 2.03 |
| 2.667            | 2.03   | 5.750    | 8.13    | 8.833       | 3.05   | 11.92      | 2.03 |
| 2.750            |        | 5.833    |         |             | 3.05   |            | 2.03 |
| 2.833            |        | 5.917    | 56.90   |             | 3.05   |            | 1.02 |
| 2.917            |        | 6.000    | 56.90   | 9.083       | 2.03   |            | 1.02 |
| 3.000            |        | 6.083    |         |             | 2.03   |            | 1.02 |
| 3.083            | 2.03   | 6.167    | 57.91   | 9.250       | 2.03   |            |      |
| Max.Eff.Inten.(m | m/hr)= | 57.91    |         | 37.09       |        |            |      |
|                  | (min)  | 5.00     |         | 10.00       |        |            |      |
|                  | (min)= |          | (ii)    | 8.41 (ii)   |        |            |      |
| Unit Hyd. Tpeak  |        | 5.00     | ` '     | 10.00       |        |            |      |
|                  | (cms)= | 0.18     |         | 0.12        |        |            |      |
|                  | , ,    |          |         |             | *T0    | TALS*      |      |
| PEAK FLOW        | (cms)= | 0.08     |         | 0.01        | 0      | .089 (iii) |      |
| TIME TO PEAK     | (hrs)= | 6.25     |         | 6.25        |        | 5.25       |      |
| RUNOFF VOLUME    | (mm)=  | 61.75    |         | 31.16       | 50     | 5.55       |      |
| TOTAL RAINFALL   | (mm)=  | 63.75    |         | 63.75       | 6      | 3.75       |      |
| RUNOFF COEFFICIE | NT =   | 0.97     |         | 0.49        | (      | 0.89       |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| , ,               |       |             |                    |       |
|-------------------|-------|-------------|--------------------|-------|
|                   |       |             |                    |       |
|                   |       |             |                    |       |
| I CALTB           |       |             |                    |       |
| STANDHYD ( 0230)  | Area  | (ha)= 0     | .70                |       |
| ID= 1 DT= 5.0 min | Total | Imp(%) = 66 | .00 Dir. Conn.(%)= | 66.00 |
| ii                |       | ,           |                    |       |
|                   |       | IMPERVIOUS  | PERVIOUS (i)       |       |
| Surface Area      | (ha)= | 0.46        | 0.24               |       |
| Dep. Storage      | (mm)= | 2.00        | 5.00               |       |
| Average Slope     | (%)=  | 1.00        | 2.00               |       |
| Length            | (m)=  | 320.00      | 25.00              |       |
| Mannings n        | =     | 0.013       | 0.300              |       |
|                   |       |             |                    |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

LangstaffRd\_EA\_Proposed\_WestDonWatershd 0.0000 0.0000 | 0.0116 0.0 0.0053 0.0048 0.0131 0.0 0.0080 0.0154 0.0202 0.0 0.0100 0.0261 | 0.0000 0.0 0.0367 0.0474 0.0639 0.0000 QPEAK (cms) 0.171 0.012 R.V. (mm) 53.51 53.33 (ha) 1.230 1.230 (hrs) 6.25 8.00 INFLOW : ID= 2 ( 0470) OUTFLOW: ID= 1 ( 0535)

PEAK FLOW REDUCTION [Qout/Qin](%)= 7.26
TIME SHIFT OF PEAK FLOW (min)=105.00
MAXIMUM STORAGE USED (ha.m.)= 0.0426

| CALIB | STANDHYD ( 0225)| |ID= 1 DT= 5.0 min Area (ha)= 0.60 Total Imp(%)= 83.00 Dir. Conn.(%)= 83.00 IMPERVIOUS 0.50 2.00 1.00 320.00 0.013 PERVIOUS (i) Surface Area Dep. Storage Average Slope Length Mannings n (ha)= (mm)= (%)= (m)= 0.10 5.00 2.00 10.00 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250   | 57.91 | 9.33  | 2.03  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333   | 11.18 | 9.42  | 2.03  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417   | 11.18 | 9.50  | 2.03  |
| 0.333 | 1.02  | 3.417 | 3.05     | 6.500   | 11.18 | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05     | 6.583   | 11.18 | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03     | 6.667   | 11.18 | 9.75  | 2.03  |
| 0.583 | 2.03  | 3.667 | 2.03     | 6.750   | 11.18 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 2.03     | 6.833   | 5.08  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 3.05     | 6.917   | 5.08  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 3.05     | 7.000   | 5.08  | 10.08 | 2.03  |
| 0.917 | 1.02  | 4.000 | 3.05     | 7.083   | 5.08  | 10.17 | 2.03  |
| 1.000 | 1.02  | 4.083 | 2.03     | 7.167   | 5.08  | 10.25 | 2.03  |
| 1.083 | 1.02  | 4.167 | 2.03     | 7.250   | 5.08  | 10.33 | 1.02  |
| 1.167 | 1.02  | 4.250 | 2.03     | 7.333   | 4.06  | 10.42 | 1.02  |
| 1.250 | 1.02  | 4.333 | 5.08     | 7.417   | 4.06  | 10.50 | 1.02  |
| 1.333 | 1.02  | 4.417 | 5.08     | 7.500   | 4.06  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 5.08     | 7.583   | 4.06  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 4.06     | 7.667   | 4.06  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 4.06     | 7.750   | 4.06  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 4.06     | 7.833   | 4.06  | 10.92 | 2.03  |
|       |       |       |          |         |       |       |       |

| Langs                  |                |              | sed_WestDo |       |                   |       |
|------------------------|----------------|--------------|------------|-------|-------------------|-------|
|                        |                |              | D HYETOGRA |       |                   |       |
| TIME RAIN              | TIME           | RAIN         | ' TIME     | RAIN  | TIME              | RAIN  |
| hrs mm/hr              |                |              | ' hrs      | mm/hr |                   | mm/hr |
| 0.083 0.00             |                | 2.03         | 6.250      | 57.91 |                   | 2.03  |
|                        | 3.250          |              | 6.333      | 11.18 | 9.42              | 2.03  |
| 0.250 0.00             |                |              | 6.417      | 11.18 | 9.50              | 2.03  |
| 0.333 1.02             | 3.417          |              | 6.500      | 11.18 | 9.58              | 2.03  |
| 0.417 1.02             |                | 3.05         |            | 11.18 | 9.67              | 2.03  |
| 0.500 1.02             | 3.583          | 2.03         |            | 11.18 | 9.75              | 2.03  |
| 0.583 2.03             |                | 2.03         |            | 11.18 | 9.83              | 2.03  |
|                        | 3.750          | 2.03         |            | 5.08  |                   | 2.03  |
|                        | 3.833          | 3.05         |            | 5.08  |                   | 2.03  |
|                        | 3.917          | 3.05         | 7.000      | 5.08  |                   | 2.03  |
| 0.917 1.02             |                | 3.05         |            | 5.08  |                   | 2.03  |
|                        | 4.083          | 2.03         |            | 5.08  |                   | 2.03  |
|                        | 4.167          | 2.03         |            | 5.08  |                   | 1.02  |
|                        | 4.250          | 2.03         | 7.333      | 4.06  |                   | 1.02  |
|                        | 4.333          | 5.08         | 7.417      | 4.06  |                   | 1.02  |
|                        | 4.417          | 5.08         | 7.500      | 4.06  |                   | 1.02  |
|                        | 4.500          | 5.08         |            | 4.06  |                   | 1.02  |
|                        | 4.583          | 4.06         | 7.667      | 4.06  |                   | 1.02  |
|                        | 4.667          | 4.06         |            | 4.06  |                   | 2.03  |
|                        | 4.750          | 4.06         |            | 4.06  |                   | 2.03  |
| 1.750 2.03             |                | 4.06         |            | 4.06  |                   | 2.03  |
|                        | 4.917          |              | 8.000      | 4.06  |                   | 1.02  |
|                        | 5.000          |              | 8.083      | 3.05  |                   | 1.02  |
|                        | 5.083          | 5.08         |            | 3.05  |                   | 1.02  |
|                        | 5.167          | 5.08         |            | 3.05  |                   | 1.02  |
|                        | 5.250<br>5.333 | 5.08<br>7.11 | 8.333      | 3.05  |                   | 1.02  |
|                        | 5.333          | 7.11         | 8.417      | 3.05  |                   | 1.02  |
|                        | 5.500          | 7.11         | 8.500      | 2.03  |                   | 1.02  |
|                        | 5.583          |              | 8.667      | 2.03  |                   | 1.02  |
|                        | 5.667          | 8.13         | 8.750      | 2.03  |                   | 2.03  |
|                        | 5.750          | 8.13         |            | 3.05  |                   | 2.03  |
|                        |                | 56.90        |            | 3.05  |                   | 2.03  |
|                        |                | 56.90        |            | 3.05  |                   | 1.02  |
|                        |                | 56.90        |            | 2.03  |                   | 1.02  |
|                        |                | 57.91        | 9.167      | 2.03  |                   | 1.02  |
|                        |                | 57.91        |            | 2.03  |                   | 1.02  |
|                        | •              |              |            |       |                   |       |
| Max.Eff.Inten.(mm/hr)= | 57.91          |              | 34.81      |       |                   |       |
| over (min)             | 5.00           |              | 20.00      |       |                   |       |
| Storage Coeff. (min)=  | 6.39 (         | ii)          | 15.45 (ii) |       |                   |       |
| Unit Hyd. Tpeak (min)= | 5.00           |              | 20.00      |       |                   |       |
| Unit Hyd. peak (cms)=  | 0.18           |              | 0.07       | ****  |                   |       |
| PEAK FLOW (cms)=       | 0.07           |              | 0.02       |       | ALS*<br>087 (iii) |       |
| TIME TO PEAK (hrs)=    | 6.25           |              | 6.42       |       | 5.25              |       |
| RUNOFF VOLUME (mm)=    | 61.75          |              | 29.17      |       | 0.66              |       |
| TOTAL RAINFALL (mm)=   | 63.75          |              | 63.75      |       | 3.75              |       |
| RUNOFF COEFFICIENT =   | 0.97           |              | 0.46       |       | 3.79              |       |
|                        | 0.57           |              | - 1-10     |       |                   |       |

### LangstaffRd\_EA\_Proposed\_WestDonWatershd

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 81.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COFFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0475)| | 1 + 2 = 3 | QPEAK (cms) 0.089 0.087 R.V. (mm) 56.55 50.66 AREA TPEAK (ha) 0.60 0.70 (hrs) 6.25 6.25 ID1= 1 ( 0225): + ID2= 2 ( 0230): ID = 3 ( 0475): 1.30 0.176 6.25 53.38

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR( 0540)| IN= 2---> OUT= 1 | DT= 5.0 min | OVERFLOW IS OFF OUTFLOW STORAGE OUTFLOW STORAGE STORAGE (ha.m.) 0.0000 0.0048 0.0154 0.0261 STORAGE (ha.m.) 0.0367 0.0474 0.0639 0.0000 (cms) 0.0000 (cms) 0.0271 0.0000 0.0118 0.0184 0.0232 0.0271 0.0306 0.0415 0.0000 TPEAK QPEAK (cms) 0.176 0.027 (hrs) 6.25 6.92 (mm) 53.38 53.30 (ha) 1.300 INFLOW: ID= 2 ( 0475) OUTFLOW: ID= 1 ( 0540)

PEAK FLOW REDUCTION [Qout/Qin](%)= 15.21 TIME SHIFT OF PEAK FLOW (min)= 40.00 MAXIMUM STORAGE USED (ha.m.)= 0.0358

ADD HYD ( 0480)| 1 + 2 = 3 | AREA (ha) 1.23 1.30 QPEAK (cms) 0.012 0.027 TPEAK (hrs) 8.00 6.92 R.V. (mm) 53.33 53.30 ID1= 1 ( 0535): + ID2= 2 ( 0540): ID = 3 ( 0480): 2.53 0.039 7.00 53.32

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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# LangstaffRd\_EA\_Proposed\_WestDonWatershd 2.03 | 6.167 57.91 | 9.250 2.03 |

| Max.Eff.Inten.(mm/hr)= | 57.91   | 42.12        |             |
|------------------------|---------|--------------|-------------|
| over (min)             | 5.00    | 10.00        |             |
| Storage Coeff. (min)=  | 5.64 (i | i) 8.21 (ii) |             |
| Unit Hyd. Tpeak (min)= | 5.00    | 10.00        |             |
| Unit Hyd. peak (cms)=  | 0.20    | 0.13         |             |
|                        |         |              | *TOTALS*    |
| PEAK FLOW (cms)=       | 0.08    | 0.00         | 0.087 (iii) |
| TIME TO PEAK (hrs)=    | 6.25    | 6.25         | 6.25        |
| RUNOFF VOLUME (mm)=    | 61.75   | 35.70        | 59.92       |
| TOTAL RAINFALL (mm)=   | 63.75   | 63.75        | 63.75       |
| RUNOFF COEFFICIENT =   | 0.97    | 0.56         | 0.94        |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 87.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

Area (ha)= 0.43 Total Imp(%)= 95.00 Dir. Conn.(%)= 95.00 IMPERVIOUS PERVIOUS (i) (ha)= (mm)= (%)= (m)= 0.41 2.00 1.00 260.00 0.013 0.02 5.00 2.00 20.00 0.250 Surface Area Dep. Storage Average Slope Length Mannings n

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TRA   | NSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|---------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN    | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr   | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03    | 6.250   | 57.91 | 9.33  | 2.03  |
| 0.167 | 0.00  | 3.250 | 2.03    | 6.333   | 11.18 | 9.42  | 2.03  |
| 0.250 | 0.00  | 3.333 | 3.05    | 6.417   | 11.18 | 9.50  | 2.03  |
| 0.333 | 1.02  | 3.417 | 3.05    | 6.500   | 11.18 | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05    | 6.583   | 11.18 | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03    | 6.667   | 11.18 | 9.75  | 2.03  |
| 0.583 | 2.03  | 3.667 | 2.03    | 6.750   | 11.18 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 2.03    | 6.833   | 5.08  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 3.05    | 6.917   | 5.08  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 3.05    | 7.000   | 5.08  | 10.08 | 2.03  |
| 0.917 | 1.02  | 4.000 | 3.05    | 7.083   | 5.08  | 10.17 | 2.03  |
| 1.000 | 1.02  | 4.083 | 2.03    | 7.167   | 5.08  | 10.25 | 2.03  |
| 1.083 | 1.02  | 4.167 | 2.03    | 7.250   | 5.08  | 10.33 | 1.02  |

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### LangstaffRd\_EA\_Proposed\_WestDonWatershd

| CALIB             |       | _           | _    | _              |       |
|-------------------|-------|-------------|------|----------------|-------|
| STANDHYD ( 0155)  | Area  | (ha)= (     | 0.56 |                |       |
| ID= 1 DT= 5.0 min | Total | Imp(%) = 93 | 3.00 | Dir. Conn.(%)= | 93.00 |
|                   |       |             |      |                |       |
|                   |       | IMPERVIOUS  | S    | PERVIOUS (i)   |       |
| Surface Area      | (ha)= | 0.52        |      | 0.04           |       |
| Dep. Storage      | (mm)= | 2.00        |      | 5.00           |       |
| Average Slope     | (%)=  | 1.00        |      | 2.00           |       |
| Length            | (m)=  | 260.00      |      | 25.00          |       |
| Mannings n        | _     | 0 012       |      | 0.200          |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TRANSFORMED HYETOGRAPH |       |       |       |        |       |       |       |  |  |  |
|------------------------|-------|-------|-------|--------|-------|-------|-------|--|--|--|
| TIME                   | RAIN  | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |  |  |
| hrs                    | mm/hr | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |  |  |
| 0.083                  | 0.00  | 3.167 | 2.03  | 6.250  | 57.91 | 9.33  | 2.03  |  |  |  |
| 0.167                  | 0.00  | 3.250 | 2.03  | 6.333  | 11.18 | 9.42  | 2.03  |  |  |  |
| 0.250                  | 0.00  | 3.333 | 3.05  | 6.417  | 11.18 | 9.50  | 2.03  |  |  |  |
| 0.333                  | 1.02  | 3.417 | 3.05  | 6.500  | 11.18 | 9.58  | 2.03  |  |  |  |
| 0.417                  | 1.02  | 3.500 | 3.05  | 6.583  | 11.18 | 9.67  | 2.03  |  |  |  |
| 0.500                  | 1.02  | 3.583 | 2.03  | 6.667  | 11.18 | 9.75  | 2.03  |  |  |  |
| 0.583                  | 2.03  | 3.667 | 2.03  | 6.750  | 11.18 | 9.83  | 2.03  |  |  |  |
| 0.667                  | 2.03  | 3.750 | 2.03  | 6.833  | 5.08  | 9.92  | 2.03  |  |  |  |
| 0.750                  | 2.03  | 3.833 | 3.05  | 6.917  | 5.08  | 10.00 | 2.03  |  |  |  |
| 0.833                  | 1.02  | 3.917 | 3.05  | 7.000  | 5.08  | 10.08 | 2.03  |  |  |  |
| 0.917                  | 1.02  | 4.000 | 3.05  | 7.083  | 5.08  | 10.17 | 2.03  |  |  |  |
| 1.000                  | 1.02  | 4.083 | 2.03  | 7.167  | 5.08  | 10.25 | 2.03  |  |  |  |
| 1.083                  | 1.02  | 4.167 | 2.03  | 7.250  | 5.08  | 10.33 | 1.02  |  |  |  |
| 1.167                  | 1.02  | 4.250 | 2.03  | 7.333  | 4.06  | 10.42 | 1.02  |  |  |  |
| 1.250                  | 1.02  | 4.333 | 5.08  | 7.417  | 4.06  | 10.50 | 1.02  |  |  |  |
| 1.333                  | 1.02  | 4.417 | 5.08  | 7.500  | 4.06  | 10.58 | 1.02  |  |  |  |
| 1.417                  | 1.02  | 4.500 | 5.08  | 7.583  | 4.06  | 10.67 | 1.02  |  |  |  |
| 1.500                  | 1.02  | 4.583 | 4.06  | 7.667  | 4.06  | 10.75 | 1.02  |  |  |  |
| 1.583                  | 2.03  | 4.667 | 4.06  | 7.750  | 4.06  | 10.83 | 2.03  |  |  |  |
| 1.667                  | 2.03  | 4.750 | 4.06  | 7.833  | 4.06  | 10.92 | 2.03  |  |  |  |
| 1.750                  | 2.03  | 4.833 | 4.06  | 7.917  | 4.06  | 11.00 | 2.03  |  |  |  |
| 1.833                  | 1.02  | 4.917 | 4.06  | 8.000  | 4.06  | 11.08 | 1.02  |  |  |  |
| 1.917                  | 1.02  | 5.000 | 4.06  | 8.083  | 3.05  | 11.17 | 1.02  |  |  |  |
| 2.000                  | 1.02  | 5.083 | 5.08  | 8.167  | 3.05  | 11.25 | 1.02  |  |  |  |
| 2.083                  | 1.02  | 5.167 | 5.08  | 8.250  | 3.05  | 11.33 | 1.02  |  |  |  |
| 2.167                  | 1.02  | 5.250 | 5.08  | 8.333  | 3.05  | 11.42 | 1.02  |  |  |  |
| 2.250                  | 1.02  | 5.333 | 7.11  | 8.417  | 3.05  | 11.50 | 1.02  |  |  |  |
| 2.333                  | 3.05  | 5.417 | 7.11  | 8.500  | 3.05  | 11.58 | 1.02  |  |  |  |
| 2.417                  | 3.05  | 5.500 | 7.11  | 8.583  | 2.03  | 11.67 | 1.02  |  |  |  |
| 2.500                  | 3.05  | 5.583 | 8.13  | 8.667  | 2.03  | 11.75 | 1.02  |  |  |  |
| 2.583                  | 2.03  | 5.667 | 8.13  | 8.750  | 2.03  | 11.83 | 2.03  |  |  |  |
| 2.667                  | 2.03  | 5.750 | 8.13  | 8.833  | 3.05  | 11.92 | 2.03  |  |  |  |
| 2.750                  | 2.03  | 5.833 | 56.90 | 8.917  | 3.05  | 12.00 | 2.03  |  |  |  |
| 2.833                  | 3.05  | 5.917 | 56.90 | 9.000  | 3.05  | 12.08 | 1.02  |  |  |  |
| 2.917                  | 3.05  | 6.000 | 56.90 | 9.083  | 2.03  | 12.17 | 1.02  |  |  |  |
| 3.000                  | 3.05  | 6.083 | 57.91 | 9.167  | 2.03  | 12.25 | 1.02  |  |  |  |

|       | Langs | taffRd E | A Propos | ed WestDo | onWaters | hd    |      |
|-------|-------|----------|----------|-----------|----------|-------|------|
| 1.167 | 1.02  | 4.250    | 2.03     | 7.333     | 4.06     | 10.42 | 1.02 |
| 1.250 | 1.02  | 4.333    | 5.08     | 7.417     | 4.06     | 10.50 | 1.02 |
| 1.333 | 1.02  | 4.417    | 5.08     | 7.500     | 4.06     | 10.58 | 1.02 |
| 1.417 | 1.02  | 4.500    | 5.08     | 7.583     | 4.06     | 10.67 | 1.02 |
| 1.500 | 1.02  | 4.583    | 4.06     | 7.667     | 4.06     | 10.75 | 1.02 |
| 1.583 | 2.03  | 4.667    | 4.06     | 7.750     | 4.06     | 10.83 | 2.03 |
| 1.667 | 2.03  | 4.750    | 4.06     | 7.833     | 4.06     | 10.92 | 2.03 |
| 1.750 | 2.03  | 4.833    | 4.06     | 7.917     | 4.06     | 11.00 | 2.03 |
| 1.833 | 1.02  | 4.917    | 4.06     | 8.000     | 4.06     | 11.08 | 1.02 |
| 1.917 | 1.02  | 5.000    | 4.06     | 8.083     | 3.05     | 11.17 | 1.02 |
| 2.000 | 1.02  | 5.083    | 5.08     | 8.167     | 3.05     | 11.25 | 1.02 |
| 2.083 | 1.02  | 5.167    | 5.08     | 8.250     | 3.05     | 11.33 | 1.02 |
| 2.167 | 1.02  | 5.250    | 5.08     | 8.333     | 3.05     | 11.42 | 1.02 |
| 2.250 | 1.02  | 5.333    | 7.11     | 8.417     | 3.05     | 11.50 | 1.02 |
| 2.333 | 3.05  | 5.417    | 7.11     | 8.500     | 3.05     | 11.58 | 1.02 |
| 2.417 | 3.05  | 5.500    | 7.11     | 8.583     | 2.03     | 11.67 | 1.02 |
| 2.500 | 3.05  | 5.583    | 8.13     | 8.667     | 2.03     | 11.75 | 1.02 |
| 2.583 | 2.03  | 5.667    | 8.13     | 8.750     | 2.03     | 11.83 | 2.03 |
| 2.667 | 2.03  | 5.750    | 8.13     | 8.833     | 3.05     | 11.92 | 2.03 |
| 2.750 | 2.03  | 5.833    | 56.90    | 8.917     | 3.05     | 12.00 | 2.03 |
| 2.833 | 3.05  | 5.917    | 56.90    | 9.000     | 3.05     | 12.08 | 1.02 |
| 2.917 | 3.05  | 6.000    | 56.90    | 9.083     | 2.03     | 12.17 | 1.02 |
| 3.000 | 3.05  | 6.083    | 57.91    | 9.167     | 2.03     | 12.25 | 1.02 |
| 3.083 | 2.03  | 6.167    | 57.91    | 9.250     | 2.03     | l     |      |
| T-1   |       | F7 04    |          |           |          |       |      |

| Max.Eff.Inten.(r | mm/hr)= | 57.91     | 44.85     |             |
|------------------|---------|-----------|-----------|-------------|
| over             | (min)   | 5.00      | 10.00     |             |
| Storage Coeff.   | (min)=  | 5.64 (ii) | 7.42 (ii) |             |
| Unit Hyd. Tpeak  | (min)=  | 5.00      | 10.00     |             |
| Unit Hyd. peak   | (cms)=  | 0.20      | 0.13      |             |
|                  |         |           |           | *TOTALS*    |
| PEAK FLOW        | (cms)=  | 0.07      | 0.00      | 0.068 (iii) |
| TIME TO PEAK     | (hrs)=  | 6.25      | 6.25      | 6.25        |
| RUNOFF VOLUME    | (mm)=   | 61.75     | 38.29     | 60.57       |
| TOTAL RAINFALL   | (mm)=   | 63.75     | 63.75     | 63.75       |
| RUNOFF COEFFICIE | ENT =   | 0.97      | 0.60      | 0.95        |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 89.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0430)   |      |       |       |       |
|-------------------|------|-------|-------|-------|
| 1 + 2 = 3         | AREA | QPEAK | TPEAK | R.V.  |
|                   | (ha) | (cms) | (hrs) | (mm)  |
| ID1= 1 ( 0155):   | 0.56 | 0.087 | 6.25  | 59.92 |
| + ID2= 2 ( 0160): | 0.43 | 0.068 | 6.25  | 60.57 |
|                   |      |       |       |       |

# 

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB         | Area<br>Total | (ha)=<br>Imp(%)= | 3.81<br>95.00 | Dir.    | Conn.(%)= | 95.00 |  |
|---------------|---------------|------------------|---------------|---------|-----------|-------|--|
|               |               | TMPERVTO         | ııc           | PERVIOL | IC (1)    |       |  |
|               |               |                  |               |         |           |       |  |
| Surface Area  | (ha)=         | 3.62             |               | 0.19    | 9         |       |  |
| Dep. Storage  | (mm)=         | 2.00             |               | 5.00    | 9         |       |  |
| Average Slope | (%)=          | 1.00             |               | 2.00    | 9         |       |  |
| Length        | (m)=          | 150.00           |               | 40.00   | 9         |       |  |
| Mannings n    | ` ´=          | 0.013            |               | 0.256   | •         |       |  |
|               |               |                  |               |         |           |       |  |
|               |               |                  |               |         |           |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TRANSFORMED HYETOGRAPH |       |       |       |        |       |       |       |  |  |  |
|------------------------|-------|-------|-------|--------|-------|-------|-------|--|--|--|
| TIME                   | RAIN  | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |  |  |
| hrs                    | mm/hr | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |  |  |
| 0.083                  | 0.00  | 3.167 | 2.03  | 6.250  | 57.91 | 9.33  | 2.03  |  |  |  |
| 0.167                  | 0.00  | 3.250 | 2.03  | 6.333  | 11.18 | 9.42  | 2.03  |  |  |  |
| 0.250                  | 0.00  | 3.333 | 3.05  | 6.417  | 11.18 | 9.50  | 2.03  |  |  |  |
| 0.333                  | 1.02  | 3.417 | 3.05  | 6.500  | 11.18 | 9.58  | 2.03  |  |  |  |
| 0.417                  | 1.02  | 3.500 | 3.05  | 6.583  | 11.18 | 9.67  | 2.03  |  |  |  |
| 0.500                  | 1.02  | 3.583 | 2.03  | 6.667  | 11.18 | 9.75  | 2.03  |  |  |  |
| 0.583                  | 2.03  | 3.667 | 2.03  | 6.750  | 11.18 | 9.83  | 2.03  |  |  |  |
| 0.667                  | 2.03  | 3.750 | 2.03  | 6.833  | 5.08  | 9.92  | 2.03  |  |  |  |
| 0.750                  | 2.03  | 3.833 | 3.05  | 6.917  | 5.08  | 10.00 | 2.03  |  |  |  |
| 0.833                  | 1.02  | 3.917 | 3.05  | 7.000  | 5.08  | 10.08 | 2.03  |  |  |  |
| 0.917                  | 1.02  | 4.000 | 3.05  | 7.083  | 5.08  | 10.17 | 2.03  |  |  |  |
| 1.000                  | 1.02  | 4.083 | 2.03  | 7.167  | 5.08  | 10.25 | 2.03  |  |  |  |
| 1.083                  | 1.02  | 4.167 | 2.03  | 7.250  | 5.08  | 10.33 | 1.02  |  |  |  |
| 1.167                  | 1.02  | 4.250 | 2.03  | 7.333  | 4.06  | 10.42 | 1.02  |  |  |  |
| 1.250                  | 1.02  | 4.333 | 5.08  | 7.417  | 4.06  | 10.50 | 1.02  |  |  |  |
| 1.333                  | 1.02  | 4.417 | 5.08  | 7.500  | 4.06  | 10.58 | 1.02  |  |  |  |
| 1.417                  | 1.02  | 4.500 | 5.08  | 7.583  | 4.06  | 10.67 | 1.02  |  |  |  |
| 1.500                  | 1.02  | 4.583 | 4.06  | 7.667  | 4.06  | 10.75 | 1.02  |  |  |  |
| 1.583                  | 2.03  | 4.667 | 4.06  | 7.750  | 4.06  | 10.83 | 2.03  |  |  |  |
| 1.667                  | 2.03  | 4.750 | 4.06  | 7.833  | 4.06  | 10.92 | 2.03  |  |  |  |
| 1.750                  | 2.03  | 4.833 | 4.06  | 7.917  | 4.06  | 11.00 | 2.03  |  |  |  |
| 1.833                  | 1.02  | 4.917 | 4.06  | 8.000  | 4.06  | 11.08 | 1.02  |  |  |  |
| 1.917                  | 1.02  | 5.000 | 4.06  | 8.083  | 3.05  | 11.17 | 1.02  |  |  |  |
| 2.000                  | 1.02  | 5.083 | 5.08  | 8.167  | 3.05  | 11.25 | 1.02  |  |  |  |
| 2.083                  | 1.02  | 5.167 | 5.08  | 8.250  | 3.05  | 11.33 | 1.02  |  |  |  |
| 2.167                  | 1.02  | 5.250 | 5.08  | 8.333  | 3.05  | 11.42 | 1.02  |  |  |  |
| 2.250                  | 1.02  | 5.333 | 7.11  | 8.417  | 3.05  | 11.50 | 1.02  |  |  |  |
| 2.333                  | 3.05  | 5.417 | 7.11  | 8.500  | 3.05  | 11.58 | 1.02  |  |  |  |
| 2.417                  | 3.05  | 5.500 | 7.11  | 8.583  | 2.03  | 11.67 | 1.02  |  |  |  |
| 2.500                  | 3.05  | 5.583 | 8.13  | 8.667  | 2.03  | 11.75 | 1.02  |  |  |  |
| 2.583                  | 2.03  | 5.667 | 8.13  | 8.750  | 2.03  | 11.83 | 2.03  |  |  |  |
|                        |       |       | Page  | 89     |       |       |       |  |  |  |

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|   | Lan                      | gstaffRo                   | _EA_Pro                 | posed_Wes              | tDonWater              | rshd  |
|---|--------------------------|----------------------------|-------------------------|------------------------|------------------------|-------|
| ADD HYD ( 0440) <br>  1 + 2 = 3  <br>  ID1= 1 ( 043<br>  + ID2= 2 ( 051 | 0):<br>5):               | (ha)<br>0.99<br>3.81       | (cms)<br>0.155<br>0.010 | (hrs)<br>6.25<br>12.25 | (mm)<br>60.20<br>59.71 |       |
| ID = 3 ( 044<br>NOTE: PEAK FLOW   | 0):                      | 4.80                       | 0.163                   | 6.25                   | 59.81                  |       |
| CALIB  <br>  STANDHYD ( 0210) <br> ID= 1 DT= 5.0 min                    |                          |                            |                         | Dir. Co                | onn.(%)=               | 78.00 |
| Surface Area<br>Dep. Storage<br>Average Slope<br>Length<br>Mannings n   | (mm) =<br>(%) =<br>(m) = | 0.1<br>2.0<br>1.0<br>470.0 | 75<br>00<br>00<br>00    | 5.00<br>2.00<br>20.00  | (i)                    |       |
| NOTE: DATE  |                          |                            |                         |                        |                        |       |

| NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME | STEP. |
|---|-------|
|---|-------|

|       |       | TR    | ANC EODMEI | D HYETOGR | ADU     |        |       |
|-------|-------|-------|------------|-----------|---------|--------|-------|
| TIME  | RAIN  | TIME  | RAIN       | l' TIME   | RAIN    | l TIME | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr      | l' hrs    | mm/hr   | hrs    | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03       | 6.250     | 57.91 l | 9.33   | 2.03  |
| 0.167 | 0.00  | 3.250 | 2.03       | 6.333     | 11.18   | 9.42   | 2.03  |
| 0.250 | 0.00  | 3.333 | 3.05       | 6.417     | 11.18   | 9.50   | 2.03  |
| 0.333 | 1.02  | 3.417 | 3.05       | 6.500     | 11.18   | 9.58   | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05       | 6.583     | 11.18   | 9.67   | 2.03  |
| 0.500 | 1.02  | 3.583 | 2.03       | 6.667     | 11.18   | 9.75   | 2.03  |
| 0.583 | 2.03  | 3.667 | 2.03       | 6.750     | 11.18   | 9.83   | 2.03  |
| 0.667 | 2.03  | 3.750 | 2.03       | 6.833     | 5.08    | 9.92   | 2.03  |
| 0.750 | 2.03  | 3.833 | 3.05       | 6.917     | 5.08    | 10.00  | 2.03  |
| 0.833 | 1.02  | 3.917 | 3.05       | 7.000     | 5.08    | 10.08  | 2.03  |
| 0.917 | 1.02  | 4.000 | 3.05       | 7.083     | 5.08    | 10.17  | 2.03  |
| 1.000 | 1.02  | 4.083 | 2.03       | 7.167     | 5.08    | 10.25  | 2.03  |
| 1.083 | 1.02  | 4.167 | 2.03       | 7.250     | 5.08    | 10.33  | 1.02  |
| 1.167 | 1.02  | 4.250 | 2.03       | 7.333     | 4.06    | 10.42  | 1.02  |
| 1.250 | 1.02  | 4.333 | 5.08       | 7.417     | 4.06    | 10.50  | 1.02  |
| 1.333 | 1.02  | 4.417 | 5.08       | 7.500     | 4.06    | 10.58  | 1.02  |
| 1.417 | 1.02  | 4.500 | 5.08       | 7.583     | 4.06    | 10.67  | 1.02  |
| 1.500 | 1.02  | 4.583 | 4.06       | 7.667     | 4.06    | 10.75  | 1.02  |
| 1.583 | 2.03  | 4.667 | 4.06       | 7.750     | 4.06    | 10.83  | 2.03  |
| 1.667 | 2.03  | 4.750 | 4.06       | 7.833     | 4.06    | 10.92  | 2.03  |
| 1.750 | 2.03  | 4.833 | 4.06       | 7.917     | 4.06    | 11.00  | 2.03  |
| 1.833 | 1.02  | 4.917 | 4.06       | 8.000     | 4.06    | 11.08  | 1.02  |

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|                    | Lang   | ctaffRd E | A Propos                              | ed WestDon | Waterch | nd        |      |
|--------------------|--|-----------|---------------------------------------|------------|---------|-----------|------|
| 2.                 |  |           |                                       | 8.833      |         | 11.92     | 2.03 |
| 2                  | 750 2 03                                     | I 5 833   | 56 90                                 | 8 917      | 3 05 İ  | 12 00     | 2 03 |
| 2.                 | 833 3.05                                     | 5.917     | 56.90                                 | 9.000      | 3.05 j  | 12.08     | 1.02 |
| 2.                 | 917 3.05                                     | 6.000     | 56.90                                 | 9.083      | 2.03    | 12.17     | 1.02 |
| 3.                 | 000 3.05                                     | 6.083     | 57.91                                 | 9.167      | 2.03    | 12.25     | 1.02 |
| 3.                 | 833 3.05<br>917 3.05<br>000 3.05<br>083 2.03 | 6.167     | 57.91                                 | 9.250      | 2.03    |           |      |
| Max.Eff.Inten      |  |           |                                       |            |         |           |      |
|                    | er (min)                                     |           |                                       |            |         |           |      |
| Storage Coeff      |  |           |                                       |            |         |           |      |
| Unit Hyd. Tpe      |  |           |                                       |            |         |           |      |
| Unit Hyd. pea      |  |           |                                       |            |         |           |      |
| , . , ,            | (/   |           |                                       |            | *T0T    | ALS*      |      |
| PEAK FLOW          | (cms)=                                       | 0.58      |                                       | 0.02       | 0.      | 603 (iii) |      |
| TIME TO PEAK       | (hrs)=<br>(mm)=<br>L (mm)=                   | 6.25      |                                       | 6.25       | 6       | .25       |      |
| RUNOFF VOLUME      | (mm)=  | 61.75     | :                                     | 36.96      | 60      | .51       |      |
| TOTAL RAINFAL      | L (mm)=                                      | 63.75     | (                                     | 53.75      | 63      | .75       |      |
| RUNOFF COEFFI      | CIENT =                                      | 0.97      |                                       | 0.58       | 6       | .95       |      |
| ***** WARNING: STO | DACE COFFE                                   | TC CMALL  | D THAN                                | TTME CTEDI |         |           |      |
| WARNING: 510       | RAGE CUEFF.                                  | 15 SMALLI | I I I I I I I I I I I I I I I I I I I | IIME SIEP! |         |           |      |
| (i) CN PROC        | EDURE SELECT                                 | FD FOR PI | RVTOUS                                | OSSES:     |         |           |      |
|                    | 88.0 Ia                                      |           |                                       |            |         |           |      |
| (ii) TIME ST       |  |           |                                       |            |         |           |      |
| ` ´ THAN TH        | E STORÁGE CO                                 | EFFICIEN  | Γ.                                    |            |         |           |      |
| (iii) PEAK FL      | OW DOES NOT                                  | INCLUDE E | BASEFLOW                              | IF ANY.    |         |           |      |
|                    |  |           |                                       |            |         |           |      |
|                    |  |           |                                       |            |         |           |      |
| RESERVOIR( 0515    | )   OVER                                     | LOW IS OF |                                       |            |         |           |      |
| IN= 2> OUT= 1      |  | LOW 13 01 |                                       |            |         |           |      |
| DT= 5.0 min        |  | .OW STO   | DRAGE                                 | OUTFLOW    | STO     | RAGE      |      |
| ,                  |  | (ha       |                                       | (cms)      |         |           |      |
|                    | 0.00   |           |                                       | 0.0091     |         | .1797     |      |
|                    | 0.00   | 13 0      | .0157                                 | 0.0095     |         | .2004     |      |

| RESERVOIR( 0515)    | OVERFLOW 1  | S OFF    |             |         |  |
|---------------------|-------------|----------|-------------|---------|--|
| IN= 2> OUT= 1       |             |          |             |         |  |
| DT= 5.0 min         | OUTFLOW     | STORAGE  | OUTFLOW     | STORAGE |  |
|                     | (cms)       | (ha.m.)  | (cms)       | (ha.m.) |  |
|                     | 0.0000      | 0.0000   | 0.0091      | 0.1797  |  |
|                     | 0.0013      | 0.0157   | 0.0095      | 0.2004  |  |
|                     | 0.0033      | 0.0320   | 0.0100      | 0.2216  |  |
|                     | 0.0044      | 0.0487   | 0.0104      | 0.2433  |  |
|                     | 0.0053      | 0.0659   | 0.0109      | 0.2655  |  |
|                     | 0.0061      | 0.0837   | 0.0113      | 0.2882  |  |
|                     | 0.0068      | 0.1019   | 0.0116      | 0.3114  |  |
|                     | 0.0074      | 0.1206   | 0.1520      | 0.3592  |  |
|                     | 0.0080      | 0.1398   | 0.5654      | 0.4336  |  |
|                     | 0.0086      | 0.1595   | 1.1316      | 0.5100  |  |
|                     |             |          |             |         |  |
|                     |             |          | TPEAK       |         |  |
|                     | (ha         | i) (cms) | (hrs)       | (mm)    |  |
| INFLOW : ID= 2 ( 01 | .50) 3.8    | 310 0.6  | 03 6.25     | 60.51   |  |
| OUTFLOW: ID= 1 ( 05 | 15) 3.8     | 810 0.0  | 10 12.25    | 59.71   |  |
|                     |             |          |             |         |  |
| PEAK                |             |          | ut/Qin](%)= |         |  |
|                     | SHIFT OF PE |          | (min)=3     |         |  |
| MAXI                | MUM STORAGE | USED     | (ha.m.)=    | 0.2067  |  |

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|          |         | Lange  | taffRd E | A Propo | sed WestDon | Waters | hd         |      |
|----------|---------|--------|----------|---------|-------------|--------|------------|------|
|          | 1.91    |        |          | 4.06    |             | 3.05   |            | 1.02 |
|          | 2.00    |        | 5.083    | 5.08    | 8.167       | 3.05   | 11.25      | 1.02 |
|          | 2.08    |        | 5.167    |         | 8.250       | 3.05   |            | 1.02 |
|          | 2.16    |        | 5.250    | 5.08    |             | 3.05   |            | 1.02 |
|          | 2.25    |        | 5.333    | 7.11    |             | 3.05   |            | 1.02 |
|          | 2.33    | 3 3.05 | 5.417    | 7.11    | 8.500       | 3.05   | 11.58      | 1.02 |
|          | 2.41    | 7 3.05 | 5.500    | 7.11    | 8.583       | 2.03   | 11.67      | 1.02 |
|          | 2.50    | 0 3.05 | 5.583    | 8.13    | 8.667       | 2.03   | 11.75      | 1.02 |
|          | 2.58    | 3 2.03 | 5.667    | 8.13    | 8.750       | 2.03   | 11.83      | 2.03 |
|          | 2.66    | 7 2.03 | 5.750    | 8.13    | 8.833       | 3.05   | 11.92      | 2.03 |
|          | 2.75    | 0 2.03 | 5.833    | 56.90   | 8.917       | 3.05   | 12.00      | 2.03 |
|          | 2.83    | 3 3.05 | 5.917    | 56.90   | 9.000       | 3.05   | 12.08      | 1.02 |
|          | 2.91    | 7 3.05 | 6.000    | 56.90   | 9.083       | 2.03   | 12.17      | 1.02 |
|          | 3.00    | 0 3.05 | 6.083    | 57.91   | 9.167       | 2.03   | 12.25      | 1.02 |
|          | 3.08    | 3 2.03 | 6.167    | 57.91   | 9.250       | 2.03   |            |      |
|          |         |        |          |         |             |        |            |      |
| Max.Eff  |         |        | 57.91    |         | 37.09       |        |            |      |
|          |         | (min)  | 10.00    |         | 15.00       |        |            |      |
| Storage  |         | (min)= | 8.04     | (ii)    | 11.54 (ii)  |        |            |      |
| Unit Hyd |         |        | 10.00    |         | 15.00       |        |            |      |
| Unit Hyd | i. peak | (cms)= | 0.13     |         | 0.09        |        |            |      |
|          |         |        |          |         |             |        | TALS*      |      |
| PEAK FLO |         | (cms)= | 0.12     |         | 0.02        |        | .133 (iii) |      |
| TIME TO  |         | (hrs)= | 6.25     |         | 6.33        |        | 5.25       |      |
| RUNOFF \ |         | (mm)=  | 61.75    |         | 31.16       |        | 5.02       |      |
| TOTAL RA |         | (mm)=  | 63.75    |         | 63.75       |        | 3.75       |      |
| RUNOFF ( | OEFFICI | ENT =  | 0.97     |         | 0.49        | 6      | 9.86       |      |
|          |         |        |          |         |             |        |            |      |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |           |       |         |           |       |  |
|-------------------|-------|-----------|-------|---------|-----------|-------|--|
| STANDHYD ( 0205)  | Area  | (ha)=     | 1.11  |         |           |       |  |
| ID= 1 DT= 5.0 min | Total | Imp(%)=   | 77.00 | Dir.    | Conn.(%)= | 77.00 |  |
|                   |       |           |       |         |           |       |  |
|                   |       | IMPERVIOU | JS    | PERVIOU | S (i)     |       |  |
| Surface Area      | (ha)= | 0.85      |       | 0.26    |           |       |  |
| Dep. Storage      | (mm)= | 2.00      |       | 5.00    |           |       |  |
| Average Slope     | (%)=  | 1.00      |       | 2.00    |           |       |  |
| Length            | (m)=  | 470.00    |       | 20.00   |           |       |  |
| Mannings n        | ` =   | 0.013     |       | 0.250   |           |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN

|                 |         |       |       | sed_WestDo |       |            |       |
|-----------------|---------|-------|-------|------------|-------|------------|-------|
| hr              |         |       | mm/hr |            |       |            | mm/hr |
| 0.08            |         |       |       |            | 57.91 |            | 2.03  |
| 0.16            |         |       |       |            | 11.18 |            | 2.03  |
| 0.25            |         | 3.333 | 3.05  |            | 11.18 |            | 2.03  |
| 0.33            |         | 3.417 |       |            | 11.18 |            | 2.03  |
| 0.41            |         | 3.500 | 3.05  |            | 11.18 |            | 2.03  |
| 0.500           |         |       | 2.03  |            | 11.18 |            | 2.03  |
| 0.58            |         | 3.667 |       |            | 11.18 |            | 2.03  |
| 0.66            |         | 3.750 |       | 6.833      | 5.08  |            | 2.03  |
| 0.75            |         | 3.833 |       | 6.917      |       | 10.00      | 2.03  |
| 0.83            |         | 3.917 | 3.05  |            | 5.08  |            | 2.03  |
| 0.91            |         | 4.000 |       | 7.083      | 5.08  |            | 2.03  |
| 1.000           |         | 4.083 | 2.03  |            | 5.08  |            | 2.03  |
| 1.08            |         | 4.167 | 2.03  |            | 5.08  |            | 1.02  |
| 1.16            |         | 4.250 | 2.03  | 7.333      |       | 10.42      | 1.02  |
| 1.250           |         | 4.333 | 5.08  |            |       | 10.50      | 1.02  |
| 1.33            | 1.02    | 4.417 | 5.08  | 7.500      | 4.06  | 10.58      | 1.02  |
| 1.41            | 7 1.02  | 4.500 | 5.08  |            | 4.06  | 10.67      | 1.02  |
| 1.500           | 1.02    | 4.583 | 4.06  | 7.667      | 4.06  | 10.75      | 1.02  |
| 1.58            | 3 2.03  | 4.667 | 4.06  | 7.750      | 4.06  | 10.83      | 2.03  |
| 1.66            | 7 2.03  | 4.750 | 4.06  | 7.833      | 4.06  | 10.92      | 2.03  |
| 1.750           | 2.03    | 4.833 | 4.06  | 7.917      | 4.06  | 11.00      | 2.03  |
| 1.83            | 1.02    | 4.917 | 4.06  | 8.000      | 4.06  | 11.08      | 1.02  |
| 1.91            | 7 1.02  | 5.000 | 4.06  | 8.083      | 3.05  | 11.17      | 1.02  |
| 2.000           | 1.02    | 5.083 | 5.08  | 8.167      | 3.05  | 11.25      | 1.02  |
| 2.08            |         | 5.167 | 5.08  | 8.250      | 3.05  | 11.33      | 1.02  |
| 2.16            | 7 1.02  | 5.250 | 5.08  | 8.333      | 3.05  | 11.42      | 1.02  |
| 2.250           | 1.02    | 5.333 | 7.11  | 8.417      | 3.05  | 11.50      | 1.02  |
| 2.33            | 3.05    | 5.417 | 7.11  | 8.500      | 3.05  | 11.58      | 1.02  |
| 2.41            | 7 3.05  | 5.500 | 7.11  | 8.583      | 2.03  | 11.67      | 1.02  |
| 2.500           | 3.05    | 5.583 | 8.13  | 8.667      | 2.03  | 11.75      | 1.02  |
| 2.58            | 3 2.03  | 5.667 | 8.13  |            | 2.03  | 11.83      | 2.03  |
| 2.66            | 7 2.03  | 5.750 | 8.13  | 8.833      | 3.05  | 11.92      | 2.03  |
| 2.750           | 2.03    | 5.833 | 56.90 |            | 3.05  | 12.00      | 2.03  |
| 2.83            | 3.05    | 5.917 | 56.90 | 9.000      | 3.05  | 12.08      | 1.02  |
| 2.91            | 7 3.05  | 6.000 | 56.90 | 9.083      | 2.03  | 12.17      | 1.02  |
| 3.000           | 3.05    | 6.083 | 57.91 | 9.167      | 2.03  | 12.25      | 1.02  |
| 3.08            | 2.03    | 6.167 | 57.91 | 9.250      | 2.03  | I          |       |
| Max.Eff.Inten.( | nm/hr)= | 57.91 |       | 37.09      |       |            |       |
|                 | (min)   | 10.00 |       | 15.00      |       |            |       |
| Storage Coeff.  | (min)=  | 8.04  | (ii)  | 11.62 (ii) | 1     |            |       |
| Unit Hyd. Tpeak | (min)=  | 10.00 |       | 15.00      |       |            |       |
| Unit Hyd. peak  | (cms)=  | 0.13  |       | 0.09       |       |            |       |
|                 |         |       |       |            |       | TALS*      |       |
| PEAK FLOW       | (cms)=  | 0.13  |       | 0.02       |       | .152 (iii) |       |
| TIME TO PEAK    | (hrs)=  | 6.25  |       | 6.33       |       | 6.25       |       |
| RUNOFF VOLUME   | (mm)=   | 61.75 |       | 31.16      |       | 4.71       |       |
| TOTAL RAINFALL  | (mm)=   | 63.75 |       | 63.75      |       | 3.75       |       |
| RUNOFF COEFFICI | NT =    | 0.97  |       | 0.49       | ,     | 0.86       |       |
|                 |         |       |       |            |       |            |       |

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

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#### LangstaffRd\_EA\_Proposed\_WestDonWatershd ---- TRANSFORMED HYETOGRAPH ----RAIN | TIME RAIN | TIME RAIN | m/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr hrs mm/hr hrs mm/hr 57.91 | hrs mm/hr 2.03 3.167 6.250 6.333 6.417 6.500 6.583 6.667 7.000 7.003 7.167 7.250 7.333 7.417 9.33 0.083 0.00 2.03 0.167 0.00 3.250 2.03 11.18 9.42 2.03 3.05 3.05 3.05 2.03 2.03 0 250 9 99 3 333 9 50 2 03 0.250 0.333 0.417 0.500 0.583 1.02 1.02 1.02 2.03 3.333 3.417 3.500 3.583 3.667 3.750 11.18 11.18 11.18 11.18 9.58 9.67 9.75 9.83 2.03 2.03 2.03 2.03 2.03 2.03 0.667 2.03 5.08 5.08 9.92 2.03 0.750 3.833 3.05 2.03 0.833 1.02 3.917 4.000 3.05 3.05 2.03 2.03 2.03 5.08 5.08 5.08 10.08 2.03 0 917 4.000 4.083 4.167 4.250 4.333 4.417 4.500 4.583 1.02 1.167 1.250 1.02 1.333 1.02 7.500 10.58 1.02 7.500 7.583 7.667 7.750 7.833 7.917 8.000 8.083 1.417 1.02 10.67 1.02 1.02 2.03 2.03 2.03 1.02 4.06 4.06 4.06 4.06 4.06 4.06 4.06 1.500 10.75 1.02 4.667 4.750 4.833 4.917 10.75 10.83 10.92 11.00 11.08 2.03 1.667 1.750 1.833 1.02 1.02 1.917 5.000 11.17 8.083 8.167 8.250 8.333 8.417 8.500 8.583 8.667 8.750 5.08 5.08 3.05 2.000 1.02 5.083 11.25 1.02 2.083 1.02 5.167 3.05 11.33 1.02 5.167 5.250 5.333 5.417 5.500 5.583 3.05 3.05 3.05 3.05 2.03 2.03 2.03 1.02 1.02 3.05 3.05 5.08 7.11 7.11 7.11 8.13 1.02 1.02 1.02 1.02 2.167 11.42 11.58 11.67 11.75 2.500 2.583 3.05 1.02 2.03 5.667 8.13 11.83 2.03 8.13 | 8.750 8.13 | 8.833 56.90 | 8.917 56.90 | 9.000 56.90 | 9.083 57.91 | 9.167 57.91 | 9.250 2.667 2.03 5.750 3.05 11.92 2.03 2.750 2.03 5.833 3.05 12.00 2.03 3.05 | 3.05 | 3.05 | 2.03 | 5.917 6.000 6.083 6.167 3.05 | 2.03 | 2.03 | 2.03 | 2.833 12.08 1.02 2.917 3.000 3.083 Max.Eff.Inten.(mm/hr)= 35.79 57.91 over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)= 20.00 18.79 (ii) 5.00 6.62 (ii)

TRANSFORMED HYETOGRAPH ----ME RAIN | TIME RAIN | TIME TIME mm/hr | 57.91 | hrs mm/hr 0.00 hrs mm/hr hrs mm/hr 2.03 3.167 6.250 9.33 9.42 0.083 2.03 0.167 0.00 3.250 11.18 İ 2.03 0.00 1.02 1.02 1.02 2.03 2.03 3.250 3.333 3.417 3.500 3.583 3.667 3.750 0.250 0.333 0.417 0.500 0.583 3.05 3.05 3.05 2.03 6.417 6.500 6.583 6.667 6.750 11.18 11.18 11.18 11.18 11.18 9.50 9.58 9.67 9.75 2.03 2.03 2.03 2.03 2.03 9.83 9.92 2.03 0.667 2.03 6.833 5.08 2.03 0.750 2.03 3.833 3.05 6.917 7.000 5.08 10.00 2.03 0.833 1.02 3.917 3.05 5.08 10.08 2.03 0.917 1.000 1.083 1.167 4.000 4.083 4.167 4.250 4.333 3.05 2.03 2.03 2.03 7.083 7.167 7.250 7.333 7.417 5.08 5.08 5.08 4.06 4.06 10.17 10.25 10.33 10.42 2.03 2.03 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.02 1.250 5.08 10.50 1.333 1.02 4.417 5.08 7.500 7.583 4.06 10.58 1.02 1.417 1.02 4.500 5.08 4.06 10.67 1.02 1.500 1.02 4.06 4.06 10.75 1.02 4.583 4.667 4.750 4.833 4.917 5.000 5.083 5.167 5.250 5.333 7.667 7.750 7.833 7.917 8.000 8.083 8.167 8.250 8.333 8.417 1.583 1.667 1.750 1.833 2.03 2.03 2.03 1.02 4.06 4.06 4.06 4.06 4.06 4.06 4.06 4.06 4.06 4.06 10.83 10.92 11.00 11.08 2.03 2.03 2.03 1.02 1.02 1.02 4.06 1.917 3.05 11.17 2.000 1.02 5.08 3.05 11.25 1.02 2.083 1.02 5.08 3.05 11.33 1.02 2 167 1 02 5 08 3 05 11 42 1 02

7.11 Page 96 11.50

2.250

1.02

LangstaffRd\_EA\_Proposed\_WestDonWatershd

CN\* = 83.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY. | ADD HYD ( 0460)| | 1 + 2 = 3 | R.V. AREA QPEAK TPEAK (ha) 1.11 0.96 (cms) 0.152 0.133 (hrs) 6.25 6.25 (mm) 54.71 55.02 ID1= 1 ( 0205): + ID2= 2 ( 0210): ID = 3 ( 0460): 2.07 0.285 54.85 6.25 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY. RESERVOIR( 0525)| IN= 2---> OUT= 1 | DT= 5.0 min | OVERFLOW IS OFF OUTFLOW STORAGE (ha.m.) 0.0000 0.0026 0.0084 (cms) 0.0000 (cms) 0.0733 (ha.m.) 0.0214 0.0274 0.0831 0.0278 0 0478 0 1449 0 0374 0.0619 (cms) 0.285 0.136 (ha) 2.070 (hrs) INFLOW : ID= 2 ( 0460) OUTFLOW: ID= 1 ( 0525) 6.25 6.50 2.070 54.85 PEAK FLOW REDUCTION [Qout/Qin](%)= 47.57
TIME SHIFT OF PEAK FLOW (min)= 15.00
MAXIMUM STORAGE USED (ha.m.)= 0.0361 CALIB STANDHYD ( 0190) Area (ha)= 0.86 Total Imp(%)= 57.00 Dir. Conn.(%)= 57.00 |ID= 1 DT= 5.0 min | IMPERVIOUS 0.49 2.00 1.00 PERVIOUS (i) 0.37 5.00 2.00 Surface Area Dep. Storage Average Slope (ha)= (mm)= (%)= (m)= Length 340.00 50.00 Mannings n 0.013 0.250 NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

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## ${\tt LangstaffRd\_EA\_Proposed\_WestDonWatershd}$

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

- CN\* = 83.0 Ia = Dep. Storage (Above)
  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
  THAN THE STORAGE COEFFICIENT.
  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

|                               |         |            |      |            |        |       | <br> |
|-------------------------------|---------|------------|------|------------|--------|-------|------|
| CALIB  <br>  STANDHYD ( 0195) | Area    | (ha)=      | 0.79 |            |        |       |      |
| ID= 1 DT= 5.0 min             | Total   | Imp(%) = 7 | 5.00 | Dir. Con   | n.(%)= | 75.00 |      |
|                               |         |            |      |            |        |       |      |
|                               |         | IMPERVIOU  | S    | PERVIOUS ( | i)     |       |      |
| Surface Area                  | (ha)=   | 0.59       |      | 0.20       |        |       |      |
| Dep. Storage                  | (mm)=   | 2.00       |      | 5.00       |        |       |      |
| Average Slope                 | (%)=    | 1.00       |      | 2.00       |        |       |      |
| Length                        | (m)=    | 340.00     |      | 20.00      |        |       |      |
| Mannings n                    | =       | 0.013      |      | 0.250      |        |       |      |
| NOTE: BATNE                   | ΔΙΙ WΔS | TRANSFORME | р то | 5 0 MTN    | TTMF   | TEP   |      |

6.42

31.16

63.75

6.25 61.75

63.75

PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =

\*TOTALS\* 0.099 (iii)

6.25 48.59

|  | Langeta                             | tto4 c                       | A Drono             | cod Noc | tDonWate | achd   |      |
|--|-------------------------------------|------------------------------|---------------------|---------|----------|--|------|
| 2 222  | 2 AE I I                            | 111KU_E                      | M_F1 OPO            | l o cor | a a ac   | rshd   11.58   11.67   11.75   11.83   11.92   12.08   12.17   12.25 | 1 02 |
| 2.333  | 3.05   3                            | 5.41/                        | 7.11                | 1 0.500 | נט.כ נ   | 11.50  | 1.02 |
| 2.41/  | 3.05   3                            | 5.500                        | 7.11                | 0.50    | 2.03     | 11.0/  | 1.02 |
| 2.500  | 3.05                                | 5.583                        | 8.13                | 8.66    | 2.03     | 11.75  | 1.02 |
| 2.583  | 2.03   5                            | 5.667                        | 8.13                | 8.75    | 2.03     | 11.83  | 2.03 |
| 2.667  | 2.03   5                            | 5.750                        | 8.13                | 8.833   | 3 3.05   | 11.92  | 2.03 |
| 2.750  | 2.03   5                            | 5.833                        | 56.90               | 8.917   | 7 3.05   | 12.00  | 2.03 |
| 2.833  | 3.05   5                            | 5.917                        | 56.90               | 9.000   | 3.05     | 12.08  | 1.02 |
| 2.917  | 3.05   6                            | 5.000                        | 56.90               | 9.083   | 3 2.03   | 12.17  | 1.02 |
| 3.000  | 3.05 İ 6                            | 5.083                        | 57.91               | 9.167   | 7 2.03   | 12.25  | 1.02 |
| 3.083  | 2.03   6                            | 5.167                        | 57.91               | 9.256   | 2.03     | i  |      |
|  |                                     |                              |                     |         |          | '  |      |
| Max.Eff.Inten.(mm/h<br>over (mi<br>Storage Coeff. (mi<br>Unit Hyd. Tpeak (mi<br>Unit Hyd. peak (cm | ır)=                                | 57.91                        |                     | 37.09   |          |  |      |
| over (mi   | .n)                                 | 5.00                         |                     | 15.00   |          |  |      |
| Storage Coeff. (mi   | .n)=                                | 6.62                         | (ii)                | 10.36   | (ii)     |  |      |
| Unit Hyd. Tpeak (mi  | .n)=                                | 5.00                         |                     | 15.00   |          |  |      |
| Unit Hyd. peak (cm   | ıs)=                                | 0.18                         |                     | 0.09    |          |  |      |
|  |                                     |                              |                     |         |          | OTALS*   |      |
| PEAK FLOW (cm  | 15)=                                | 0.09                         |                     | 0.02    |          | 0.110 (iii)  |      |
| TIME TO PEAK (hr   | ·s)=                                | 6 25                         |                     | 6 33    |          | 6.25   |      |
| PLINGE VOLUME (#   | m)-                                 | 61 75                        |                     | 31 16   |          | 5/ 10  |      |
| TOTAL DATABALL (-  | ····) -                             | 62.75                        |                     | 62.75   |          | 54.10<br>63.75   |      |
| PEAK FLOW (cm<br>TIME TO PEAK (hr<br>RUNOFF VOLUME (m<br>TOTAL RAINFALL (m<br>RUNOFF COEFFICIENT   | ını)=                               | 03./3                        |                     | 03./5   |          |  |      |
| KUNUFF CUEFFICIENT   | =                                   | 0.97                         |                     | 0.49    |          | 0.85   |      |
| CN* = 83.0<br>(ii) TIME STEP (DT<br>THAN THE STOR<br>(iii) PEAK FLOW DOE                           | SHOULD<br>AGE COEFF                 | BE SMA<br>FICIENT<br>CLUDE E | LLER OF<br>BASEFLOW | RÈQUAL  | •        |  |      |
|  |                                     |                              |                     |         |          |  |      |
| ADD HYD ( 0455)  |                                     |                              |                     |         |          |  |      |
| 1 + 2 = 3  | AREA                                | A QF                         | PEAK                | TPEAK   | R.V.     |  |      |
|  | (ha)                                | ) (                          | ms)                 | (hrs)   | (mm)     |  |      |
| 1 + 2 = 3  <br>ID1= 1 ( 0190):   | 0.86                                | 5 0.6                        | 99                  | 6.25    | 48.59    |  |      |
| + ID2= 2 ( 0195):  | 0.79                                | 9 0.1                        | 10                  | 6.25    | 54.10    |  |      |
| ID = 3 ( 0455):  |                                     |                              |                     |         |          |  |      |
| (  |                                     |                              |                     |         |          |  |      |
| NOTE: PEAK FLOWS D   |                                     |                              |                     |         |          |  |      |
|  |                                     |                              |                     |         |          |  |      |
| RESERVOIR( 0555)   | OVERFLO                             | W IS OF                      | F                   |         |          |  |      |
| IN= 2> OUT= 1  |                                     |                              |                     |         |          |  |      |
| DT= 5.0 min  | OUTFLOW                             | STO                          | RAGE                | OUT     | LOW S    | TORAGE   |      |
|  | (cms)<br>0.0000<br>0.0104<br>0.0162 | (ha                          | ı.m.)               | (cr     | ns) (    | ha.m.)   |      |
|  | 0.0000                              | 0.                           | 0000                | 0.6     | 9238     | 0.0199   |      |
|  | 0.0104                              | 0.                           | 0024                | 0.6     | 9268     | 0.0259   |      |
|  | 0.0162                              | 0.                           | 0079                | 0.6     | 9825     | 0.0346   |      |
|  | 0.0202                              |                              | 0120                | 1 00    | 2000     | 0 0000   |      |

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0.0259 0.0346 0.0000

|                   | Lan   | ngstaffRd_EA_Pro | posed_WestDonWate | rshd  |
|-------------------|-------|------------------|-------------------|-------|
| ID= 1 DT= 5.0 min | Total | Imp(%) = 72.00   | Dir. Conn.(%)=    | 72.00 |
|                   |       |                  |                   |       |
|                   |       | IMPERVIOUS       | PERVIOUS (i)      |       |
| Surface Area      | (ha)= | 0.43             | 0.17              |       |
| Dep. Storage      | (mm)= | 2.00             | 5.00              |       |
| Average Slope     | (%)=  | 1.00             | 2.00              |       |
| Length            | (m)=  | 250.00           | 20.00             |       |
| Mannings n        |       | 0 013            | 0 250             |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORMFI | HYETOGR | APH   |       |       |
|-------|-------|-------|-----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN      | l' TIME | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr     | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03      | 6.250   | 67.05 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 2.03      | 6.333   | 13.21 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 3.05      | 6.417   | 13.21 | 9.50  | 3.05  |
| 0.333 | 1.02  | 3.417 | 3.05      | 6.500   | 13.21 | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05      | 6.583   | 13.21 | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 3.05      | 6.667   | 13.21 | 9.75  | 2.03  |
| 0.583 | 2.03  | 3.667 | 3.05      | 6.750   | 13.21 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 3.05      | 6.833   | 6.10  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 3.05      | 6.917   | 6.10  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 3.05      | 7.000   | 6.10  | 10.08 | 2.03  |
| 0.917 | 1.02  | 4.000 | 3.05      | 7.083   | 6.10  | 10.17 | 2.03  |
| 1.000 | 1.02  | 4.083 | 3.05      | 7.167   | 6.10  | 10.25 | 2.03  |
| 1.083 | 2.03  | 4.167 | 3.05      | 7.250   | 6.10  | 10.33 | 2.03  |
| 1.167 | 2.03  | 4.250 | 3.05      | 7.333   | 5.08  | 10.42 | 2.03  |
| 1.250 | 2.03  | 4.333 | 5.08      | 7.417   | 5.08  | 10.50 | 2.03  |
| 1.333 | 1.02  | 4.417 | 5.08      | 7.500   | 5.08  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 5.08      | 7.583   | 4.06  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 5.08      | 7.667   | 4.06  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 5.08      | 7.750   | 4.06  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 5.08      | 7.833   | 4.06  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 6.10      | 7.917   | 4.06  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 6.10      | 8.000   | 4.06  | 11.08 | 1.02  |
| 1.917 | 1.02  | 5.000 | 6.10      | 8.083   | 5.08  | 11.17 | 1.02  |
| 2.000 | 1.02  | 5.083 | 5.08      | 8.167   | 5.08  | 11.25 | 1.02  |
| 2.083 | 2.03  | 5.167 | 5.08      | 8.250   | 5.08  | 11.33 | 2.03  |
| 2.167 | 2.03  | 5.250 | 5.08      | 8.333   | 3.05  | 11.42 | 2.03  |
| 2.250 | 2.03  | 5.333 | 8.13      | 8.417   | 3.05  | 11.50 | 2.03  |
| 2.333 | 3.05  | 5.417 | 8.13      | 8.500   | 3.05  | 11.58 | 1.02  |
| 2.417 | 3.05  | 5.500 | 8.13      | 8.583   | 3.05  | 11.67 | 1.02  |
| 2.500 | 3.05  | 5.583 | 9.14      | 8.667   | 3.05  | 11.75 | 1.02  |
| 2.583 | 3.05  | 5.667 | 9.14      | 8.750   | 3.05  | 11.83 | 2.03  |
| 2.667 | 3.05  | 5.750 | 9.15      | 8.833   | 3.05  | 11.92 | 2.03  |
| 2.750 | 3.05  | 5.833 | 67.06     | 8.917   | 3.05  | 12.00 | 2.03  |
| 2.833 | 3.05  | 5.917 | 67.06     | 9.000   | 3.05  | 12.08 | 1.02  |
| 2.917 | 3.05  | 6.000 | 67.06     | 9.083   | 2.03  | 12.17 | 1.02  |
| 3.000 | 3.05  | 6.083 | 67.06     | 9.167   | 2.03  | 12.25 | 1.02  |
| 3.083 | 2.03  | 6.167 | 67.06     | 9.250   | 2.03  |       |       |

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LangstaffRd\_EA\_Proposed\_WestDonWatershd AREA QPEAK TPEAK R. (ha) (cms) (hrs) (m AREA (ha) 1.650 (hrs) 6.25 6.50 INFLOW: ID= 2 ( 0455) OUTFLOW: ID= 1 ( 0555) PEAK FLOW REDUCTION [Qout/Qin](%)= 38.44 TIME SHIFT OF PEAK FLOW (min)= 15.00 MAXIMUM STORAGE USED (ha.m.)= 0.0343 ADD HYD ( 0465) | 1 + 2 = 3 | ID1= 1 ( 0525): + ID2= 2 ( 0555): QPEAK (cms) 0.136 0.080 R.V. (mm) 54.85 51.19 (hrs) 6.50 6.50 (ha) 2.07 1.65 ID = 3 ( 0465): 3.72 0.216 53.23 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY. READ STORM Filename: C:\Users\ray.zhao\AppD ata\Local\Temp\ eda∂adac-3ha3-467d-984d-5ab4a7d3492c\d55f05e6 Comments: 25yr-12hrSCS | Ptotal= 74.42 mm | RAIN | TIME mm/hr | hrs 3.05 | 6.75 | 3.05 | 7.00 | 3.05 | 7.25 | 5.08 | 8.00 | 6.10 | 8.25 | 5.08 | 8.50 | 8.13 | 8.75 | 9.14 | 9.00 | 6.706 | 9.25 | 67.06 | 9.50 | 13.21 | 9.75 TIME TIME RATN I RATN I TTMF RAIN | TIME RATN RAIN mm/hr 0.00 1.02 2.03 1.02 2.03 1.02 2.03 mm/hr 2.03 2.03 2.03 1.02 2.03 mm/hr 13.21 | 6.10 | 6.10 | 5.08 | 4.06 | 4.06 | 5.08 | 3.05 | 3.05 | 2.03 | hrs 10.00 10.25 10.50 10.75 11.00 11.25 11.50 11.75 12.00 12.25 hrs 0.25 0.50 0.75 1.00 1.25 1.50 1.75 hrs 3.50 3.75 4.00 4.25 4.50 4.75 5.00 5.25 5.50 6.25 6.50 1.02 2.03 2.03 | 1.02 | 2.03 | 3.05 | 3.05 | 3.05 | 2.03 | 2.00 2.25 2.50 2.75 3.00 3.25 1.02 2.03 1.02 3.05 | 2.03 | 

|                   | La      | ngstaffRd_E | A_Propo | sed_We | stDonk | latershd |       |
|-------------------|---------|-------------|---------|--------|--------|----------|-------|
| Max.Eff.Inten.(r  | mm/hr)= | 67.06       |         | 46.22  |        |          |       |
| over              | (min)   | 5.00        |         | 10.00  |        |          |       |
| Storage Coeff.    | (min)=  | 5.19        | (ii)    | 8.94   | (ii)   |          |       |
| Unit Hyd. Tpeak   | (min)=  | 5.00        |         | 10.00  |        |          |       |
| Unit Hyd. peak    | (cms)=  | 0.21        |         | 0.12   |        |          |       |
|                   |         |             |         |        |        | *TOTALS* | *     |
| PEAK FLOW         | (cms)=  | 0.08        |         | 0.02   |        | 0.099    | (iii) |
| TIME TO PEAK      | (hrs)=  | 6.25        |         | 6.25   |        | 6.25     |       |
| RUNOFF VOLUME     | (mm)=   | 72.42       |         | 39.68  |        | 63.24    |       |
| TOTAL RAINFALL    | (mm)=   | 74.42       |         | 74.42  |        | 74.42    |       |
| PLINOEE COFFEETCT | ENT -   | a 97        |         | 0 53   |        | 0.85     |       |

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- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |             |                    |       |
|-------------------|-------|-------------|--------------------|-------|
| STANDHYD ( 0170)  | Area  | (ha)= 0     | .43                |       |
|                   |       |             |                    |       |
| ID= 1 DT= 5.0 min | Total | Imp(%) = 98 | .00 Dir. Conn.(%)= | 98.00 |
|                   |       |             |                    |       |
|                   |       | IMPERVIOUS  | PERVIOUS (i)       |       |
| Surface Area      | (ha)= | 0.42        | 0.01               |       |
| Dep. Storage      | (mm)= | 2.00        | 5.00               |       |
| Average Slope     | (%)=  | 1.00        | 2.00               |       |
| Length            | (m)=  | 250.00      | 20.00              |       |
| Mannings n        | ` =   | 0.013       | 0.250              |       |
| _                 |       |             |                    |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       | TRANSFORMED HYETOGRAPH |       |       |        |       |       |       |  |  |  |
|-------|------------------------|-------|-------|--------|-------|-------|-------|--|--|--|
| TIME  | RAIN                   | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |  |  |
| hrs   | mm/hr                  | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |  |  |
| 0.083 | 0.00                   | 3.167 | 2.03  | 6.250  | 67.05 | 9.33  | 3.05  |  |  |  |
| 0.167 | 0.00                   | 3.250 | 2.03  | 6.333  | 13.21 | 9.42  | 3.05  |  |  |  |
| 0.250 | 0.00                   | 3.333 | 3.05  | 6.417  | 13.21 | 9.50  | 3.05  |  |  |  |
| 0.333 | 1.02                   | 3.417 | 3.05  | 6.500  | 13.21 | 9.58  | 2.03  |  |  |  |
| 0.417 | 1.02                   | 3.500 | 3.05  | 6.583  | 13.21 | 9.67  | 2.03  |  |  |  |
| 0.500 | 1.02                   | 3.583 | 3.05  | 6.667  | 13.21 | 9.75  | 2.03  |  |  |  |
| 0.583 | 2.03                   | 3.667 | 3.05  | 6.750  | 13.21 | 9.83  | 2.03  |  |  |  |
| 0.667 | 2.03                   | 3.750 | 3.05  | 6.833  | 6.10  | 9.92  | 2.03  |  |  |  |
| 0.750 | 2.03                   | 3.833 | 3.05  | 6.917  | 6.10  | 10.00 | 2.03  |  |  |  |
| 0.833 | 1.02                   | 3.917 | 3.05  | 7.000  | 6.10  | 10.08 | 2.03  |  |  |  |
| 0.917 | 1.02                   | 4.000 | 3.05  | 7.083  | 6.10  | 10.17 | 2.03  |  |  |  |
| 1.000 | 1.02                   | 4.083 | 3.05  | 7.167  | 6.10  | 10.25 | 2.03  |  |  |  |
| 1.083 | 2.03                   | 4.167 | 3.05  | 7.250  | 6.10  | 10.33 | 2.03  |  |  |  |
| 1.167 | 2.03                   | 4.250 | 3.05  | 7.333  | 5.08  | 10.42 | 2.03  |  |  |  |
| 1.250 | 2.03                   | 4.333 | 5.08  | 7.417  | 5.08  | 10.50 | 2.03  |  |  |  |
|       |                        |       |       |        |       |       |       |  |  |  |

| LangstaffRd EA Proposed WestDonWatershd |      |       |       |       |      |       |      |  |  |
|---|------|-------|-------|-------|------|-------|------|--|--|
| 1.333                                   | 1.02 | 4.417 | 5.08  | 7.500 | 5.08 | 10.58 | 1.02 |  |  |
| 1.417                                   | 1.02 | 4.500 | 5.08  | 7.583 | 4.06 | 10.67 | 1.02 |  |  |
| 1.500                                   | 1.02 | 4.583 | 5.08  | 7.667 | 4.06 | 10.75 | 1.02 |  |  |
| 1.583                                   | 2.03 | 4.667 | 5.08  | 7.750 | 4.06 | 10.83 | 2.03 |  |  |
| 1.667                                   | 2.03 | 4.750 | 5.08  | 7.833 | 4.06 | 10.92 | 2.03 |  |  |
| 1.750                                   | 2.03 | 4.833 | 6.10  | 7.917 | 4.06 | 11.00 | 2.03 |  |  |
| 1.833                                   | 1.02 | 4.917 | 6.10  | 8.000 | 4.06 | 11.08 | 1.02 |  |  |
| 1.917                                   | 1.02 | 5.000 | 6.10  | 8.083 | 5.08 | 11.17 | 1.02 |  |  |
| 2.000                                   | 1.02 | 5.083 | 5.08  | 8.167 | 5.08 | 11.25 | 1.02 |  |  |
| 2.083                                   | 2.03 | 5.167 | 5.08  | 8.250 | 5.08 | 11.33 | 2.03 |  |  |
| 2.167                                   | 2.03 | 5.250 | 5.08  | 8.333 | 3.05 | 11.42 | 2.03 |  |  |
| 2.250                                   | 2.03 | 5.333 | 8.13  | 8.417 | 3.05 | 11.50 | 2.03 |  |  |
| 2.333                                   | 3.05 | 5.417 | 8.13  | 8.500 | 3.05 | 11.58 | 1.02 |  |  |
| 2.417                                   | 3.05 | 5.500 | 8.13  | 8.583 | 3.05 | 11.67 | 1.02 |  |  |
| 2.500                                   | 3.05 | 5.583 | 9.14  | 8.667 | 3.05 | 11.75 | 1.02 |  |  |
| 2.583                                   | 3.05 | 5.667 | 9.14  | 8.750 | 3.05 | 11.83 | 2.03 |  |  |
| 2.667                                   | 3.05 | 5.750 | 9.15  | 8.833 | 3.05 | 11.92 | 2.03 |  |  |
| 2.750                                   | 3.05 | 5.833 | 67.06 | 8.917 | 3.05 | 12.00 | 2.03 |  |  |
| 2.833                                   | 3.05 | 5.917 | 67.06 | 9.000 | 3.05 | 12.08 | 1.02 |  |  |
| 2.917                                   | 3.05 | 6.000 | 67.06 | 9.083 | 2.03 | 12.17 | 1.02 |  |  |
| 3.000                                   | 3.05 | 6.083 | 67.06 | 9.167 | 2.03 | 12.25 | 1.02 |  |  |
| 3.083                                   | 2.03 | 6.167 | 67.06 | 9.250 | 2.03 |       |      |  |  |
|   |      |       |       |       |      |       |      |  |  |

Max.Eff.Inten.(mm/hr)= 67.06 54.54 over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 5.00 5.19 (ii) 5.00 0.21 10.00 6.35 (ii) 10.00 0.15 \*TOTALS\* 0.080 (iii) PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 0.08 6.25 72.42 74.42 6.25 6.25 71.92 47.80 74.42 RUNOFF COEFFICIENT 0.97

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: CN\* = 89.0 Ia = Dep. Storage (Above) (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COFFFICIENT. (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB  <br>  STANDHYD ( 0180) <br> ID= 1 DT= 5.0 min | Area<br>Total | (ha)=<br>Imp(%)= | 0.65<br>52.00 | Dir. Conn.(%)= | 52.00 |
|--|---------------|------------------|---------------|----------------|-------|
|  |               | IMPERVI          | OUS           | PERVIOUS (i)   |       |
| Surface Area   | (ha)=         | 0.3              | 4             | 0.31           |       |
| Dep. Storage   | (mm)=         | 2.0              | Э             | 5.00           |       |
| Average Slope  | (%)=          | 1.0              | Э             | 2.00           |       |
| Length   | (m)=          | 65.8             | 3             | 40.00          |       |

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LangstaffRd EA Proposed WestDonWatershd

| TIME TO PEAK    | (hrs)= | 6.17  | 6.33  | 6.25  |
|-----------------|--------|-------|-------|-------|
| RUNOFF VOLUME   | (mm)=  | 72.42 | 39.68 | 56.70 |
| TOTAL RAINFALL  | (mm)=  | 74.42 | 74.42 | 74.42 |
| RUNOFF COEFFICI | ENT =  | 0.97  | 0.53  | 0.76  |

\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB   STANDHYD ( 0185) | Area  | (ha)= 0.4     | 47                |       |
|--------------------------|-------|---------------|-------------------|-------|
| ID= 1 DT= 5.0 min        | Total | Imp(%) = 72.0 | 00 Dir. Conn.(%)= | 72.00 |
|                          |       |               |                   |       |
|                          |       | IMPERVIOUS    | PERVIOUS (i)      |       |
| Surface Area             | (ha)= | 0.34          | 0.13              |       |
| Dep. Storage             | (mm)= | 2.00          | 5.00              |       |
| Average Slope            | (%)=  | 1.00          | 2.00              |       |
| Length                   | (m)=  | 240.00        | 20.00             |       |
| Mannings n               | ` =   | 0.013         | 0.350             |       |
| •                        |       |               |                   |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       | TRANSFORMED HYETOGRAPH |       |       |        |       |       |       |  |  |  |
|-------|------------------------|-------|-------|--------|-------|-------|-------|--|--|--|
| TIME  | RAIN                   | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |  |  |  |
| hrs   | mm/hr                  | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |  |  |  |
| 0.083 | 0.00                   | 3.167 | 2.03  | 6.250  | 67.05 | 9.33  | 3.05  |  |  |  |
| 0.167 | 0.00                   | 3.250 | 2.03  | 6.333  | 13.21 | 9.42  | 3.05  |  |  |  |
| 0.250 | 0.00                   | 3.333 | 3.05  | 6.417  | 13.21 | 9.50  | 3.05  |  |  |  |
| 0.333 | 1.02                   | 3.417 | 3.05  | 6.500  | 13.21 | 9.58  | 2.03  |  |  |  |
| 0.417 | 1.02                   | 3.500 | 3.05  | 6.583  | 13.21 | 9.67  | 2.03  |  |  |  |
| 0.500 | 1.02                   | 3.583 | 3.05  | 6.667  | 13.21 | 9.75  | 2.03  |  |  |  |
| 0.583 | 2.03                   | 3.667 | 3.05  | 6.750  | 13.21 | 9.83  | 2.03  |  |  |  |
| 0.667 | 2.03                   | 3.750 | 3.05  | 6.833  | 6.10  | 9.92  | 2.03  |  |  |  |
| 0.750 | 2.03                   | 3.833 | 3.05  | 6.917  | 6.10  | 10.00 | 2.03  |  |  |  |
| 0.833 | 1.02                   | 3.917 | 3.05  | 7.000  | 6.10  | 10.08 | 2.03  |  |  |  |
| 0.917 | 1.02                   | 4.000 | 3.05  | 7.083  | 6.10  | 10.17 | 2.03  |  |  |  |
| 1.000 | 1.02                   | 4.083 | 3.05  | 7.167  | 6.10  | 10.25 | 2.03  |  |  |  |
| 1.083 | 2.03                   | 4.167 | 3.05  | 7.250  | 6.10  | 10.33 | 2.03  |  |  |  |
| 1.167 | 2.03                   | 4.250 | 3.05  | 7.333  | 5.08  | 10.42 | 2.03  |  |  |  |
| 1.250 | 2.03                   | 4.333 | 5.08  | 7.417  | 5.08  | 10.50 | 2.03  |  |  |  |
| 1.333 | 1.02                   | 4.417 | 5.08  | 7.500  | 5.08  | 10.58 | 1.02  |  |  |  |
| 1.417 | 1.02                   | 4.500 | 5.08  | 7.583  | 4.06  | 10.67 | 1.02  |  |  |  |
| 1.500 | 1.02                   | 4.583 | 5.08  | 7.667  | 4.06  | 10.75 | 1.02  |  |  |  |
| 1.583 | 2.03                   | 4.667 | 5.08  | 7.750  | 4.06  | 10.83 | 2.03  |  |  |  |
| 1.667 | 2.03                   | 4.750 | 5.08  | 7.833  | 4.06  | 10.92 | 2.03  |  |  |  |
| 1.750 | 2.03                   | 4.833 | 6.10  | 7.917  | 4.06  | 11.00 | 2.03  |  |  |  |

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LangstaffRd\_EA\_Proposed\_WestDonWatershd = 0.013 0.250 Mannings n

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME RAIN | TIME RAIN | TIME hrs mm/hr | hrs mm/hr | hrs mm/hr | 5.66 67.65 | 9.33 3.250 2.03 | 6.333 13.21 | 9.42 TIME RAIN | RAIN mm/hr 0.00 0.00 0.00 1.02 1.02 2.03 2.03 hrs 6.250 6.333 6.6917 7.250 6.833 7.417 7.250 8.833 7.417 8.900 8.833 8.167 8.8083 8.167 8.8083 8.167 8.8083 8.9167 9.9083 9.167 0.083 3.05 0.167 3.05 0.167 0.250 0.333 0.417 0.500 0.583 3.250 3.333 3.417 3.500 3.583 3.667 3.750 3.05 3.05 3.05 3.05 3.05 3.05 3.05 9.42 9.50 9.58 9.67 9.75 9.83 9.92 13.21 13.21 13.21 13.21 3.05 2.03 2.03 2.03 13.21 2.03 0.667 6.10 6.10 6.10 6.10 6.10 5.08 5.08 5.08 2.03 9.92 10.00 10.08 10.17 10.25 10.33 10.42 10.50 10.58 0.750 0.833 2.03 3.833 3.05 2.03 1.02 3.917 4.000 4.083 4.167 4.250 4.333 4.417 4.500 4.583 4.667 4.750 4.833 4.917 1.02 1.02 2.03 2.03 2.03 1.02 3.05 3.05 3.05 3.05 3.05 5.08 5.08 0.917 1.000 1.083 1.167 1.250 2.03 1.333 1.02 1.02 1.02 2.03 2.03 2.03 1.02 4.06 4.06 4.06 4.06 4.06 4.06 1.02 1.02 2.03 2.03 2.03 1.02 1.417 5.08 5.08 5.08 5.08 6.10 6.10 6.10 5.08 10.67 10.75 10.83 10.92 11.00 11.08 11.17 11.33 11.42 11.50 11.58 11.67 11.75 11.83 1.41/ 1.500 1.583 1.667 1.750 1.833 1.917 5.08 5.08 1.02 5.000 1.02 2,000 1.02 2.000 2.083 2.167 2.250 2.333 2.417 2.500 2.583 5.08 5.08 5.08 8.13 8.13 8.13 9.14 9.14 5.08 5.08 3.05 3.05 3.05 3.05 3.05 3.05 2.03 2.03 2.03 1.02 1.02 2.03 2.03 2.03 3.05 3.05 3.05 3.05 3.05 3.05 5.167 5.250 5.333 5.417 5.500 5.583 5.667 5.750 5.833 5.917 6.000 6.083 6.167 2.03 11.92 12.00 12.08 12.17 12.25 2.667 9.15 3.05 3.05 2.03 2.750 67.06 2.03 2.833 2.917 3.000 3.083 3.05 3.05 3.05 2.03 67.06 67.06 67.06 67.06 3.05 2.03 2.03 2.03 1.02 1.02 1.02 Max.Eff.Inten.(mm/hr)= 46.22 67.06 over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 5.00 15.00 2.33 (ii) 11.94 (ii) 5.00 15.00 \*TOTALS\* 0.093 (iii)

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|   |                   |              |              |       | sed_WestDor  |        |                    |     |
|---|-------------------|--------------|--------------|-------|--------------|--------|--------------------|-----|
|   | 1.833             | 1.02         | 4.917        | 6.10  | 8.000        | 4.06   | 11.08              | 1.0 |
|   | 1.917             | 1.02         | 5.000        | 6.10  | 8.083        | 5.08   | 11.17              | 1.0 |
|   | 2.000             | 1.02         | 5.083        | 5.08  | 8.167        | 5.08   | 11.25              | 1.0 |
|   | 2.083             |              | 5.167        |       | 8.250        | 5.08   | 11.33              | 2.0 |
|   | 2.167             | 2.03         | 5.250        |       | 8.333        |        | 11.42              | 2.0 |
|   | 2.250             | 2.03         | 5.333        | 8.13  | 8.417        | 3.05   | 11.50              | 2.0 |
|   | 2.333             | 3.05         | 5.417        | 8.13  | 8.500        | 3.05   | 11.58              | 1.0 |
|   | 2.417             | 3.05         | 5.500        | 8.13  | 8.583        | 3.05   | 11.67              | 1.0 |
|   | 2.500             | 3.05         | 5.583        | 9.14  | 8.667        | 3.05   | 11.75              | 1.0 |
|   | 2.583             | 3.05         | 5.667        | 9.14  | 8.750        | 3.05   | 11.83              | 2.0 |
|   | 2.667             | 3.05         | 5.750        | 9.15  | 8.833        | 3.05   | 11.92              | 2.0 |
|   | 2.750             | 3.05         | 5.833        | 67.06 | 8.917        | 3.05   | 12.00              | 2.0 |
|   | 2.833             | 3.05         | 5.917        |       | 9.000        | 3.05   | 12.08              | 1.0 |
|   | 2.917             | 3.05         | 6.000        | 67.06 | 9.083        | 2.03   | 12.17              | 1.0 |
|   | 3.000             | 3.05         | 6.083        | 67.06 | 9.167        | 2.03   | 12.25              | 1.0 |
|   | 3.083             | 2.03         | 6.167        | 67.06 | 9.250        | 2.03   | l                  |     |
| Max.Eff.I   | nten.(mm/         | hr)=         | 67.06        |       | 41.26        |        |                    |     |
|   | over (m           | in)          | 5.00         |       | 10.00        |        |                    |     |
| Storage C   | oeff. (m          | in)=         | 5.07         | (ii)  | 9.65 (ii)    |        |                    |     |
| Unit Hyd.   | Tpeak (m          | in)=         | 5.00         |       | 10.00        |        |                    |     |
|   | peak (ci          | ms)=         | 0.21         |       | 0.11         |        |                    |     |
| Unit Hyd.   |                   |              |              |       |              |        |                    |     |
| Unit Hyd.   |                   |              |              |       |              | *T0    | IALS*              |     |
| ,   | (cı               | ms)=         | 0.06         |       | 0.01         |        | IALS*<br>.076 (iii | )   |
| PEAK FLOW   |                   | ms)=<br>rs)= | 0.06<br>6.25 |       | 0.01<br>6.25 | 0      |                    | )   |
| PEAK FLOW<br>TIME TO P                              | EAK (h            |              |              |       |              | 0      | .076 (iii          | )   |
| Unit Hyd.  PEAK FLOW TIME TO PI RUNOFF VO TOTAL RAI | EAK (h<br>LUME (i | rs)=         | 6.25         |       | 6.25         | 0<br>6 | .076 (iii<br>5.25  | )   |

| ADD HYD ( 0445) |          | QPEAK | TPEAK | R.V.  |
|-----------------|----------|-------|-------|-------|
| 1 + 2 = 3       |          | (cms) | (hrs) | (mm)  |
| ID1= 1 ( 018    |          | 0.093 | 6.25  | 56.70 |
| + ID2= 2 ( 018  |          | 0.076 | 6.25  | 61.99 |
| ID = 3 ( 044    | 5): 1.12 | 0.169 | 6.25  | 58.92 |

| ADD HYD ( 0450)| | 1 + 2 = 3 | AREA QPEAK TPEAK R.V.

```
LangstaffRd_EA_Proposed_WestDonWatershd
                                      (ha)
0.60
                                              (cms)
0.099
                                                             (hrs)
6.25
                                                                       (mm)
63.24
      ID1= 1 ( 0165):
+ ID2= 2 ( 0170):
                                      0.43
                                                0.080
                                                             6.25
                                                                        71.92
                                               0.179
         ID = 3 ( 0450):
                                     1.03
                                                             6.25
                                                                        66.87
      NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
| ADD HYD ( 0450)|
| 3 + 2 = 1 |
                                               QPEAK
(cms)
0.179
0.169
                                      ΔRFΔ
                                                             TΡΕΔΚ
                                                             (hrs)
6.25
6.25
                                      (ha)
1.03
       ID1= 3 ( 0450):
+ ID2= 2 ( 0445):
                                      1.12
                                                                        58.92
        ID = 1 ( 0450):
                                     2.15 0.348
                                                            6.25
                                                                        62.73
      NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
 RESERVOIR( 0520) |
IN= 2---> OUT= 1 |
DT= 5.0 min |
                                OVERFLOW IS OFF
                                OUTFLOW
                                               STORAGE
                                                                OUTFLOW
                                                                                STORAGE
                                               STORAGE
(ha.m.)
0.0000
0.0048
0.0192
0.0372
                                                                               STORAGE
(ha.m.)
0.0552
0.0732
0.1152
0.0000
                                  (cms)
0.0000
                                                                  (cms)
0.0181
                                  0.0081
0.0123
0.0155
                                                                  0.0203
0.0224
0.0000
                                                                    TPEAK
                                          AREA
                                                      QPEAK
                                                                    (hrs)
6.25
8.33
                                                                                    (mm)
62.73
62.66
                                          (ha)
2.150
                                                      (cms)
   INFLOW : ID= 2 ( 0450)
OUTFLOW: ID= 1 ( 0520)
                                                        0.348
                                          2.150
```

Dep. Storage Average Slope Length Mannings n (mm) = (%) = (m) = 1.00 531.00 NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

IMPERVIOUS

2.32

(ha)=

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Area (ha)= 3.05 Total Imp(%)= 76.00 Dir. Conn.(%)= 76.00

PERVIOUS (i)

0.73 5.00 2.00

40.00

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

-----

Surface Area

CALTB | CALIB | STANDHYD ( 0145)| |ID= 1 DT= 5.0 min |

(1) CN\* = 86.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |         |       |                |       |
|-------------------|-------|---------|-------|----------------|-------|
| STANDHYD ( 0135)  | Area  | (ha)=   | 1.43  |                |       |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 99.00 | Dir. Conn.(%)= | 99.00 |
|                   |       |         |       |                |       |
|                   |       | IMPERVI | OUS   | PERVIOUS (i)   |       |
| Surface Area      | (ha)= | 1.4     | 2     | 0.01           |       |
| Dep. Storage      | (mm)= | 2.0     | 0     | 5.00           |       |
| Average Slope     | (%)=  | 1.0     | 0     | 2.00           |       |
| Length            | (m)=  | 503.0   | 0     | 30.00          |       |
| Mannings n        | =     | 0.01    | 3     | 0.250          |       |
|                   |       |         |       |                |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250   | 67.05 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333   | 13.21 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417   | 13.21 | 9.50  | 3.05  |
| 0.333 | 1.02  | 3.417 | 3.05     | 6.500   | 13.21 | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05     | 6.583   | 13.21 | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 3.05     | 6.667   | 13.21 | 9.75  | 2.03  |
| 0.583 | 2.03  | 3.667 | 3.05     | 6.750   | 13.21 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 3.05     | 6.833   | 6.10  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 3.05     | 6.917   | 6.10  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 3.05     | 7.000   | 6.10  | 10.08 | 2.03  |
| 0.917 | 1.02  | 4.000 | 3.05     | 7.083   | 6.10  | 10.17 | 2.03  |
| 1.000 | 1.02  | 4.083 | 3.05     | 7.167   | 6.10  | 10.25 | 2.03  |
| 1.083 | 2.03  | 4.167 | 3.05     | 7.250   | 6.10  | 10.33 | 2.03  |
| 1.167 | 2.03  | 4.250 | 3.05     | 7.333   | 5.08  | 10.42 | 2.03  |
| 1.250 | 2.03  | 4.333 | 5.08     | 7.417   | 5.08  | 10.50 | 2.03  |
| 1.333 | 1.02  | 4.417 | 5.08     | 7.500   | 5.08  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 5.08     | 7.583   | 4.06  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 5.08     | 7.667   | 4.06  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 5.08     | 7.750   | 4.06  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 5.08     | 7.833   | 4.06  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 6.10     | 7.917   | 4.06  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 6.10     | 8.000   | 4.06  | 11.08 | 1.02  |
| 1.917 | 1.02  | 5.000 | 6.10     | 8.083   | 5.08  | 11.17 | 1.02  |
| 2.000 | 1.02  | 5.083 | 5.08     | 8.167   | 5.08  | 11.25 | 1.02  |
| 2.083 | 2.03  | 5.167 | 5.08     | 8.250   | 5.08  | 11.33 | 2.03  |

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### LangstaffRd\_EA\_Proposed\_WestDonWatershd

|                  |        | TP    | ANS EORME | D HYETOGR | NDH   | _          |       |
|------------------|--------|-------|-----------|-----------|-------|------------|-------|
| TIME             | RAIN   | TIME  | RAIN      |           | RAIN  |            | RAIN  |
| hrs              |        | l hrs | mm/hr     | l' hrs    | mm/hr |            | mm/hr |
| 0.083            |        | 3.167 | 2.03      | 6.250     | 67.05 |            | 3.05  |
| 0.167            |        | 3.250 | 2.03      | 6.333     | 13.21 | 9.33       | 3.05  |
| 0.167            |        | 3.333 | 3.05      | 6.417     | 13.21 | 9.42       | 3.05  |
| 0.333            |        | 3.417 | 3.05      | 6.500     | 13.21 | 9.58       | 2.03  |
| 0.333            |        | 3.500 | 3.05      | 6.583     | 13.21 | 9.56       | 2.03  |
| 0.500            |        | 3.583 | 3.05      | 6.667     | 13.21 |            | 2.03  |
| 0.583            |        | 3.667 | 3.05      | 6.750     | 13.21 | 9.83       | 2.03  |
| 0.667            |        |       | 3.05      | 6.833     | 6.10  |            | 2.03  |
| 0.750            |        |       | 3.05      | 6.917     | 6.10  |            | 2.03  |
| 0.833            |        | 3.917 | 3.05      | 7.000     | 6.10  |            | 2.03  |
| 0.917            |        |       | 3.05      | 7.083     | 6.10  |            | 2.03  |
| 1.000            |        | 4.083 | 3.05      | 7.167     | 6.10  |            | 2.03  |
| 1.083            |        |       | 3.05      | 7.250     | 6.10  |            | 2.03  |
| 1.167            |        | 4.250 | 3.05      | 7.333     | 5.08  |            | 2.03  |
| 1.250            |        | 4.333 | 5.08      | 7.417     | 5.08  |            | 2.03  |
| 1.333            |        | 4.417 | 5.08      | 7.500     | 5.08  |            | 1.02  |
| 1.417            |        |       | 5.08      | 7.583     | 4.06  | 10.67      | 1.02  |
| 1.500            |        | 4.583 | 5.08      | 7.667     | 4.06  | 10.75      | 1.02  |
| 1.583            |        |       | 5.08      | 7.750     | 4.06  | 10.83      | 2.03  |
| 1.667            |        |       | 5.08      | 7.833     | 4.06  |            | 2.03  |
| 1.750            |        | 4.833 | 6.10      | 7.917     | 4.06  |            | 2.03  |
| 1.833            |        | 4.917 | 6.10      | 8.000     | 4.06  | 11.08      | 1.02  |
| 1.917            |        |       | 6.10      | 8.083     | 5.08  |            | 1.02  |
| 2.000            |        | 5.083 | 5.08      | 8.167     | 5.08  |            | 1.02  |
| 2.083            |        |       |           | 8.250     | 5.08  |            | 2.03  |
| 2.167            | 2.03   | 5.250 | 5.08      | 8.333     | 3.05  | 11.42      | 2.03  |
| 2.250            |        | 5.333 | 8.13      | 8.417     | 3.05  |            | 2.03  |
| 2.333            | 3.05   | 5.417 | 8.13      | 8.500     | 3.05  | 11.58      | 1.02  |
| 2.417            | 3.05   | 5.500 | 8.13      | 8.583     | 3.05  | 11.67      | 1.02  |
| 2.500            | 3.05   | 5.583 | 9.14      | 8.667     | 3.05  | 11.75      | 1.02  |
| 2.583            | 3.05   | 5.667 | 9.14      | 8.750     | 3.05  | 11.83      | 2.03  |
| 2.667            | 3.05   | 5.750 | 9.15      | 8.833     | 3.05  | 11.92      | 2.03  |
| 2.750            | 3.05   | 5.833 | 67.06     | 8.917     | 3.05  | 12.00      | 2.03  |
| 2.833            | 3.05   | 5.917 | 67.06     | 9.000     | 3.05  | 12.08      | 1.02  |
| 2.917            |        | 6.000 | 67.06     | 9.083     | 2.03  | 12.17      | 1.02  |
| 3.000            |        |       | 67.06     | 9.167     | 2.03  |            | 1.02  |
| 3.083            | 2.03   | 6.167 | 67.06     | 9.250     | 2.03  |            |       |
| Max.Eff.Inten.(m |        | 67.06 |           | 50.27     |       |            |       |
| over             |        | 10.00 |           | 20.00     |       |            |       |
|                  | (min)= | 8.16  | (ii)      | 17.46 (ii | )     |            |       |
| Unit Hyd. Tpeak  | (min)= | 10.00 |           | 20.00     |       |            |       |
| Unit Hyd. peak   | (cms)= | 0.13  |           | 0.06      |       |            |       |
|                  |        |       |           |           |       | TALS*      |       |
| PEAK FLOW        | (cms)= | 0.42  |           | 0.07      |       | .479 (iii) | )     |
| TIME TO PEAK     | (hrs)= | 6.25  |           | 6.42      |       | 5.25       |       |
| RUNOFF VOLUME    | (mm)=  | 72.42 |           | 43.51     |       | .48        |       |
| TOTAL RAINFALL   | (mm)=  | 74.42 |           | 74.42     | 74    | 1.42       |       |

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LangstaffRd\_EA\_Proportion 
2.03 | 5.250 | 5.08 |
2.03 | 5.333 | 8.13 |
3.05 | 5.417 | 8.13 |
3.05 | 5.500 | 8.13 |
3.05 | 5.5667 | 9.14 |
3.05 | 5.667 | 9.14 |
3.05 | 5.633 | 67.06 |
3.05 | 6.080 | 67.06 |
3.05 | 6.083 | 67.06 |
2.03 | 6.167 | 67.06 | ed\_WestDo
8.333
8.417
8.500
8.583
8.667
8.750
8.833
8.917
9.000
9.083
9.167
9.250 2.167 2.250 2.333 11.42 11.50 11.58 11.67 2.03 1.02 3.05 2.417 3.05 1.02 3.05 3.05 3.05 3.05 3.05 3.05 2.03 2.03 2.500 11.75 11.83 1.02 2.583 2.667 2.750 2.833 2.917 11.83 11.92 12.00 12.08 12.17 2.03 2.03 2.03 1.02 1.02 12.25 3.000 1.02 3.083 67.06 İ Max.Eff.Inten.(mm/hr)= 67 86 47 54 over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 10.00 7.90 (ii) 10.00 0.13 47.54 10.00 9.01 (ii) 10.00 0.12 \*TOTALS\* PEAK FLOW (cms)= 0.26 0.00 0.258 (iii) TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 6.25 72.42 74.42 0.97 6.25 40.91 74.42 0.55 6.25 72.10 74.42 0.97

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 84.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB | | CALIB | | STANDHYD ( 0140) | |ID= 1 DT= 5.0 min | Area (ha)= 1.27 Total Imp(%)= 91.00 Dir. Conn.(%)= 91.00 PERVIOUS (i) 0.11 5.00 2.00 IMPERVIOUS 1.16 2.00 1.00 Dep. Storage Average Slope (mm)= (%)= Length (m)= 503.00 25.00 Mannings n 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TRA   | ANSFORMED | HYETOGR | APH   |      |       |
|-------|-------|-------|-----------|---------|-------|------|-------|
| TIME  | RAIN  | TIME  | RAIN      | ' TIME  | RAIN  | TIME | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr     | ' hrs   | mm/hr | hrs  | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03      | 6.250   | 67.05 | 9.33 | 3.05  |
| 0.167 | 0.00  | 3.250 | 2.03      | 6.333   | 13.21 | 9.42 | 3.05  |
|       |       |       |           |         |       |      |       |

|           |      | taffRd E | A Danas | ad Haata |       | h.al   |      |
|-----------|------|----------|---------|----------|-------|--------|------|
| 0.250     | 0.00 | 1 3.333  | 3.05    | 6.417    | 13.21 | l 9.50 | 3.05 |
| 0.333     | 1.02 | 3.417    | 3.05    | 6.500    | 13.21 | 9.58   | 2.03 |
| 0.417     | 1.02 | 3.500    | 3.05    | 6.583    | 13.21 | 9.67   | 2.03 |
| 0.500     | 1.02 | 3.583    | 3.05    | 6.667    | 13.21 | 9.75   | 2.03 |
| 0.583     | 2.03 | 3.667    | 3.05    | 6.750    | 13.21 | 9.83   | 2.03 |
| 0.667     | 2.03 | 3.750    | 3.05    | 6.833    | 6.10  | 9.92   | 2.03 |
| 0.750     |      | 3.833    | 3.05    | 6.917    | 6.10  | 10.00  | 2.03 |
| 0.833     | 1.02 | 3.917    | 3.05    | 7.000    | 6.10  | 10.08  | 2.03 |
| 0.917     | 1.02 | 4.000    | 3.05    | 7.083    | 6.10  | 10.17  | 2.03 |
| 1.000     | 1.02 | 4.083    | 3.05    | 7.167    | 6.10  | 10.25  | 2.03 |
| 1.083     | 2.03 | 4.167    | 3.05    | 7.250    | 6.10  | 10.33  | 2.03 |
| 1.167     | 2.03 | 4.250    | 3.05    | 7.333    | 5.08  | 10.42  | 2.03 |
| 1.250     | 2.03 | 4.333    | 5.08    | 7.417    | 5.08  | 10.50  | 2.03 |
| 1.333     | 1.02 | 4.417    | 5.08    | 7.500    | 5.08  | 10.58  | 1.02 |
| 1.417     | 1.02 | 4.500    | 5.08    | 7.583    | 4.06  | 10.67  | 1.02 |
| 1.500     | 1.02 | 4.583    | 5.08    | 7.667    | 4.06  | 10.75  | 1.02 |
| 1.583     | 2.03 | 4.667    | 5.08    | 7.750    | 4.06  | 10.83  | 2.03 |
| 1.667     | 2.03 | 4.750    | 5.08    | 7.833    | 4.06  | 10.92  | 2.03 |
| 1.750     | 2.03 | 4.833    | 6.10    | 7.917    | 4.06  | 11.00  | 2.03 |
| 1.833     | 1.02 | 4.917    | 6.10    | 8.000    | 4.06  | 11.08  | 1.02 |
| 1.917     | 1.02 | 5.000    | 6.10    | 8.083    | 5.08  | 11.17  | 1.02 |
| 2.000     | 1.02 | 5.083    | 5.08    | 8.167    | 5.08  | 11.25  | 1.02 |
| 2.083     | 2.03 | 5.167    | 5.08    | 8.250    | 5.08  | 11.33  | 2.03 |
| 2.167     | 2.03 | 5.250    | 5.08    | 8.333    | 3.05  | 11.42  | 2.03 |
| 2.250     | 2.03 | 5.333    | 8.13    | 8.417    | 3.05  | 11.50  | 2.03 |
| 2.333     | 3.05 | 5.417    | 8.13    | 8.500    | 3.05  | 11.58  | 1.02 |
| 2.417     | 3.05 | 5.500    | 8.13    | 8.583    | 3.05  | 11.67  | 1.02 |
| 2.500     | 3.05 | 5.583    | 9.14    | 8.667    | 3.05  | 11.75  | 1.02 |
| 2.583     | 3.05 | 5.667    | 9.14    | 8.750    | 3.05  | 11.83  | 2.03 |
| 2.667     | 3.05 | 5.750    | 9.15    | 8.833    | 3.05  | 11.92  | 2.03 |
| 2.750     | 3.05 | 5.833    | 67.06   | 8.917    | 3.05  | 12.00  | 2.03 |
| 2.833     | 3.05 | 5.917    | 67.06   | 9.000    | 3.05  | 12.08  | 1.02 |
| 2.917     | 3.05 | 6.000    | 67.06   | 9.083    | 2.03  | 12.17  | 1.02 |
| 3.000     | 3.05 | 6.083    | 67.06   | 9.167    | 2.03  | 12.25  | 1.02 |
| 3.083     | 2.03 | 6.167    | 67.06   | 9.250    | 2.03  | l      |      |
| iten.(mm/ | hr)= | 67.06    |         | 46.22    |       |        |      |
| over (m   | in)  | 10.00    |         | 15.00    |       |        |      |

over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 10.00 15.00 7.90 (ii) 10.38 (ii) 10.00 0.13 0.09

\*TOTALS\* PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 0.220 (iii) 6.25 69.47 a a1 6.33 39.68 74.42 0.97 0.53

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  $CN^*=83.0$  Ia=Dep. Storage (Above) (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

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LangstaffRd\_EA\_Proposed\_WestDonWatershd 0.0071 0.0165 | 0.0636 0.1 0.0098 0.0331 | 0.0763 0.1 0.1934 0.0119 0.0526 0.0870 0.0138 0.0750 0.0964 0.2308 ΟΡΕΔΚ TPFΔK R V

INFLOW : ID= 2 ( 0425) OUTFLOW: ID= 1 ( 0512) PEAK FLOW REDUCTION [Qout/Qin](%)= 14.79
TIME SHIFT OF PEAK FLOW (min)=135.00

MAXIMUM STORAGE USED (ha.m.)= 0.1531

TMPERVTOUS PERVIOUS (i)

(ha)= (mm)= (%)= (m)= 0.47 2.00 1.00 260.00 0.11 5.00 2.00 30.00 Dep. Storage Average Slope Length Mannings n 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TRANSFORMED HYETOGRAPH ---ME RAIN | TIME RAIN | TIME
rs mm/hr | hrs mm/hr | hrs
67 2.03 | 6.250 67.05 | 9.33 hrs 0.083 mm/hr hrs 3.167 ' hrs 6.250 6.333 6.417 6.500 6.583 6.667 6.750 6.833 mm/hr 3.05 0.00 0.167 0.00 3.250 2.03 13.21 9.42 3.05 0.250 0.00 3.333 3.05 13.21 9.50 3.05 0.250 0.333 0.417 0.500 0.583 0.667 0.750 3.333 3.417 3.500 3.583 3.667 3.750 3.833 3.05 3.05 3.05 3.05 3.05 3.05 1.02 1.02 1.02 2.03 2.03 2.03 2.03 2.03 2.03 13.21 9.58 9.67 9.75 9.83 9.92 3.05 | 6.833 3.05 | 6.917 3.05 | 7.000 3.05 | 7.083 3.05 | 7.250 3.05 | 7.250 3.05 | 7.333 5.08 | 7.500 5.08 | 7.500 5.08 | 7.500 5.08 | 7.500 5.08 | 7.750 5.08 | 7.750 6.10 2.03 2.03 2.03 0.833 1.02 3.917 6.10 10.08 2.03 0.917 1.02 | 4.000 1.02 | 4.083 2.03 | 4.167 2.03 | 4.250 2.03 | 4.333 1.02 | 4.417 1.02 | 4.500 1.02 | 4.583 2.03 | 4.667 2.03 | 4.750 1.02 4.000 10.17 2.03 2.03 2.03 2.03 2.03 2.03 6.10 6.10 5.08 5.08 10.17 10.25 10.33 10.42 10.50 10.58 1.333 1.02 1.417 4.06 10.67 1.02 4.06 1.500 10.75 1.02 1 583 4.06 | 2 03

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# LangstaffRd\_EA\_Proposed\_WestDonWatershd (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0420)| | 1 + 2 = 3 | QPEAK (ha) 1.43 (cms) 0.258 (hrs) 6.25 (mm) 72.10 ID1= 1 ( 0135): + ID2= 2 ( 0140): 1.27 0.220 69.47 ID = 3 ( 0420): 2.70 0.478 6.25 70.86

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR( 0530)| IN= 2---> OUT= 1 | DT= 5.0 min | OVERFLOW IS OFF OUTFLOW STORAGE OUTFLOW STORAGE (cms) 0.0000 0.0056 (ha.m.) 0.0000 0.0072 (cms) 0.0122 0.0382 0.0283 0.0516 0.1598 0.0105 0.0000 0.0000 AREA ΟΡΕΔΚ TΡΕΔΚ R V (ha) 2.700 2.700 INFLOW : ID= 2 ( 0420) OUTFLOW: ID= 1 ( 0530) PEAK FLOW REDUCTION [Qout/Qin](%)= 9.16
TIME SHIFT OF PEAK FLOW (min)= 65.00
MAXIMUM STORAGE USED (ha.m.)= 0.1303

| ADD HYD ( 0425)| | 1 + 2 = 3 | AREA (hrs) 6.25 7.33 (ha) 3.05 (cms) (mm) 65.48 ID1= 1 ( 0145): + ID2= 2 ( 0530): 0.479 2.70 0.044 70.75 ID = 3 ( 0425):

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR( 0512)| OVERFLOW IS OFF IN= 2---> OUT= 1 DT= 5.0 min OUTFLOW STORAGE | OUTFLOW (cms) (ha.m.) | (cms) 0.0000 | 0.0471 STORAGE

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|                   |       |       |       | sed_WestDon |      |       |      |
|-------------------|-------|-------|-------|-------------|------|-------|------|
| 1.750             | 2.03  | 4.833 | 6.10  | 7.917       | 4.06 | 11.00 | 2.03 |
| 1.833             | 1.02  |       | 6.10  |             | 4.06 |       | 1.02 |
| 1.917             | 1.02  | 5.000 | 6.10  | 8.083       | 5.08 | 11.17 | 1.02 |
| 2.000             | 1.02  | 5.083 | 5.08  | 8.167       | 5.08 | 11.25 | 1.02 |
| 2.083             | 2.03  | 5.167 | 5.08  | 8.250       | 5.08 | 11.33 | 2.03 |
| 2.167             | 2.03  | 5.250 | 5.08  | 8.333       | 3.05 | 11.42 | 2.03 |
| 2.250             | 2.03  | 5.333 | 8.13  | 8.417       | 3.05 | 11.50 | 2.03 |
| 2.333             | 3.05  | 5.417 | 8.13  | 8.500       | 3.05 | 11.58 | 1.02 |
| 2.417             | 3.05  | 5.500 | 8.13  | 8.583       | 3.05 | 11.67 | 1.02 |
| 2.500             | 3.05  | 5.583 | 9.14  | 8.667       | 3.05 | 11.75 | 1.02 |
| 2.583             | 3.05  | 5.667 | 9.14  | 8.750       | 3.05 | 11.83 | 2.03 |
| 2.667             | 3.05  | 5.750 | 9.15  | 8.833       | 3.05 | 11.92 | 2.03 |
| 2.750             | 3.05  | 5.833 | 67.06 | 8.917       | 3.05 | 12.00 | 2.03 |
| 2.833             | 3.05  | 5.917 | 67.06 | 9.000       | 3.05 | 12.08 | 1.02 |
| 2.917             | 3.05  | 6.000 | 67.06 | 9.083       | 2.03 | 12.17 | 1.02 |
| 3.000             | 3.05  | 6.083 | 67.06 | 9.167       | 2.03 | 12.25 | 1.02 |
| 3.083             | 2.03  | 6.167 | 67.06 | 9.250       | 2.03 | İ     |      |
|                   |       |       |       |             |      |       |      |
| Max.Eff.Inten.(mm | /hr)= | 67.06 |       | 46.22       |      |       |      |
| over (            | min)  | 5.00  |       | 10.00       |      |       |      |
|                   | min)= | 5.32  | (ii)  | 9.22 (ii)   |      |       |      |
| Unit Hyd. Tpeak ( |       | 5.00  |       | 10.00       |      |       |      |
|                   | cms)= | 0.21  |       | 0.12        |      |       |      |
| , peen (          | /     |       |       |             |      |       |      |

\*TOTALS\* 0.100 (iii) 6.25 PEAK FLOW TIME TO PEAK (cms)= (hrs)= (mm)= (mm)= 6.25 6.25 RUNOFF VOLUME TOTAL RAINFALL 72.42 39.68 66.19 74.42 RUNOFF COEFFICIENT

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 83.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB | | STANDHYD ( 0220) | |ID= 1 DT= 5.0 min | Area (ha)= 0.65 Total Imp(%)= 66.00 Dir. Conn.(%)= 66.00 IMPERVIOUS PERVIOUS (i) Surface Area Dep. Storage Average Slope (ha)= (mm)= (%)= (m)= 0.43 2.00 1.00 260.00 0.22 5.00 2.00 Length Mannings n 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

### LangstaffRd\_EA\_Proposed\_WestDonWatershd

| TRANSFORMED HYETOGRAPH |       |                         |       |        |       |                         |       |  |  |
|------------------------|-------|-------------------------|-------|--------|-------|-------------------------|-------|--|--|
| TIME                   | RAIN  |                         | RAIN  | ' TIME | RAIN  | TIME                    |       |  |  |
| hrs                    | mm/hr | hrs                     | mm/hr | ' hrs  | mm/hr | hrs                     | mm/hr |  |  |
| 0.083                  | 0.00  | 3.167                   | 2.03  | 6.250  | 67.05 | 9.33                    | 3.05  |  |  |
| 0.167                  | 0.00  | 3.250                   | 2.03  | 6.333  | 13.21 |                         | 3.05  |  |  |
| 0.250                  | 0.00  | 3.333                   | 3.05  | 6.417  | 13.21 | 9.50                    | 3.05  |  |  |
| 0.333                  | 1.02  | 3.417                   | 3.05  | 6.500  | 13.21 |                         | 2.03  |  |  |
| 0.417                  |       | 3.500                   | 3.05  | 6.583  | 13.21 | 9.67                    | 2.03  |  |  |
| 0.500                  | 1.02  | 3.583                   | 3.05  | 6.667  | 13.21 |                         | 2.03  |  |  |
| 0.583                  | 2.03  | 3.667                   | 3.05  | 6.750  | 13.21 |                         |       |  |  |
| 0.667                  | 2.03  | 3.750                   | 3.05  | 6.833  | 6.10  | 9.92                    | 2.03  |  |  |
| 0.750                  | 2.03  | 3.833                   | 3.05  | 6.917  | 6.10  | 10.00                   | 2.03  |  |  |
| 0.833                  | 1.02  | 3.917                   | 3.05  | 7.000  | 6.10  | 10.08                   | 2.03  |  |  |
| 0.917                  | 1.02  | 4.000                   | 3.05  | 7.083  | 6.10  | 10.17                   | 2.03  |  |  |
| 1.000                  | 1.02  | 4.083                   | 3.05  | 7.167  | 6.10  | 10.25                   | 2.03  |  |  |
| 1.083                  | 2.03  | 4.167                   | 3.05  | 7.250  | 6.10  | 10.33                   | 2.03  |  |  |
| 1.167                  | 2.03  | 4.167<br>4.250<br>4.333 | 3.05  | 7.333  | 5.08  | 10.42                   | 2.03  |  |  |
| 1.250                  | 2.03  | 4.333                   | 5.08  | 7.417  | 5.08  | 10.50                   | 2.03  |  |  |
| 1.333                  | 1.02  | 4.417                   | 5.08  | 7.500  | 5.08  | 10.58                   | 1.02  |  |  |
| 1.417                  | 1.02  | 4.500                   | 5.08  | 7.583  | 4.06  | 10.58<br>10.67<br>10.75 | 1.02  |  |  |
| 1.500                  | 1.02  | 4.500<br>4.583<br>4.667 | 5.08  | 7.667  | 4.06  | 10.75                   | 1.02  |  |  |
| 1.583                  | 2.03  | 4.667                   | 5.08  | 7.750  | 4.06  | 10.83                   | 2.03  |  |  |
|                        |       | 4.750                   |       | 7.833  | 4.06  |                         |       |  |  |
| 1.750                  | 2.03  | 4.833                   | 6.10  | 7.917  | 4.06  | 10.92<br>  11.00        | 2.03  |  |  |
| 1.833                  | 1.02  | 4.917                   | 6.10  | 8.000  |       |                         |       |  |  |
|                        |       | 5.000                   |       |        | 5.08  | 11.17                   |       |  |  |
| 2.000                  | 1.02  | 5.083                   | 5.08  | 8.167  | 5.08  |                         | 1.02  |  |  |
| 2.083                  | 2.03  | 5.167                   | 5.08  | 8.250  | 5.08  | 11.25                   | 2.03  |  |  |
| 2.167                  | 2.03  | 5.250                   | 5.08  | 8.333  |       |                         |       |  |  |
|                        |       | 5.333                   |       |        |       | 11.50                   | 2.03  |  |  |
| 2.333                  | 3.05  | 5.417                   | 8.13  | 8.500  | 3.05  |                         |       |  |  |
| 2.417                  | 3.05  | 5.500                   | 8.13  | 8.583  | 3.05  | 11.67                   | 1.02  |  |  |
|                        |       |                         |       |        |       | 11.75                   | 1.02  |  |  |
|                        |       | 5.667                   |       |        | 3.05  | 11.83                   | 2.03  |  |  |
| 2.667                  | 3.05  | 5.750                   | 9.15  | 8.833  | 3.05  | 11.92                   | 2.03  |  |  |
| 2.750                  | 3.05  | 5.833<br>5.917          | 67.06 | 8.917  | 3.05  | 12.00                   | 2.03  |  |  |
|                        |       |                         |       |        | 3.05  | 12.08                   | 1.02  |  |  |
| 2.917                  |       | 6.000                   |       | 9.083  |       |                         |       |  |  |
| 3.000<br>3.083         |       | 6.083<br>6.167          |       | 9.167  |       | 12.25                   | 1.02  |  |  |
| 3.083                  | 2.03  | 0.16/                   | 07.06 | 9.250  | 2.03  |                         |       |  |  |
| Max.Eff.Inten.(mm      | /hr)- | 67.06                   |       | 46.22  |       |                         |       |  |  |
| over (                 |       | 5.00                    |       | 10.00  |       |                         |       |  |  |
|                        |       |                         |       |        |       |                         |       |  |  |

10.00 9.51 (ii) 10.00 0.12 over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 5.32 (ii) 5.00 0.21 \*TOTALS\* 0.08 6.25 72.42 74.42 0.97 0.104 (iii) 6.25 0.02 PEAK FLOW (cms)= TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 6.25 39.68 74.42 0.53 61.28 74.42 0.82

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### LangstaffRd\_EA\_Proposed\_WestDonWatershd

|          |       | TRA   | NSFORME | HYETOGR | APH   |       |       |
|----------|-------|-------|---------|---------|-------|-------|-------|
| TIME     | RAIN  |       | RAIN    |         | RAIN  | TIME  | RAIN  |
| hrs      | mm/hr | hrs   | mm/hr   | ' hrs   | mm/hr |       | mm/hr |
| 0.083    | 0.00  | 3.167 | 2.03    | 6.250   | 67.05 | 9.33  | 3.05  |
| 0.167    | 0.00  | 3.250 | 2.03    | 6.333   | 13.21 | 9.42  | 3.05  |
| 0.250    | 0.00  | 3.333 | 3.05    | 6.417   | 13.21 | 9.50  | 3.05  |
| 0.333    | 1.02  | 3.417 | 3.05    | 6.500   | 13.21 | 9.58  | 2.03  |
| 0.417    | 1.02  | 3.500 | 3.05    | 6.583   | 13.21 | 9.67  | 2.03  |
| 0.500    | 1.02  | 3.583 | 3.05    | 6.667   | 13.21 | 9.75  | 2.03  |
| 0.583    | 2.03  | 3.667 | 3.05    | 6.750   | 13.21 | 9.83  | 2.03  |
| 0.667    | 2.03  | 3.750 | 3.05    |         | 6.10  |       | 2.03  |
| 0.750    | 2.03  | 3.833 | 3.05    |         | 6.10  |       | 2.03  |
| 0.833    | 1.02  |       | 3.05    |         | 6.10  |       | 2.03  |
| 0.917    | 1.02  | 4.000 | 3.05    |         | 6.10  |       | 2.03  |
| 1.000    | 1.02  | 4.083 | 3.05    | 7.167   | 6.10  |       | 2.03  |
| 1.083    | 2.03  | 4.167 | 3.05    | 7.250   | 6.10  |       | 2.03  |
| 1.167    |       | 4.250 | 3.05    | 7.333   | 5.08  |       | 2.03  |
| 1.250    |       | 4.333 | 5.08    |         | 5.08  |       | 2.03  |
| 1.333    | 1.02  | 4.417 | 5.08    |         | 5.08  |       | 1.02  |
| 1.417    |       | 4.500 | 5.08    |         | 4.06  |       | 1.02  |
| 1.500    |       | 4.583 | 5.08    |         | 4.06  |       | 1.02  |
| 1.583    |       | 4.667 | 5.08    |         | 4.06  |       | 2.03  |
| 1.667    | 2.03  | 4.750 | 5.08    |         | 4.06  |       | 2.03  |
| 1.750    | 2.03  | 4.833 | 6.10    |         | 4.06  |       | 2.03  |
| 1.833    |       | 4.917 | 6.10    |         | 4.06  |       | 1.02  |
| 1.917    | 1.02  | 5.000 | 6.10    |         | 5.08  |       | 1.02  |
| 2.000    | 1.02  | 5.083 | 5.08    |         | 5.08  | 11.25 | 1.02  |
| 2.083    | 2.03  |       | 5.08    |         | 5.08  |       | 2.03  |
| 2.167    | 2.03  |       | 5.08    |         | 3.05  |       | 2.03  |
| 2.250    | 2.03  | 5.333 | 8.13    |         | 3.05  |       | 2.03  |
| 2.333    | 3.05  | 5.417 | 8.13    | 8.500   | 3.05  | 11.58 | 1.02  |
| 2.417    | 3.05  | 5.500 | 8.13    | 8.583   | 3.05  |       | 1.02  |
| 2.500    | 3.05  | 5.583 | 9.14    | 8.667   | 3.05  |       | 1.02  |
| 2.583    | 3.05  | 5.667 | 9.14    |         | 3.05  |       | 2.03  |
| 2.667    | 3.05  | 5.750 | 9.15    | 8.833   | 3.05  | 11.92 | 2.03  |
| 2.750    | 3.05  | 5.833 | 67.06   |         | 3.05  | 12.00 | 2.03  |
| 2.833    | 3.05  | 5.917 | 67.06   |         | 3.05  | 12.08 | 1.02  |
| 2.917    | 3.05  | 6.000 | 67.06   |         | 2.03  | 12.17 | 1.02  |
| 3.000    | 3.05  | 6.083 | 67.06   | 9.167   | 2.03  | 12.25 | 1.02  |
| 3.083    | 2.03  | 6.167 | 67.06   | 9.250   | 2.03  |       |       |
| nten.(mm | /hr)= | 67.06 | 4       | 16.22   |       |       |       |

Max.Eff.Inten.(mm/hr)= over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 5.00 6.02 (ii) 5.00 0.19 10.00 7.94 (ii) 10.00 0.13 \*TOTALS\* 0.104 (iii) 6.25 PEAK FLOW (cms)= TIME TO PEAK (hrs)= RUNOFF VOLUME (mm)= TOTAL RAINFALL (mm)= 0.09 0.01 6.25 6.25 74.42

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#### LangstaffRd\_EA\_Proposed\_WestDonWatershd

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0470)| | 1 + 2 = 3 | QPEAK (cms) 0.100 0.104 ΔRFΔ (hrs) 6.25 6.25 ID1= 1 ( 0215): + ID2= 2 ( 0220): 61.28 0.65 ID = 3 ( 0470): 1.23 0.204 6.25 63.60

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR( 0535)| IN= 2---> OUT= 1 | DT= 5.0 min | OVERFLOW IS OFF OUTFLOW STORAGE OUTFLOW STORAGE STORAGE (ha.m.) 0.0000 0.0048 0.0154 0.0261 STORAGE (ha.m.) 0.0367 0.0474 0.0639 0.0000 (cms) 0.0000 0.0053 0.0080 0.0100 (cms) 0.0116 0.0116 0.0131 0.0202 0.0000 TPEAK AREA QPEAK (hrs) 6.25 7.58 (ha) 1.230 (cms) INFLOW : ID= 2 ( 0470) OUTFLOW: ID= 1 ( 0535) 0.204 63.60

CAL TB | STANDHYD ( 0225)| |ID= 1 DT= 5.0 min | Area (ha)= 0.60 Total Imp(%)= 83.00 Dir. Conn.(%)= 83.00 PERVIOUS (i) IMPERVIOUS Surface Area 0.50 2.00 1.00 0.10 5.00 Dep. Storage Average Slope Length Mannings n (mm) = (%) = (m) = 2.00 320.00 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

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 $\label{eq:loss_loss} \begin{array}{lll} & LangstaffRd\_EA\_Proposed\_WestDonWatershd \\ RUNOFF \ COEFFICIENT & = \ 0.97 & 0.53 & 0.9 \\ \end{array}$ 

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
- (1) CN\* = 83.0 Ia = Dep. Storage (Above)
  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
  THAN THE STORAGE COEFFICIENT.
  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB | | STANDHYD ( 0230) | |ID= 1 DT= 5.0 min | Area (ha)= 0.70 Total Imp(%)= 66.00 Dir. Conn.(%)= 66.00

PERVIOUS (i) 0.24 5.00 2.00 IMPERVIOUS Surface Area 0.46 2.00 (mm)= (%)= (m)= Dep. Storage Average Slope 1.00 Length Mannings n 320.00 25.00 0.013 0.300

1 02

2.03

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TRANSFORMED HYETOGRAPH TIME RAIN TIME RAIN | TIME RAIN | TIME RAIN mm/hr hrs mm/hr hrs mm/hr mm/hr 3.167 3.250 3.333 3.417 3.500 3.583 6.250 6.333 6.417 6.500 6.583 6.667 0.083 0.167 0.250 0.333 0.417 0.00 0.00 0.00 1.02 67.05 | 13.21 | 13.21 | 13.21 | 9.33 9.42 9.50 9.58 3.05 3.05 3.05 2.03 1.02 3.05 13.21 9.67 9.75 2.03 0.500 1.02 3.05 13.21 2.03 0.583 2.03 3.667 3.750 3.05 6.750 6.833 13.21 9.83 2.03 0.667 2.03 3.05 6.10 2.03 6.833 6.917 7.000 7.083 7.167 7.250 7.333 7.417 0.750 0.833 0.917 1.000 1.083 2.03 1.02 1.02 1.02 2.03 3.833 3.917 4.000 4.083 4.167 3.05 3.05 3.05 3.05 3.05 6.10 6.10 6.10 6.10 10.00 10.08 10.17 10.25 10.33 2.03 2.03 2.03 2.03 3.05 6.10 2.03 1.167 2.03 4.250 3.05 5.08 10.42 2.03 1.250 2.03 5.08 5.08 10.50 2.03 4.533 4.417 4.500 4.583 4.667 4.750 4.833 7.500 7.583 7.667 7.750 7.833 7.917 1.333 1.02 5.08 5.08 10.58 1.02 1.417 1.500 1.583 1.667 1.750 1.02 1.02 2.03 2.03 2.03 5.08 5.08 5.08 5.08 10.67 10.75 10.83 10.92 1.02 1.02 2.03 2.03 4.06 6.10 11.00 2.03 8.000 8.083 8.167 8.250 4.917 5.000 5.083 5.167 1.833 1.02 6.10 4.06 11.08 1.02 1.917 1.02 6.10 5.08 11.17 1.02

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11.33

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LangstaffRd_EA_Proposed_WestDonWatershd
2.03 | 5.250 | 5.08 | 8.333 | 3.05 | 1
2.03 | 5.333 | 8.13 | 8.417 | 3.05 | 1
3.05 | 5.417 | 8.13 | 8.590 | 3.05 | 1
3.05 | 5.500 | 8.13 | 8.583 | 3.05 | 1
3.05 | 5.567 | 9.14 | 8.667 | 3.05 | 1
3.05 | 5.667 | 9.14 | 8.750 | 3.05 | 1
3.05 | 5.667 | 9.15 | 8.833 | 3.05 | 1
3.05 | 5.333 | 67.06 | 8.917 | 3.05 | 1
3.05 | 5.333 | 67.06 | 9.083 | 2.03 | 1
3.05 | 5.000 | 67.06 | 9.083 | 2.03 | 1
3.05 | 6.083 | 67.06 | 9.167 | 2.03 | 1
2.03 | 6.167 | 67.06 | 9.250 | 2.03 |
                                      2.167
                                                                                                                                                   3.05 | 11.42
3.05 | 11.50
                                       2.250
                                                                                                                                                                                              2.03
                                      2.333
2.417
2.500
2.583
                                                                                                                                                                                             1.02
1.02
1.02
2.03
2.03
                                                                                                                                                                      11.58
                                       2.667
                                                                                                                                                                      11.92
                                       2.750
                                                                                                                                                                      12.00
                                                                                                                                                                                              2.03
                                       2.833
                                                                                                                                                                     12.08
                                                                                                                                                                                              1.02
                                       2.917
                                                                                                                                                                                              1.02
                                                                                                                                                                    12.25
         Max.Eff.Inten.(mm/hr)=
         over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                                                     5.00 15.00
6.02 (ii) 14.30 (ii)
                                                                                     5.00
0.19
                                                                                                                      15.00
                                                                                                                        0.08
                                                                                                                                                         *TOTALS*
         PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                                                    0.09
6.25
72.42
74.42
                                                                                                                      0.02
6.33
37.36
                                                                                                                                                              0.106 (iii)
6.25
60.49
                                                                                                                       74.42
                                                                                      0.97
                                                                                                                                                                 0.81
         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN* = 81.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COFFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
DD HYD ( 0475)

1 + 2 = 3 |

ID1= 1 ( 0225):

+ ID2= 2 ( 0230):
                                                                         (ha)
0.60
                                                                                                                      (hrs)
6.25
                                                                                                                                           (mm)
66.85
                                                                                           (cms)
0.104
                                                                         0.70
                                                                                            0.106
                                                                                                                      6.25
                                                                                                                                            60.49
            ID = 3 ( 0475):
                                                                 1.30 0.210
                                                                                                                     6.25
                                                                                                                                           63.42
         NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
RESERVOIR( 0540)
                                                             OVERFLOW IS OFF
```

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OUTFLOW

(cms) 0.0271 0.0306 0.0415

STORAGE

STORAGE

(ha.m.) 0.0000 0.0048 0.0154

IN= 2---> OUT= 1 | DT= 5.0 min |

OUTFLOW

(cms) 0.0000

0.0184

|   |          |                             |       | sed_WestDon             |      |                  |      |
|---|----------|-----------------------------|-------|-------------------------|------|------------------|------|
| 1.000                                     | 1.02     | 4.083                       | 3.05  | 7.167                   |      | 10.25            | 2.03 |
| 1.083                                     | 2.03     | 4.167                       | 3.05  | 7.250                   |      | 10.33            | 2.03 |
| 1.167                                     | 2.03     | 4.250                       | 3.05  | 7.333                   |      | 10.42            | 2.03 |
| 1.250                                     |          | 4.333                       |       |                         |      | 10.50            | 2.03 |
| 1.333                                     | 1.02     | 4.417                       |       | 7.500                   |      | 10.58            | 1.02 |
| 1.417                                     | 1.02     | 4.500                       | 5.08  | 7.583<br>7.667<br>7.750 | 4.06 | 10.67            | 1.02 |
| 1.500                                     | 1.02     | 4.583                       | 5.08  | 7.667                   | 4.06 | 10.75            | 1.02 |
|   |          |                             |       |                         |      | 10.83            | 2.03 |
| 1.667                                     |          | 4.750                       |       | 7.833                   |      | 10.92            | 2.03 |
| 1.750                                     | 2.03     | 4.833                       | 6.10  | 7.917                   |      | 11.00            | 2.03 |
| 1.833                                     | 1.02     | 4.91/                       | 6.10  | 8.000                   |      | 11.08            | 1.02 |
| 1.91/                                     | 1.02     | 4.917<br>  5.000<br>  5.083 | 6.10  | 8.083<br>8.167          |      | 11.17            | 1.02 |
|   |          |                             |       |                         |      | 11.25            | 1.02 |
| 2.083                                     |          | 5.167                       |       | 8.250                   |      | 11.33            | 2.03 |
| 2.167                                     |          | 5.250                       |       | 8.333                   | 3.05 | 11.42<br>  11.50 | 2.03 |
| 2.250                                     | 2.03     | 5.333<br>5.417<br>5.500     | 8.13  | 8.417<br>8.500<br>8.583 | 3.05 | 11.50            | 2.03 |
| 2.333                                     | 3.05     | 5.41/                       | 8.13  | 8.500                   | 3.05 | 11.58            | 1.02 |
|   |          |                             |       |                         |      | 11.67            | 1.02 |
|   |          | 5.583                       |       | 8.667                   |      | 11.75            | 1.02 |
| 2.583                                     |          | 5.667                       |       | 8.750                   | 3.05 | 11.83<br>  11.92 | 2.03 |
| 2.667                                     | 3.05     | 5./50                       | 9.15  | 8.833                   | 3.05 | 11.92            | 2.03 |
| 2.750                                     | 3.05     | 5.833                       | 67.06 | 8.833<br>8.917<br>9.000 | 3.05 | 12.00            | 2.03 |
|   |          |                             |       |                         |      | 12.08            | 1.02 |
|   |          |                             |       | 9.083                   |      | 12.17            | 1.02 |
| 3.000                                     | 3.05     | 6.083                       | 67.06 | 9.167                   |      | 12.25            | 1.02 |
| 3.083                                     | 2.03     | 6.16/                       | 67.06 | 9.250                   | 2.03 | l                |      |
| Max.Eff.Inten.(mm/                        |          |                             |       | 51.67                   |      |                  |      |
| over (m                                   |          | 5.00                        |       | 10.00                   |      |                  |      |
| Storage Coeff. (mi<br>Unit Hyd. Tpeak (mi | in)=     | 5.32<br>5.00                | (ii)  | 7.74 (ii)               |      |                  |      |
|   |          | 5.00                        |       | 10.00                   |      |                  |      |
| Unit Hyd. peak (cr                        | ns)=     | 0.21                        |       | 0.13                    |      |                  |      |
|   |          |                             |       |                         |      | TALS*            |      |
|   | ns)=     | 0.10                        |       | 0.01                    |      | .102 (iii)       |      |
|   | `s)=     | 6.25                        |       | 6.25                    |      | 5.25             |      |
|   | nm)=     | 72.42                       |       | 44.88                   |      | 0.49             |      |
|   | nm)=     | 74.42                       |       | 74.42                   |      | 4.42             |      |
| RUNOFF COEFFICIENT                        | =        | 0.97                        |       | 0.60                    | •    | 0.95             |      |
|   |          |                             |       |                         |      |                  |      |
| (i) CN PROCEDURE                          |          |                             |       |                         |      |                  |      |
| CN* = 87.6                                |          |                             |       | (Above)                 |      |                  |      |
| (ii) TIME STEP (DI                        |          |                             |       | LQUAL                   |      |                  |      |
| THAN THE STOR                             | KAGE COI | ELLICIEN1                   | Γ.    |                         |      |                  |      |

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

STANDHYD ( 0160) Area (ha)= 0.43 Total Imp(%)= 95.00 Dir. Conn.(%)= 95.00

IMPERVIOUS PERVIOUS (i)

ID= 1 DT= 5.0 min

LangstaffRd\_EA\_Proposed\_WestDonWatershd 0.0232 0.0261 | 0.0000 0.6 0.0000

ARFA OPFAK (cms) 0.210 0.029 (mm) 63.42 63.35 INFLOW : ID= 2 ( 0475) OUTFLOW: ID= 1 ( 0540)

| ADD HYD ( 0480)| | 1 + 2 = 3 | AREA OPEAK (ha) (cms) 0.015 (hrs) 7.58 (mm) 63.42 ID1= 1 ( 0535): + ID2= 2 ( 0540): 1.30 0.029 6.92 63.35 ID = 3 ( 0480): 2.53 0.044 7.25 63.38

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALTR | CALIB | STANDHYD ( 0155) |ID= 1 DT= 5.0 min | Area (ha)= 0.56 Total Imp(%)= 93.00 Dir. Conn.(%)= 93.00

PERVIOUS (i) Surface Area 0.52 2.00 0.04 5.00 Dep. Storage Average Slope Length Mannings n (mm)= (%)= (m)= 1.00 2.00 0.013 0.290

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TRANSFORMED HYETOGRAPH FORNED IT. TOME
M/hr | ' hrs
2.03 | 6.250
2.03 | 6.333
3.05 | 6.417
3.05 | 6.500
3.05 | 6.583
3.05 | 6.750
3.05 | 6.833
3.05 | 6.750
3.05 | 6.833
3.05 | 6.770
3.05 | 7.000
3.05 | 7.000 RAIN | TIME mm/hr | hrs 67.05 | 9.33 TIME RAIN | TIME RAIN 0.083 0.167 0.250 0.333 0.417 mm/hr 0.00 0.00 0.00 1.02 hrs 3.167 3.250 3.333 3.417 3.500 9.33 9.42 9.50 9.58 9.67 mm/hr mm/hi 3.05 3.05 3.05 2.03 13.21 1.02 13.21 2.03 9.75 9.83 9.92 10.00 10.08 0.500 0.583 1.02 3.583 13.21 2.03 2.03 3.667 13.21 2.03 2.03 2.03 1.02 1.02 3.750 3.833 3.917 4.000 6.10 | 6.10 | 6.10 | 6.10 | 2.03 2.03 2.03 2.03 2.03 0.667 0.750

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LangstaffRd\_EA\_Proposed\_WestDonWatershd
)= 0.41 0.02
)= 2.00 5.00
)= 1.00 2.00 (ha)= (mm)= (%)= (m)= Dep. Storage Average Slope Length Mannings n 260.00 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

RAIN | TIME RAIN | TIME RAIN | TIME mm/hr hrs mm/hr hrs mm/hr İ mm/hr 6.250 6.333 6.417 6.500 6.583 6.667 6.750 6.833 0.083 0.167 0.250 0.333 0.417 2.03 2.03 3.05 3.05 3.05 3.05 67.05 | 13.21 | 3.05 3.05 3.05 2.03 2.03 0.00 3.167 0.00 1.02 1.02 1.02 3.250 3.333 3.417 3.500 3.583 13.21 13.21 13.21 13.21 13.21 2.03 3.667 3.750 3.05 13.21 9.83 2.03 2.03 3.05 2.03 2.03

0.500 0.583 6.10 6.10 6.10 6.10 6.10 6.10 5.08 0.667 0.667 0.750 0.833 0.917 1.000 1.083 1.167 2.03 1.02 1.02 1.02 2.03 2.03 3.05 3.05 3.05 3.05 3.05 3.05 3.05 6.833 6.917 7.000 7.083 7.167 7.250 7.333 7.417 10.00 10.08 10.17 10.25 10.33 3.833 3.917 4.000 4.083 4.167 4.250 4.333 4.417 4.500 4.583 4.667 4.750 4.833 2.03 2.03 2.03 2.03 10.42 2.03 1.250 2.03 5.08 5.08 5.08 10.50 2.03 1.333 1.02 5.08 7.500 7.583 7.667 7.750 7.833 7.917 8.000 8.083 8.167 10.58 1.02 1.417 1.500 1.583 1.667 1.750 1.02 1.02 2.03 2.03 5.08 5.08 5.08 5.08 4.06 4.06 4.06 4.06 4.06 10.67 10.75 10.83 10.92 1.02 1.02 2.03 2.03 2.03 6.10 11.00 2.03 4.917 1.833 1.02 6.10 4.06 11.08 1.02 1.917 1.02 5.000 6.10 5.08 5.08 11.17 1.02 5.08 | 8.167 5.08 | 8.250 5.08 | 8.333 8.13 | 8.417 8.13 | 8.500 8.13 | 8.583 9.14 | 8.650 9.15 | 8.833 67.06 | 9.000 67.06 | 9.000 67.06 | 9.000 67.06 | 9.167 67.06 | 9.250 2.000 1.02 5.08 11.25 1.02 2.03 2.03 2.03 2.03 3.05 3.05 3.05 5.083 5.167 5.250 5.333 5.417 5.500 5.583 2.083 2.167 2.250 2.333 2.417 5.08 3.05 3.05 3.05 2.03 2.03 2.03 1.02 1.02 11.33 3.05 11.67 2.500 3.05 11.75 1.02 2.583 3.05 5.667 3.05 11.83 2.03 2.667 3.05 5.750 5.833 5.917 6.000 6.083 3.05 11.92 2.03 3.05 | 3.05 | 3.05 | 3.05 | 2.03 | 3.05 | 3.05 | 2.03 | 2.03 | 2.03 | 12.00 12.08 12.17 12.25 2.03 1.02 1.02 1.02 2.750

67.06 Max.Eff.Inten.(mm/hr)= 54.54 over (min) Storage Coeff. (min)= 5.00 10.00 5.32 (ii) 7.00 (ii)

6.167

2.833 2.917 3.000

3.083

#### ${\tt LangstaffRd\_EA\_Proposed\_WestDonWatershd}$ Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)= 5.00 0.21 0.14 \*TOTALS\* PEAK FLOW (cms)= TIME TO PEAK (hrs)= RUNOFF VOLUME (mm)= TOTAL RAINFALL (mm)= RUNOFF COEFFICIENT = 0.08 6.25 72.42 74.42 0.00 6.25 47.80 74.42 0.079 (iii) 6.25 71.18 74.42 0.97 0.64 0.96

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 89.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COEFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD ( 0430)| 1 + 2 = 3 | TD1= 1 ( 0155): + ID2= 2 ( 0160): AREA QPEAK (ha) (cms) 0.56 0.102 TPEAK (hrs) 6.25 R.V. (mm) 70.49 (ha) 0.56 0.43 6.25 71.18 0.079 ID = 3 ( 0430): 0.99 0.181 6.25 70.79

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

Area (ha)= 3.81 Total Imp(%)= 95.00 Dir. Conn.(%)= 95.00 IMPERVIOUS 3.62 2.00 1.00 PERVIOUS (i) 0.19 5.00 2.00 Surface Area Dep. Storage Average Slope (ha)= (mm)= (%)= (m)= Length Mannings n 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TRANSFORMED HYETOGRAPH ---ME RAIN ' TIME RAIN | TIME
rs mm/hr | hrs mm/hr | hrs
67 2.03 | 6.250 | 67.05 | 9.33
50 2.03 | 6.333 | 13.21 | 9.42
313 3.05 | 6.417 | 13.21 | 9.58
107 3.05 | 6.583 | 13.21 | 9.58
108 3.05 | 6.583 | 13.21 | 9.75 RAIN | TIME TIME hrs 0.083 0.167 0.250 0.333 0.417 0.500 mm/hr 0.00 0.00 hrs 3.167 3.250 mm/hr 3.05 3.05 0.00 | 3.333 1.02 | 3.417 1.02 | 3.500 1.02 | 3.583 3.05 2.03 2.03 2.03

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 ${\tt LangstaffRd\_EA\_Proposed\_WestDonWatershd}$ 

| RESERVOIR( 0515) <br>  IN= 2> OUT= 1 | OVERFLO          | W IS OFF   |               |                 |
|--------------------------------------|------------------|------------|---------------|-----------------|
| DT= 5.0 min                          | OUTFLOW<br>(cms) | (ha.m.)    | OUTFLOW (cms) | STORAGE (ha.m.) |
|                                      | 0.0000           | 0.0000     | 0.0091        | 0.1797          |
|                                      | 0.0013           | 0.0157     | 0.0095        | 0.2004          |
|                                      | 0.0033           | 0.0320     | 0.0100        | 0.2216          |
|                                      | 0.0044           | 0.0487     | 0.0104        | 0.2433          |
|                                      | 0.0053           | 0.0659     | 0.0109        | 0.2655          |
|                                      | 0.0061           | 0.0837     | 0.0113        | 0.2882          |
|                                      | 0.0068           | 0.1019     | 0.0116        | 0.3114          |
|                                      | 0.0074           | 0.1206     | 0.1520        | 0.3592          |
|                                      | 0.0080           | 0.1398     | 0.5654        | 0.4336          |
|                                      | 0.0086           | 0.1595     | 1.1316        | 0.5100          |
|                                      |                  | AREA QPEA  | K TPEAK       | R.V.            |
|                                      |                  | (ha) (cms) | ) (hrs)       | (mm)            |
| INFLOW : ID= 2 (                     |                  | 3.810 0.   | 700 6.25      | 71.12           |
| OUTFLOW: ID= 1 (                     | 0515)            | 3.810 0.6  | 010 12.25     | 70.16           |

PEAK FLOW REDUCTION [Qout/Qin](%)= 1.49
TIME SHIFT OF PEAK FLOW (min)=360.00
MAXIMUM STORAGE USED (ha.m.)= 0.2448

ADD HYD ( 0440)| 1 + 2 = 3 | ID1= 1 ( 0430): + ID2= 2 ( 0515): AREA (ha) 0.99 3.81 QPEAK (cms) 0.181 0.010 TPEAK (hrs) 6.25 12.25 R.V. (mm) 70.79 70.16 ID = 3 ( 0440): 4.80 0.189 6.25 70.29

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB<br>  STANDHYD ( 0210) <br> ID= 1 DT= 5.0 min | Area<br>Total | (ha)= 0.96<br>Imp(%)= 78.00 | Dir. Conn.(%)= | 78.00 |
|--|---------------|-----------------------------|----------------|-------|
|  |               | IMPERVIOUS                  | PERVIOUS (i)   |       |
| Surface Area                                       | (ha)=         | 0.75                        | 0.21           |       |
| Dep. Storage                                       | (mm)=         | 2.00                        | 5.00           |       |
| Average Slope                                      | (%)=          | 1.00                        | 2.00           |       |
| Length   | (m)=          | 470.00                      | 20.00          |       |
| Mannings n   | =             | 0.013                       | 0.250          |       |
|  |               |                             |                |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|                    | Langs | taffRd F | Δ Prono | sed WestDo | nWaters | hd        |      |
|--------------------|-------|----------|---------|------------|---------|-----------|------|
| 0.583              |       | 3.667    |         | 6.750      | 13.21   |           | 2.03 |
| 0.667              | 2.03  |          | 3.05    |            | 6.10    |           | 2.03 |
| 0.750              | 2.03  |          | 3.05    |            | 6.10    |           | 2.03 |
| 0.833              |       | 3.917    |         | 7.000      | 6.10    |           | 2.03 |
| 0.917              |       | 4.000    |         | 7.083      | 6.10    |           | 2.03 |
| 1.000              | 1.02  | 4.083    | 3.05    | 7.167      | 6.10    | 10.25     | 2.03 |
| 1.083              |       | 4.167    |         | 7.250      | 6.10    |           | 2.03 |
| 1.167              |       | 4.250    |         | 7.333      | 5.08    |           | 2.03 |
| 1.250              | 2.03  | 4.333    | 5.08    | 7.417      | 5.08    | 10.50     | 2.03 |
| 1.333              | 1.02  | 4.417    | 5.08    | 7.500      | 5.08    | 10.58     | 1.02 |
| 1.417              | 1.02  | 4.500    | 5.08    | 7.583      | 4.06    | 10.67     | 1.02 |
| 1.500              | 1.02  | 4.583    | 5.08    | 7.667      | 4.06    | 10.75     | 1.02 |
| 1.583              | 2.03  | 4.667    | 5.08    | 7.750      | 4.06    | 10.83     | 2.03 |
| 1.667              | 2.03  | 4.750    | 5.08    | 7.833      | 4.06    | 10.92     | 2.03 |
| 1.750              | 2.03  | 4.833    | 6.10    | 7.917      | 4.06    |           | 2.03 |
| 1.833              |       | 4.917    |         | 8.000      | 4.06    |           | 1.02 |
| 1.917              |       | 5.000    |         | 8.083      | 5.08    |           | 1.02 |
| 2.000              |       | 5.083    |         | 8.167      |         |           | 1.02 |
| 2.083              |       | 5.167    |         | 8.250      | 5.08    |           | 2.03 |
| 2.167              | 2.03  | 5.250    |         | 8.333      | 3.05    |           | 2.03 |
| 2.250              | 2.03  |          | 8.13    |            |         |           | 2.03 |
| 2.333              |       | 5.417    |         | 8.500      | 3.05    |           | 1.02 |
| 2.417              |       | 5.500    |         | 8.583      | 3.05    |           | 1.02 |
| 2.500              |       | 5.583    | 9.14    |            |         |           | 1.02 |
| 2.583              |       | 5.667    |         | 8.750      | 3.05    |           | 2.03 |
| 2.667              |       | 5.750    |         | 8.833      |         | 11.92     | 2.03 |
| 2.750              | 3.05  |          |         | 8.917      |         |           | 2.03 |
| 2.833              |       | 5.917    |         | 9.000      | 3.05    |           | 1.02 |
| 2.917              |       | 6.000    |         | 9.083      |         | 12.17     | 1.02 |
| 3.000              |       | 6.083    |         |            |         |           | 1.02 |
| 3.083              | 2.03  | 6.167    | 67.06   | 9.250      | 2.03    | l         |      |
| Max.Eff.Inten.(mm, |       | 67.06    |         | 53.10      |         |           |      |
| over (r            |       | 5.00     |         | 10.00      |         |           |      |
|                    | nin)= | 3.82     | (ii)    | 6.37 (ii   | )       |           |      |
| Unit Hyd. Tpeak (r |       | 5.00     |         | 10.00      |         |           |      |
| Unit Hyd. peak (   | cms)= | 0.25     |         | 0.15       |         |           |      |
|                    |       |          |         |            |         | TALS*     |      |
|                    | cms)= | 0.67     |         | 0.03       |         | .700 (iii | )    |
|                    | nrs)= | 6.25     |         | 6.25       |         | 5.25      |      |
|                    | (mm)= | 72.42    |         | 46.31      |         | 1.12      |      |
|                    | (mm)= | 74.42    |         | 74.42      |         | 4.42      |      |
| RUNOFF COEFFICIEN  | Γ =   | 0.97     |         | 0.62       | (       | 9.96      |      |

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
- CN\* = 88.0 Ia = Dep. Storage (Above)
  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
  THAN THE STORAGE COEFFICIENT.
  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| LangstaffRd EA Proposed   MestDom    LangstaffRd   EA Proposed   MestDom    LangstaffRd   Langstaf   |                   |       |          |          |           |         |       |       |
|--|-------------------|-------|----------|----------|-----------|---------|-------|-------|
| TIME   |                   | Langs | taffRd E | A Propos | ed WestDo | nWaters | hd    |       |
| hrs mm/hr hrs mm/hr c 1. hrs mm/hr hrs hrs mm/hr hrs hrs mm/hr hrs hrs mm/hr hrs hrs mm/hr hrs hrs mm/hr hrs hrs mm/hr hrs hrs mm/hr hrs hrs mm/hr hrs hrs mm/hr hrs hrs mm/hr hrs hrs mm/hr hrs hrs hrs hrs hrs hrs hrs hrs hrs h   |                   |       | TR       | ANSFORME | D HYETOGR | APH     | -     |       |
| 0.083 0.00   3.167   2.03   6.250   67.05   9.33   3.05   0.167 0.00   3.250   2.03   6.333   13.21   9.42   3.05   0.250   0.00   3.333   3.05   6.417   13.21   9.50   3.05   0.333   1.02   3.417   3.05   6.580   13.21   9.67   2.03   0.500   1.02   3.583   3.05   6.658   13.21   9.67   2.03   0.500   1.02   3.583   3.05   6.658   13.21   9.67   2.03   0.667   2.03   3.667   3.05   6.675   13.21   9.75   2.03   0.667   2.03   3.353   3.05   6.667   13.21   9.83   2.03   0.667   2.03   3.3750   3.05   6.691   6.10   9.92   2.03   0.667   2.03   3.3750   3.05   6.917   6.10   10.08   2.03   0.917   1.02   4.083   3.05   7.080   6.17   6.10   10.08   2.03   1.000   1.02   4.083   3.05   7.167   6.10   10.02   2.03   1.000   1.02   4.083   3.05   7.167   6.10   10.25   2.03   1.167   2.03   4.250   3.05   7.333   5.08   10.42   2.03   1.167   2.03   4.250   3.05   7.590   5.08   10.58   1.02   1.133   1.02   4.407   3.05   7.590   5.08   10.58   1.02   1.1417   1.02   4.500   5.08   7.583   4.06   10.67   1.02   1.583   2.03   4.667   5.08   7.758   4.06   10.83   2.03   1.590   1.02   4.458   5.08   7.750   4.06   10.72   1.02   1.590   1.02   4.458   5.08   7.750   4.06   10.83   2.03   1.750   2.03   4.735   5.08   7.750   4.06   10.83   2.03   1.750   2.03   4.735   5.08   7.583   4.06   10.67   1.02   1.917   1.02   5.000   5.08   7.750   4.06   10.83   2.03   1.750   2.03   4.735   5.08   7.573   4.06   10.02   2.03   1.750   2.03   4.735   5.08   7.583   4.06   10.05   1.02   1.917   1.02   5.000   6.10   8.003   5.08   11.17   1.02   2.003   3.05   5.583   9.14   8.667   3.05   11.58   2.03   2.167   2.03   5.585   5.00   8.18   8.833   5.05   11.55   1.02   2.083   3.05   5.580   9.14   8.667   3.05   11.59   2.03   2.250   2.03   5.533   8.13   8.417   3.05   11.55   1.02   2.250   3.05   5.583   9.14   8.667   3.05   11.59   2.03   2.250   3.05   5.583   9.14   8.667   3.05   11.59   2.03   2.250   3.05   5.580   6.08   6.08   6.09   6.00   3.05   11.50   2.283   3.05   5.66   6.08   6.06   6.06   9.00  | TIME              | RAIN  | TIME     | RAIN     | ' TIME    | RAIN    | TIME  | RAIN  |
| 0.167   0.00   3.250   2.03   6.333   13.21   9.58   2.03     0.250   0.00   3.333   3.05   6.500   13.21   9.58   2.03     0.417   1.02   3.500   3.05   6.583   13.21   9.58   2.03     0.417   1.02   3.500   3.05   6.583   13.21   9.56   2.03     0.583   2.03   3.667   3.05   6.667   13.21   9.56   2.03     0.583   2.03   3.667   3.05   6.750   13.21   9.56   2.03     0.583   2.03   3.667   3.05   6.750   13.21   9.58   2.03     0.750   2.03   3.750   3.05   6.6750   13.21   9.58   2.03     0.750   2.03   3.750   3.05   6.6750   13.21   9.58   2.03     0.750   2.03   3.833   3.05   6.917   6.10   10.00   2.03     0.833   1.02   3.917   3.05   7.000   6.10   10.00   2.03     0.917   1.02   4.000   3.05   7.083   6.10   10.17   2.03     1.000   1.02   4.083   3.05   7.167   6.10   10.25   2.03     1.167   2.03   4.250   3.05   7.333   5.08   10.42   2.03     1.150   2.03   4.353   5.08   7.417   5.08   10.58   2.03     1.333   1.02   4.417   3.05   7.500   5.08   10.58   1.02     1.417   1.02   4.500   5.08   7.5758   4.06   10.67   1.02     1.500   1.02   4.533   5.08   7.417   5.08   10.58   1.02     1.533   2.03   4.467   5.08   7.667   4.06   10.075   1.02     1.533   2.03   4.457   5.08   7.750   4.06   10.075   1.02     1.533   1.02   4.475   5.08   7.750   4.06   10.075   1.02     1.533   1.02   4.475   5.08   7.667   4.06   10.075   1.02     1.533   1.02   4.475   5.08   7.633   4.06   10.075   1.02     1.667   2.03   4.458   5.08   7.667   4.06   10.075   1.02     1.670   2.03   4.450   5.08   7.833   4.06   10.075   1.02     1.200   1.02   5.083   5.08   7.833   4.06   10.075   1.02     1.200   1.02   5.083   5.08   7.667   4.06   10.09   2.03     1.667   2.03   4.750   5.08   7.833   4.06   10.075   1.02     2.083   3.05   5.167   5.08   8.167   5.08   11.13   1.02     2.090   1.02   5.083   5.08   6.10   8.083   5.08   11.15   1.02     2.083   2.03   5.167   5.08   8.167   5.08   11.15   1.02     2.590   3.05   5.500   8.13   8.833   3.05   11.50   2.03     2.550   3.05   5.500   8.13   8.833   3.0   | hrs               | mm/hr | hrs      | mm/hr    | ' hrs     | mm/hr   | hrs   | mm/hr |
| 0.250 0.00 1.333 3.05 6.417 13.21 9.50 3.05 0.335 0.335 0.335 0.333 3.05 6.500 13.21 9.58 2.03 0.417 1.02 3.580 3.05 6.580 13.21 9.58 2.03 0.590 1.02 3.583 3.05 6.667 13.21 9.58 2.03 0.580 0.667 2.03 3.657 3.05 6.667 13.21 9.58 2.03 0.667 2.03 3.750 3.05 6.667 13.21 9.58 2.03 0.667 2.03 3.750 3.05 6.667 13.21 9.83 2.03 0.667 2.03 3.750 3.05 6.6917 6.10 19.00 2.03 0.833 1.02 3.917 3.05 7.000 6.10 19.00 2.03 0.833 1.02 3.917 3.05 7.000 6.10 19.00 2.03 0.833 1.02 3.917 3.05 7.000 6.10 19.00 2.03 0.833 1.02 3.917 3.05 7.000 6.10 19.00 2.03 1.000 1.02 4.000 3.05 7.000 6.10 19.00 2.03 1.000 1.02 4.003 3.05 7.167 6.10 19.00 2.03 1.000 1.02 4.003 3.05 7.167 6.10 19.00 2.03 1.000 1.02 4.003 3.05 7.167 6.10 19.02 2.03 1.167 2.03 4.250 3.05 7.167 6.10 19.02 2.03 1.167 2.03 4.250 3.05 7.167 6.10 19.05 2.03 1.167 2.03 4.250 3.05 7.167 6.10 19.05 2.03 1.167 2.03 4.250 3.05 7.500 5.08 19.04 2.03 1.167 2.03 4.250 3.05 7.500 5.08 19.05 2.03 1.333 1.02 4.417 5.08 7.500 5.08 19.58 19.58 1.02 1.333 1.02 4.417 5.08 7.500 5.08 19.05 | 0.083             | 0.00  | 3.167    | 2.03     | 6.250     | 67.05   | 9.33  | 3.05  |
| 0.333   1.02   3.417   3.05   6.500   13.21   9.58   2.03     0.500   1.02   3.583   3.05   6.653   13.21   9.67   2.03     0.583   2.03   3.667   3.05   6.750   13.21   9.67   2.03     0.667   2.03   3.750   3.05   6.750   13.21   9.67   2.03     0.750   2.03   3.750   3.05   6.750   13.21   9.67   2.03     0.750   2.03   3.750   3.05   6.633   6.10   9.92   2.03     0.750   2.03   3.833   3.05   6.917   6.10   10.00   2.03     0.917   1.02   4.000   3.05   7.000   6.10   10.08   2.03     0.917   1.02   4.000   3.05   7.000   6.10   10.17   2.03     1.000   1.02   4.033   3.05   7.167   6.10   10.25   2.03     1.167   2.03   4.250   3.05   7.250   6.10   10.13   2.03     1.167   2.03   4.250   3.05   7.250   6.10   10.33   2.03     1.250   2.03   4.333   5.08   7.417   5.08   10.50   2.03     1.333   1.02   4.417   5.08   7.500   5.08   10.52   2.03     1.417   1.02   4.500   5.08   7.580   5.08   10.52   1.02     1.500   1.02   4.533   5.08   7.583   4.06   10.67   1.02     1.583   2.03   4.667   5.08   7.750   4.06   10.075   1.02     1.667   2.03   4.750   5.08   7.750   4.06   10.02   2.03     1.667   2.03   4.450   5.08   7.750   4.06   10.02   2.03     1.833   1.02   4.417   5.08   7.833   4.06   10.92   2.03     1.667   2.03   4.750   5.08   7.750   4.06   10.02   2.03     1.833   1.02   4.917   5.08   7.917   4.06   10.02   2.03     1.833   1.02   4.917   5.08   8.250   5.08   11.15   1.02     2.000   1.02   5.083   5.08   8.167   5.08   11.15   1.02     2.000   1.02   5.083   5.167   5.08   8.167   5.08   11.15   1.02     2.000   1.02   5.083   5.333   8.13   8.417   3.05   11.50   2.03     2.167   2.03   5.550   5.83   6.10   9.000   3.05   11.50   2.03     2.550   3.05   5.560   9.18   8.250   5.08   11.33   2.03     2.570   3.05   5.667   9.14   8.750   3.05   11.50   2.03     2.583   3.05   5.667   9.14   8.750   3.05   11.50   2.03     2.590   3.05   6.000   67.06   9.003   3.05   11.02   2.03     2.750   3.05   5.833   67.06   9.000   3.05   11.02   2.03     2.750   3.05   5.833   67.06   9.00   | 0.167             | 0.00  | 3.250    | 2.03     | 6.333     | 13.21   | 9.42  | 3.05  |
| 0.417 1.02   3.500   3.05   6.583   13.21   9.67   2.03   0.500   1.02   3.583   3.05   6.667   3.21   9.75   2.03   0.583   2.03   3.667   3.05   6.750   13.21   9.75   2.03   0.667   2.03   3.750   3.05   6.750   13.21   9.78   0.750   2.03   3.833   3.05   6.917   6.10   10.00   2.03   0.833   1.02   3.917   3.05   7.000   6.10   10.00   2.03   0.833   1.02   3.917   3.05   7.000   6.10   10.00   2.03   1.000   1.02   4.000   3.05   7.167   6.10   10.25   2.03   1.000   1.02   4.003   3.05   7.167   6.10   10.25   2.03   1.001   1.02   3.05   3.05   7.167   6.10   10.25   2.03   1.167   2.03   4.167   3.05   7.250   6.10   10.32   2.03   1.167   2.03   4.250   3.05   7.167   6.10   10.25   2.03   1.167   2.03   4.250   3.05   7.733   5.08   10.42   2.03   1.133   1.02   4.417   5.08   7.500   5.08   10.58   1.02   1.590   1.02   4.583   5.08   7.583   4.06   10.67   1.02   1.590   1.02   4.583   5.08   7.667   4.06   10.75   1.02   1.590   1.02   4.583   5.08   7.750   4.06   10.83   2.03   1.750   2.03   4.833   6.10   7.917   4.06   11.00   2.03   1.750   2.03   4.750   5.08   7.590   4.06   10.83   2.03   1.750   2.03   4.750   5.08   7.833   4.06   10.97   1.02   2.000   1.02   5.000   6.10   8.083   5.08   11.17   1.02   2.03   1.917   1.02   5.000   6.10   8.083   5.08   11.17   1.02   2.03   2.167   2.03   5.550   5.08   8.833   5.08   11.17   1.02   2.03   2.250   2.03   5.333   8.18   8.417   3.05   11.58   1.02   2.2167   2.03   5.550   5.08   8.833   3.05   11.48   2.03   2.250   2.03   5.550   5.08   8.833   3.05   11.48   2.03   2.250   2.03   5.550   6.08   8.050   5.05   11.58   1.02   2.250   3.05   5.500   6.10   8.083   3.05   11.58   1.02   2.250   3.05   5.500   6.10   8.083   3.05   11.50   2.03   2.250   2.03   5.333   8.13   8.417   3.05   11.55   1.02   2.250   3.05   5.500   6.10   8.083   3.05   11.50   2.03   2.250   2.03   5.353   8.13   8.417   3.05   11.55   1.02   2.253   3.05   5.500   6.10   8.083   3.05   11.83   2.03   2.250   3.05   5.500   6.08   6.000   3.05   11.05   1. | 0.250             | 0.00  | 3.333    | 3.05     | 6.417     | 13.21   | 9.50  | 3.05  |
| 0.500 1.02   3.583   3.05   6.667   13.21   9.75   2.03   0.583   2.03   3.667   3.05   6.675   13.21   9.83   2.03   0.667   2.03   3.750   3.05   6.833   6.10   9.92   2.03   0.750   2.03   3.833   3.05   6.917   6.10   10.00   2.03   0.917   1.02   3.9317   3.05   7.080   6.10   10.00   2.03   0.917   1.02   4.080   3.05   7.083   6.10   10.17   2.03   1.080   1.02   4.080   3.05   7.700   6.10   10.03   2.03   1.083   2.03   4.167   3.05   7.250   6.10   10.13   2.03   1.167   2.03   4.250   3.05   7.250   6.10   10.33   2.03   1.250   2.03   4.333   5.00   7.417   5.08   10.50   2.03   1.333   1.02   4.417   5.08   7.590   5.08   10.50   2.03   1.590   1.02   4.583   5.08   7.667   4.06   10.67   1.02   1.583   2.03   4.667   5.08   7.750   4.06   10.67   1.02   1.583   2.03   4.667   5.08   7.750   4.06   10.75   1.02   1.667   2.03   4.750   5.08   7.750   4.06   10.87   1.02   1.667   2.03   4.457   5.08   7.750   4.06   10.92   2.03   1.667   2.03   4.450   5.08   7.750   4.06   10.92   2.03   1.633   1.02   4.4917   6.10   8.000   4.06   11.00   2.03   1.833   1.02   4.4917   6.10   8.000   4.06   11.00   2.03   1.833   1.02   5.083   5.08   7.617   5.08   11.50   2.03   1.833   1.02   5.083   5.08   8.167   5.08   11.15   1.02   2.000   1.02   5.083   5.08   8.167   5.08   11.15   1.02   2.000   1.02   5.083   5.08   8.167   5.08   11.15   1.02   2.000   1.02   5.083   5.333   8.13   8.417   3.05   11.50   2.03   2.167   2.03   5.550   5.08   8.333   3.05   11.42   2.03   2.250   2.03   5.550   5.08   8.333   3.05   11.42   2.03   2.250   2.03   5.550   5.83   6.06   9.083   2.05   11.58   2.03   2.503   3.05   5.560   9.14   8.750   3.05   11.50   2.03   2.504   3.05   5.583   67.06   9.14   8.750   3.05   11.50   2.03   2.507   3.05   5.583   67.06   9.14   8.750   3.05   11.50   2.03   2.509   3.05   5.833   67.06   9.16   8.833   5.05   11.50   2.03   2.500   3.05   6.000   67.06   9.083   2.03   12.17   1.02   2.500   3.05   5.833   67.06   9.16   8.833   3.05   11.42   2.03   2.500   3.05   6.0 | 0.333             | 1.02  | 3.417    | 3.05     | 6.500     | 13.21   | 9.58  | 2.03  |
| 0.583 2.03   3.667   3.05   6.750   13.21   9.83   2.03   8.667   2.03   3.750   3.05   6.833   6.10   9.92   2.03   0.750   2.03   3.833   3.05   6.917   6.10   10.00   2.03   0.833   1.02   3.917   3.055   7.080   6.10   10.08   2.03   0.833   1.02   3.917   3.055   7.080   6.10   10.08   2.03   0.833   1.02   4.083   3.05   7.167   6.10   10.25   2.03   1.080   1.02   4.083   3.05   7.167   6.10   10.25   2.03   1.080   1.02   4.083   3.05   7.167   6.10   10.25   2.03   1.167   2.03   4.157   3.05   7.7250   6.10   10.33   2.03   1.167   2.03   4.250   3.05   7.333   5.08   10.42   2.03   1.167   2.03   4.250   3.05   7.333   5.08   10.42   2.03   1.333   1.02   4.417   5.08   7.590   5.08   10.58   1.02   1.417   1.02   4.580   5.08   7.583   4.06   10.67   1.02   1.590   1.02   4.583   5.08   7.667   4.06   10.67   1.02   1.590   1.02   4.583   5.08   7.750   4.06   10.075   1.02   1.583   2.03   4.750   5.08   7.750   4.06   10.92   2.03   1.667   2.03   4.750   5.08   7.750   4.06   11.00   2.03   1.750   2.03   4.750   5.08   7.833   4.06   10.92   2.03   1.750   2.03   4.750   5.08   7.833   4.06   10.92   2.03   1.750   2.03   4.750   5.08   5.08   5.08   1.102   2.03   1.917   1.02   5.000   6.10   8.083   5.08   11.100   2.03   1.917   1.02   5.000   5.08   8.000   5.08   11.55   1.02   2.003   2.03   5.167   5.08   8.000   5.08   11.55   1.02   2.033   2.250   2.03   5.567   5.08   8.033   5.08   11.17   1.02   2.033   2.250   2.03   5.533   8.13   8.417   3.05   11.58   2.03   2.250   2.03   5.533   8.13   8.417   3.05   11.50   2.03   2.250   2.03   5.535   5.000   8.13   8.583   3.05   11.46   2.03   2.250   2.03   5.567   9.14   8.750   3.05   11.50   2.03   2.250   2.03   5.560   6.083   67.06   9.167   2.03   12.25   1.02   2.583   3.05   5.567   9.14   8.750   3.05   11.50   2.03   2.253   2.250   3.05   5.500   8.13   8.583   3.05   11.167   1.02   2.583   3.05   5.5750   9.15   8.833   3.05   11.167   1.02   2.583   3.05   5.5750   9.15   8.833   3.05   11.50   2.03   2.250   3.000   3.0  | 0.417             | 1.02  | 3.500    | 3.05     | 6.583     | 13.21   | 9.67  | 2.03  |
| 0.667 2.03   3.750 3.05   6.833   6.10   9.92 2.03   0.750 2.03   3.833   3.05   6.917   6.10   10.00 2.03   0.833   1.02   3.917   3.05   7.000   6.10   10.08   2.03   0.917   1.02   4.000   3.05   7.003   6.10   10.17   2.03   1.000   1.02   4.033   3.05   7.167   6.10   10.25   2.03   1.083   2.03   4.167   3.05   7.250   6.10   10.33   2.03   1.167   2.03   4.250   3.05   7.250   6.10   10.33   2.03   1.250   2.03   4.167   3.05   7.250   6.10   10.25   2.03   1.250   2.03   4.333   5.08   7.417   5.08   10.59   2.03   1.250   2.03   4.333   5.08   7.417   5.08   10.50   2.03   1.250   2.03   4.560   5.08   7.590   5.08   10.52   2.03   1.417   1.02   4.500   5.08   7.500   4.06   10.57   1.02   1.500   1.02   4.583   5.08   7.750   4.06   10.67   1.02   1.583   2.03   4.667   5.08   7.750   4.06   10.07   1.02   1.583   2.03   4.667   5.08   7.750   4.06   10.07   1.02   1.583   2.03   4.450   5.08   7.750   4.06   10.07   1.02   1.583   2.03   4.450   5.08   7.750   4.06   10.07   1.02   1.583   2.03   4.450   5.08   7.750   4.06   10.07   1.02   1.583   2.03   4.450   5.08   7.750   4.06   10.07   1.02   1.583   2.03   4.450   5.08   7.750   4.06   10.02   2.03   1.667   2.03   4.433   6.10   7.917   4.06   11.00   2.03   1.833   1.02   4.4917   6.10   8.000   4.06   11.08   1.02   2.000   1.02   5.083   5.080   8.167   5.08   11.12   1.02   2.000   1.02   5.083   5.080   8.167   5.08   11.12   1.02   2.000   1.02   5.083   5.250   5.08   8.250   5.08   11.13   2.03   2.167   2.03   5.157   5.00   8.167   5.08   1.50   11.50   2.583   3.05   5.560   9.14   8.750   3.05   11.50   2.03   2.590   3.05   5.560   9.13   8.833   3.05   11.50   2.03   2.590   3.05   5.583   67.06   8.917   3.05   11.50   2.03   2.590   3.05   5.833   67.06   9.167   2.03   12.17   1.02   2.500   3.05   6.000   67.06   9.003   2.05   11.50   2.667   3.05   5.530   67.06   9.167   2.03   12.17   1.02   2.500   3.05   6.000   67.06   9.003   2.05   11.58   1.02   2.533   3.05   5.667   9.14   8.833   3.05   11.150   2.03   2.750   | 0.500             | 1.02  | 3.583    | 3.05     | 6.667     | 13.21   | 9.75  | 2.03  |
| 0.750 2.03   3.833 3.05   6.917   6.10   10.00 2.03  | 0.583             | 2.03  | 3.667    | 3.05     | 6.750     | 13.21   | 9.83  | 2.03  |
| 0.833 1.02   3.917 3.05   7.000   6.10   10.08   2.03   1.000   1.02   4.000   3.05   7.167   6.10   10.17   2.03   1.000   1.02   4.008   3.05   7.167   6.10   10.17   2.03   1.003   1.003   2.03   4.167   3.05   7.250   6.10   10.25   2.03   1.083   2.03   4.167   3.05   7.250   6.10   10.25   2.03   1.250   2.03   4.250   3.05   7.250   6.10   10.25   2.03   1.250   2.03   4.333   5.08   7.417   5.08   10.50   2.03   1.250   2.03   4.333   5.08   7.417   5.08   10.50   2.03   1.250   2.03   4.333   5.08   7.500   5.08   10.58   10.20   1.417   1.02   4.500   5.08   7.583   4.06   10.67   1.02   1.583   2.03   4.667   5.08   7.750   4.06   10.75   1.02   1.583   2.03   4.667   5.08   7.750   4.06   10.75   1.02   1.583   2.03   4.667   5.08   7.750   4.06   10.75   1.02   1.583   1.02   4.417   1.02   5.000   6.10   8.000   4.06   11.00   2.03   1.667   2.03   4.917   6.10   8.000   4.06   11.00   2.03   1.833   1.02   4.917   6.10   8.000   4.06   11.08   1.02   2.000   1.02   5.003   5.08   8.167   5.08   8.167   5.08   11.17   1.02   2.000   6.10   8.000   4.06   11.00   2.03   2.03   2.167   2.03   5.500   5.08   8.167   5.08   11.125   1.02   2.000   2.167   2.03   5.550   5.08   8.167   5.08   11.125   1.02   2.050   2.03   2.167   2.03   5.550   5.00   8.333   3.05   11.42   2.03   2.250   2.03   5.560   5.00   8.333   3.05   11.58   1.02   2.583   3.05   5.500   5.08   8.833   3.05   11.58   1.02   2.583   3.05   5.500   5.08   8.833   3.05   11.58   1.02   2.03   2.550   3.05   5.583   67.06   8.917   3.05   11.50   2.03   2.550   2.603   3.05   5.583   67.06   8.917   3.05   11.50   2.03   2.550   2.603   3.05   5.583   67.06   8.917   3.05   11.50   2.03   2.550   2.603   2.550   3.05   5.583   67.06   8.917   3.05   11.50   11.02   2.03   2.550   3.05   5.583   67.06   8.917   3.05   11.50   1.02   2.03   2.550   3.05   5.583   67.06   8.917   3.05   11.50   1.02   2.03   2.550   3.05   5.833   67.06   9.167   2.03   12.17   1.02   2.03   2.550   3.05   5.833   67.06   9.167   2.03   12.17   1.02  | 0.667             | 2.03  | 3.750    | 3.05     | 6.833     | 6.10    | 9.92  | 2.03  |
| 0.917   1.02   4.000   3.05   7.083   6.10   10.17   2.03   1.080   1.02   4.080   3.05   7.167   6.10   10.25   2.03   1.083   2.03   4.167   3.05   7.250   6.10   10.25   2.03   1.083   2.03   4.157   3.05   7.250   6.10   10.33   2.03   1.250   2.03   4.333   5.08   7.417   5.08   10.58   10.20   2.03   1.250   2.03   4.333   5.08   7.417   5.08   10.58   10.58   1.250   1.250   2.03   4.333   5.08   7.417   5.08   10.58   1.02   1.417   1.02   4.560   5.08   7.500   5.08   10.58   1.02   1.500   1.02   4.583   5.08   7.667   4.06   10.67   1.02   1.500   1.02   4.583   5.08   7.667   4.06   10.67   1.02   1.583   2.03   4.667   5.08   7.750   4.06   10.67   1.02   1.583   2.03   4.667   5.08   7.750   4.06   10.67   1.02   1.667   2.03   4.450   5.08   7.750   4.06   10.83   2.03   1.667   2.03   4.450   5.08   7.750   4.06   10.83   2.03   1.667   2.03   4.450   5.08   7.750   4.06   10.80   2.03   1.667   2.03   4.450   5.08   7.917   4.06   10.92   2.03   1.667   2.03   4.590   5.08   7.833   4.06   10.92   2.03   1.833   1.02   4.917   6.10   8.000   4.06   11.08   1.02   1.917   1.02   5.000   6.10   8.000   4.06   11.08   1.02   2.003   5.167   5.08   8.167   5.08   11.15   1.02   2.033   2.03   5.167   5.08   8.167   5.08   11.15   1.02   2.033   2.250   2.03   5.333   8.13   8.417   3.05   5.500   8.13   8.500   3.05   11.50   2.03   2.333   3.05   5.500   8.13   8.583   3.05   11.50   2.03   2.500   2.583   3.05   5.500   8.13   8.583   3.05   11.50   2.03   2.500   2.583   3.05   5.500   8.13   8.583   3.05   11.50   2.03   2.500   2.05   5.000   8.000   3.05   11.58   1.02   2.03   2.500   3.05   5.500   8.13   8.583   3.05   11.50   2.03   2.500   2.03   5.500   6.083   6.060   9.083   2.03   12.17   1.02   2.03   2.03   2.550   3.05   5.83   6.060   9.083   2.03   12.17   1.02   2.03   2.03   2.03   2.03   2.03   2.03   2.03   2.03   2.03   2.03   2.03   2.03   2.03   2.03   2.03   2.03   2.03   2.000   2.000   2.000   2.000   2.000   2.000   2.000   2.000   2.000   2.000   2.000   2.000   2.   | 0.750             | 2.03  | 3.833    | 3.05     | 6.917     | 6.10    | 10.00 | 2.03  |
| 1.000  | 0.833             | 1.02  | 3.917    | 3.05     | 7.000     | 6.10    | 10.08 | 2.03  |
| 1.083 2.03   4.167 3.05   7.250   6.10   10.33 2.03   1.167 2.03   4.250   3.65   7.250   6.10   10.33 2.03   1.250 2.03   4.333 5.08   7.417 5.08   10.50 2.03   1.333 1.02   4.417 5.08   7.510 5.08   10.50 2.03   1.500 1.02   4.500 5.08   7.583 4.06   10.57 1.02   1.500 1.02   4.500 5.08   7.575 4.06   10.67 5.102   1.500 1.02   4.500 5.08   7.667 4.06   10.67 5.102   1.500 1.02   4.500 5.08   7.667 4.06   10.63 2.03   1.667 2.03   4.667 5.08   7.750 4.06   10.83 2.03   1.667 2.03   4.450 5.08   7.750 4.06   10.92 2.03   1.667 2.03   4.450 6.10   8.000 4.06   11.00 2.03   1.833 1.02   4.917 6.10   8.000 4.06   11.00 2.03   1.833 1.02   4.917 6.10   8.000 4.06   11.08 1.02   2.000 1.02   5.003   5.067   5.08   8.250 5.08   11.17 1.02   2.000 1.02   5.003   5.507 5.08   8.250 5.08   11.17 1.02   2.003   2.333 3.05   5.417   8.13   8.500 3.05   11.52   2.250 2.03   5.533 8.13   8.417 3.05   11.50   2.250 2.03   5.508   8.250 5.08   11.15   2.250 2.03   5.508   8.250 5.08   11.42   2.510 2.510 3.05   5.500 8.13   8.500 3.05   11.50   2.520 2.03   5.500 5.00   2.550 3.05   5.500 8.13   8.500 3.05   11.50   2.550 3.05   5.500 8.13   8.850 3.05   11.50   2.550 3.05   5.500 8.13   8.833 3.05   11.67   2.550 3.05   5.500 8.13   8.833 3.05   11.50   2.550 3.05   5.500 8.13   8.833 3.05   11.50   2.550 3.05   5.500 8.13   8.850 3.05   11.50   2.583 3.05   5.567 9.14   8.750 3.05   11.50   2.583 3.05   5.567 9.14   8.750 3.05   11.50   2.917 3.05   6.000 67.06   9.083 2.03   12.17   2.018 2.019 3.05   6.083 67.06   9.167 2.03   12.25   2.02 2.03   6.167   67.06   9.083 2.03   12.17   2.03 3.000 3.05   6.083 67.06   9.167 2.03   12.25   2.001 3.000 3.05   6.083 67.06   9.167 2.03   12.25   2.002 3.000 3.05   6.083 67.06   9.167 2.03   12.25   2.003 3.000 3.05   6.083 67.06   9.167 2.03   12.25   2.001 3.000 3.05   6.083 67.06   9.167 2.03   12.25   2.001 3.000 3.05   6.083 67.06   9.167 2.03   12.25   2.001 3.000 3.05   6.083 67.06   9.167 2.03   12.25   2.001 3.000 3.05   6.083 67.06   9.167 2.03   12.25   2.001 3.0000 3. | 0.917             | 1.02  | 4.000    | 3.05     | 7.083     | 6.10    | 10.17 | 2.03  |
| 1.167   2.03   4.250   3.05   7.333   5.08   10.42   2.03     1.250   2.03   4.333   5.08   7.500   5.08   10.50   2.03     1.333   1.02   4.417   5.08   7.500   5.08   10.50   1.02     1.417   1.02   4.500   5.08   7.567   4.06   10.58   1.02     1.500   1.02   4.533   5.08   7.667   4.06   10.75   1.02     1.583   2.03   4.667   5.08   7.750   4.06   10.75   1.02     1.583   2.03   4.667   5.08   7.750   4.06   10.92   2.03     1.750   2.03   4.730   5.08   7.753   4.06   11.00   2.03     1.750   2.03   4.730   6.10   7.917   4.06   11.00   2.03     1.833   1.02   4.917   6.10   8.000   4.06   11.00   2.03     1.917   1.02   5.000   6.10   8.003   5.08   11.17   1.02     2.000   1.02   5.083   5.08   8.167   5.08   11.25   1.02     2.083   2.03   5.167   5.08   5.08   8.167   5.08   11.25   1.02     2.083   2.03   5.167   5.08   8.250   5.08   11.33   2.03     2.167   2.03   5.250   5.08   8.333   3.05   11.42   2.03     2.250   2.03   5.533   8.13   8.417   3.05   11.50   2.03     2.333   3.05   5.547   8.13   8.500   3.05   11.56   2.03     2.417   3.05   5.500   8.13   8.583   3.05   11.67   1.02     2.583   3.05   5.583   9.14   8.667   3.05   11.57   1.02     2.583   3.05   5.583   9.14   8.667   3.05   11.57   1.02     2.833   3.05   5.583   6.06   8.917   3.05   11.50   2.03     2.667   3.05   5.583   6.06   8.917   3.05   12.00   2.03     2.833   3.05   5.570   9.14   8.667   3.05   11.57   1.02     2.833   3.05   5.917   67.06   9.000   3.05   12.00   2.03     2.833   3.05   5.917   67.06   9.000   3.05   12.00   2.03     2.833   3.05   5.917   67.06   9.000   3.05   12.00   2.03     2.833   3.05   6.083   67.06   9.167   2.03   12.15   1.02     3.000   3.05   6.083   67.06   9.167   2.03   12.15   1.02     3.000   3.05   6.083   67.06   9.167   2.03   12.15   1.02     3.000   3.05   6.083   67.06   9.167   2.03   12.15   1.02     3.000   3.05   6.083   67.06   9.167   2.03   12.15   1.02     3.000   3.05   6.050   67.06   9.000   3.05   12.00   2.03     3.000   3.05   6.050   67.06   9.000   3.05    | 1.000             | 1.02  | 4.083    | 3.05     | 7.167     | 6.10    | 10.25 | 2.03  |
| 1.250 2.03   4.333 5.08   7.417 5.08   10.50 2.03  | 1.083             | 2.03  | 4.167    | 3.05     | 7.250     | 6.10    | 10.33 | 2.03  |
| 1.333 1.02   4.417   5.08   7.590   5.08   1.02   1.417 1.02   4.590   5.08   7.657   4.06   10.67   1.02   1.590   1.02   4.583   5.08   7.667   4.06   10.67   1.02   1.583   2.03   4.467   5.08   7.759   4.06   10.67   1.02   1.583   1.02   4.917   6.10   7.917   4.06   11.09   1.833   1.02   4.917   6.10   8.000   4.06   11.09   1.917   1.02   5.000   6.10   8.003   5.08   11.17   1.02   5.000   6.10   8.003   5.08   11.17   1.02   5.000   6.10   8.003   5.08   11.17   1.02   5.000   6.10   8.003   5.08   11.17   1.02   2.003   5.50   5.00   8.107   5.08   11.25   1.917   1.02   5.000   5.00   8.003   5.08   8.112   2.000   1.02   5.003   5.00   5.00   8.003   5.00   11.17   1.02   5.000   6.10   8.003   5.00   11.17   1.02   2.003   5.550   5.00   8.333   3.05   11.42   2.167   2.03   5.250   5.00   8.333   3.05   11.42   2.250   2.03   5.333   8.13   8.417   3.05   11.50   2.250   3.05   5.500   8.13   8.580   3.05   11.50   2.417   3.05   5.500   8.13   8.580   3.05   11.67   2.500   3.05   5.583   9.14   8.667   3.05   11.58   2.667   3.05   5.583   9.14   8.667   3.05   11.50   2.833   3.05   5.567   9.14   8.667   3.05   11.50   2.833   3.05   5.5750   9.15   8.833   3.05   11.42   2.833   3.05   5.917   67.06   9.000   3.05   12.00   2.833   3.05   5.917   67.06   9.000   3.05   12.00   2.833   3.05   6.003   67.06   9.000   3.05   12.00   3.000   3.05   6.003   67.06   9.000   3.05   12.00   3.000   3.05   6.003   67.06   9.167   2.03   12.15   3.000   3.05   6.003   67.06   9.250   2.03   3.000   3.05   6.003   67.06   9.250   2.03   3.000   3.05   6.003   67.06   9.250   2.03   3.000   3.05   6.003   67.06   9.250   2.03   3.000   3.05   6.003   67.06   9.250   2.03   3.000   3.05   6.003   67.06   9.250   2.03   3.000   3.05   6.003   67.06   9.250   2.03   3.000   3.05   6.003   67.06   9.250   2.03   3.000   3.05   6.003   67.06   9.250   2.03   3.000   3.05   6.003   67.06   9.250   2.03   3.000   3.05   6.000   67.06   9.250   2.03   3.000   3.05   6.000   67.06   9.250   2.03   3.000   3.05   | 1.167             | 2.03  | 4.250    | 3.05     | 7.333     | 5.08    | 10.42 | 2.03  |
| 1.417   1.02   4.500   5.08   7.583   4.06   10.67   1.02     1.590   1.02   4.583   5.08   7.667   4.06   10.75   1.02     1.583   2.03   4.667   5.08   7.750   4.06   10.75   1.02     1.667   2.03   4.4750   5.08   7.750   4.06   10.83   2.03     1.667   2.03   4.4750   5.08   7.791   4.06   11.09   2.03     1.833   1.02   4.917   6.10   8.000   4.06   11.08   1.02     1.917   1.02   5.000   6.10   8.000   4.06   11.08   1.02     2.000   1.02   5.000   6.10   8.000   4.06   11.08   1.02     2.000   1.02   5.083   5.08   8.167   5.08   11.17   1.02     2.083   2.03   5.167   5.08   8.250   5.08   11.17   1.02     2.083   2.03   5.157   5.08   8.250   5.08   11.15   1.02     2.167   2.03   5.250   5.08   8.333   3.05   11.42   2.03     2.167   2.03   5.550   8.13   8.417   3.05   11.50   2.03     2.333   3.05   5.417   8.13   8.500   3.05   11.58   1.02     2.417   3.05   5.560   8.13   8.583   3.05   11.57   1.02     2.583   3.05   5.567   9.14   8.750   3.05   11.58   1.02     2.583   3.05   5.667   9.14   8.750   3.05   11.53   2.03     2.750   3.05   5.583   67.06   8.917   3.05   12.00   2.03     2.750   3.05   5.583   67.06   8.917   3.05   12.00   2.03     2.750   3.05   5.667   9.14   8.750   3.05   11.58   1.02     2.917   3.05   5.667   9.15   8.833   3.05   11.02   2.03     2.750   3.05   6.000   67.06   9.083   2.03   12.17   1.02     2.917   3.05   6.000   67.06   9.000   3.05   12.08   1.02     2.917   3.05   6.000   67.06   9.083   2.03   12.17   1.02     3.000   3.05   6.000   67.06   9.150   2.03    Max.Eff.Inten.(mm/hr) =  | 1.250             | 2.03  | 4.333    | 5.08     | 7.417     | 5.08    | 10.50 | 2.03  |
| 1.590 1.02   4.583   5.08   7.667   4.06   10.75   1.02   1.583 2.03   4.667   5.08   7.750   4.06   10.83 2.03   1.667 2.03   4.750   5.08   7.833   4.06   10.92 2.03   1.750 2.03   4.4750   5.08   7.833   4.06   10.92 2.03   1.833 1.02   4.917   6.10   8.000   4.06   11.00   2.03   1.917 1.02   5.000   6.10   8.083   5.08   11.17   1.02   2.000 1.02   5.000   6.10   8.083   5.08   11.17   1.02   2.083 2.03   5.167   5.08   8.167   5.08   11.25   1.02   2.083 2.03   5.167   5.08   8.250   5.08   11.25   1.02   2.167 2.03   5.250   5.08   8.333   3.05   11.42   2.03   2.250 2.03   5.333   8.13   8.417   3.05   11.50   2.03   2.250 2.03   5.533   8.13   8.417   3.05   11.50   2.03   2.333 3.05   5.417   8.13   8.500   3.05   11.56   1.02   2.417   3.05   5.500   8.13   8.583   3.05   11.67   1.02   2.583   3.05   5.567   9.14   8.750   3.05   11.57   1.02   2.583   3.05   5.667   9.14   8.750   3.05   11.58   2.03   2.667   3.05   5.583   9.14   8.667   3.05   11.59   2.03   2.590 3.05   5.583   6.06   8.917   3.05   11.20   2.03   2.590 3.05   5.667   9.14   8.750   3.05   11.20   2.03   2.590 3.05   5.667   9.15   8.833   3.05   11.02   2.03   2.590 3.05   5.667   9.15   8.833   3.05   11.20   2.03   2.590 3.05   5.667   9.16   9.000   3.05   12.00   2.03   2.833 3.05   5.917   67.06   9.000   3.05   12.00   2.03   2.833 3.05   5.917   67.06   9.000   3.05   12.00   2.03   2.833 3.05   5.917   67.06   9.000   3.05   12.00   2.03   2.03   5.05   6.083   67.06   9.167   2.03   12.17   1.02   3.000   3.05   6.083   67.06   9.167   2.03   12.17   1.02   3.000   3.05   6.083   67.06   9.167   2.03   12.15   1.02   3.000   3.05   6.083   67.06   9.167   2.03   12.15   1.02   3.000   3.05   6.083   67.06   9.167   2.03   12.15   1.02   3.000   3.05   6.083   67.06   9.167   2.03   12.15   1.02   3.000   3.05   6.083   67.06   9.167   2.03   12.15   1.02   3.000   3.05   6.083   67.06   9.167   2.03   12.15   1.02   3.000   3.05   6.083   67.06   9.167   2.03   12.15   1.02   3.000   3.05   6.083   67.06   9.167   2.0 | 1.333             | 1.02  | 4.417    | 5.08     | 7.500     | 5.08    | 10.58 | 1.02  |
| 1.583 2.03   4.667 5.08   7.750   4.06   10.83 2.03   1.667 2.03   4.750   5.08   7.833   4.06   10.92 2.03   1.750 2.03   4.833   6.10   7.917   4.06   11.00 2.03   1.833   1.02   4.917   6.10   8.000   4.06   11.00   2.03   1.833   1.02   4.917   6.10   8.000   4.06   11.00   2.03   1.833   1.02   4.917   6.10   8.000   4.06   11.00   1.02   1.000   6.10   8.000   4.06   11.00   1.02   2.000   6.10   8.000   4.06   11.00   1.02   2.000   6.10   8.000   4.06   11.00   1.02   2.000   1.02   5.083   5.08   8.167   5.08   11.17   1.02   2.003   2.03   5.167   5.08   8.250   5.08   11.17   1.02   2.03   2.167   2.03   5.250   5.08   8.333   3.05   11.42   2.03   2.167   2.03   5.250   5.08   8.333   3.05   11.42   2.03   2.333   3.05   5.417   8.13   8.500   3.05   11.58   1.02   2.417   3.05   5.500   8.13   8.583   3.05   11.58   1.02   2.500   3.05   5.560   9.14   8.667   3.05   11.58   1.02   2.583   3.05   5.667   9.14   8.667   3.05   11.75   1.02   2.583   3.05   5.583   9.14   8.667   3.05   11.75   1.02   2.03   2.750   3.05   5.833   67.06   8.917   3.05   12.00   2.03   2.750   3.05   5.833   67.06   8.917   3.05   12.00   2.03   2.917   3.05   6.000   67.06   9.083   2.03   12.17   1.02   3.000   3.05   6.000   67.06   9.250   2.03   2.03   12.17   1.02   3.000   3.05   6.000   67.06   9.250   2.03   2.03   12.17   1.02   3.000   3.05   6.000   67.06   9.250   2.03   2.03   12.17   1.02   3.000   3.05   6.000   67.06   9.250   2.03   2.03   12.17   1.02   3.000   3.05   6.000   67.06   9.250   2.03   2.03   12.17   1.02   3.000   3.05   6.000   67.06   9.250   2.03   2.03   12.17   1.02   3.000   3.05   6.000   67.06   9.250   2.03   2.03   12.17   1.02   3.000   3.05   6.000   67.06   9.250   2.03   2.03   12.17   1.02   3.000   3.05   6.000   67.06   9.250   2.03   2.03   12.17   1.02   3.000   3.05   6.000   67.06   9.250   2.03   2.03   12.17   1.02   3.000   3.05   6.000   67.06   9.250   2.03   2.03   12.17   1.02   3.000   3.05   6.000   67.06   9.250   2.03   2.03   12.17   1.02   3.000   3.05 | 1.417             | 1.02  | 4.500    | 5.08     | 7.583     | 4.06    | 10.67 | 1.02  |
| 1.667 2.03   4.750   5.08   7.833   4.06   10.92   2.03   1.833   1.02   4.917   6.10   8.000   4.06   11.00   2.03   1.833   1.02   4.917   6.10   8.000   4.06   11.00   2.03   1.833   1.02   5.000   6.10   8.000   4.06   11.00   1.02   1. | 1.500             | 1.02  | 4.583    | 5.08     | 7.667     | 4.06    | 10.75 | 1.02  |
| 1.750 2.03   4.833 6.10   7.917   4.06   11.00   2.03   1.833 1.02   4.917   6.10   8.000   4.06   11.00   1.02   1.917 1.02   5.000   6.10   8.003   5.08   11.17   1.02   2.000   1.02   5.003   5.08   8.167   5.08   11.17   1.02   2.083   2.03   5.167   5.08   8.250   5.08   11.32   2.03   2.167   2.03   5.550   5.08   8.250   5.08   11.33   2.03   2.250   2.03   5.550   5.08   8.333   3.05   11.42   2.03   2.333   3.05   5.417   8.13   8.500   3.05   11.58   1.02   2.417   3.05   5.500   8.13   8.500   3.05   11.58   1.02   2.500   3.05   5.583   9.14   8.667   3.05   11.57   1.02   2.500   3.05   5.583   9.14   8.667   3.05   11.75   1.02   2.500   3.05   5.583   9.14   8.667   3.05   11.75   1.02   2.583   3.05   5.667   9.15   8.833   3.05   11.67   1.02   2.590   3.05   5.833   67.06   8.917   3.05   12.00   2.03   2.750   3.05   5.833   67.06   8.917   3.05   12.00   2.03   2.917   3.05   6.000   67.06   9.083   2.03   12.17   1.02   3.000   3.05   6.000   67.06   9.167   2.03   12.25   1.02   3.083   2.03   6.167   67.06   9.250   2.03    Max.Eff.Inten.(mm/hr)   | 1.583             | 2.03  | 4.667    | 5.08     | 7.750     | 4.06    | 10.83 | 2.03  |
| 1.833 1.02   4.917   6.10   8.000   4.06   11.08   1.02   1.917   1.02   5.000   6.10   8.083   5.08   11.17   1.02   2.000   1.02   5.083   5.08   8.167   5.08   11.17   1.02   2.083   2.083   2.03   5.167   5.08   8.250   5.08   11.25   1.02   2.083   2.167   2.03   5.250   5.08   8.250   5.08   11.25   1.02   2.03   2.250   2.03   5.333   8.13   8.417   3.05   11.50   2.03   2.333   3.05   5.417   8.13   8.500   3.05   11.50   2.03   2.417   3.05   5.500   8.13   8.500   3.05   11.50   2.03   2.500   3.05   5.500   8.13   8.583   3.05   11.67   1.02   2.500   3.05   5.560   8.13   8.583   3.05   11.67   1.02   2.500   2.653   3.05   5.560   8.13   8.583   3.05   11.57   1.02   2.583   3.05   5.567   9.14   8.750   3.05   11.75   1.02   2.583   3.05   5.567   9.14   8.750   3.05   11.50   2.03   2.570   3.05   5.583   67.06   8.917   3.05   11.00   2.03   2.570   3.05   5.833   67.06   9.083   2.03   12.17   1.02   2.03   2.33   3.05   5.833   67.06   9.083   2.03   12.17   1.02   3.000   3.05   6.083   67.06   9.083   2.03   12.17   1.02   3.000   3.05   6.083   67.06   9.083   2.03   12.17   1.02   3.000   3.05   6.083   67.06   9.167   2.03   12.25   1.02   3.000   3.05   6.083   67.06   9.083   2.03   12.17   1.02   3.083   2.03   6.167   67.06   9.250   2.03   12.15   1.02   3.000   3.05   6.083   67.06   9.167   2.03   12.25   1.02   3.000   3.05   6.083   67.06   9.250   2.03   12.15   1.02   3.000   3.05   6.083   67.06   9.167   2.03   12.55   1.02   3.000   3.05   6.083   67.06   9.250   2.03   3.05   5.000   3.05   6.083   67.06   9.250   2.03   3.05   6.050   3.05   6.05 | 1.667             | 2.03  | 4.750    | 5.08     | 7.833     | 4.06    | 10.92 | 2.03  |
| 1.917   1.02   5.000   6.10   8.083   5.08   11.17   1.02   2.000   1.02   5.000   6.10   8.083   5.08   11.25   1.02   2.083   2.03   5.167   5.08   8.156   5.08   11.25   2.03   2.167   2.03   5.157   5.08   8.250   5.08   11.33   2.03   2.167   2.03   5.250   5.08   8.333   3.05   11.42   2.03   2.333   3.05   5.417   8.13   8.500   3.05   11.50   2.03   2.333   3.05   5.417   8.13   8.500   3.05   11.58   1.02   2.500   3.05   5.583   9.14   8.667   3.05   11.57   1.02   2.500   3.05   5.583   9.14   8.667   3.05   11.67   1.02   2.583   3.05   5.583   9.14   8.750   3.05   11.67   1.02   2.583   3.05   5.583   9.14   8.750   3.05   11.83   2.03   2.750   3.05   5.833   67.06   8.917   3.05   12.08   10.2   2.93   2.750   3.05   6.000   67.06   9.083   2.03   12.17   1.02   2.93   3.065   3.05   6.000   67.06   9.083   2.03   12.17   1.02   3.083   2.03   6.167   67.06   9.157   2.03   12.25   1.02   3.083   2.03   6.167   67.06   9.250   2.03   3.05   3.   | 1.750             | 2.03  | 4.833    | 6.10     | 7.917     | 4.06    | 11.00 | 2.03  |
| 2.000  | 1.833             | 1.02  | 4.917    | 6.10     | 8.000     | 4.06    | 11.08 | 1.02  |
| 2.083   2.03   5.167   5.08   8.250   5.08   1.1.33   2.03   2.167   2.03   5.250   5.08   8.333   3.05   11.42   2.03   2.250   2.03   5.333   8.13   8.417   3.05   11.45   2.03   2.250   2.03   5.333   8.13   8.417   3.05   11.158   1.02   2.03   2.417   3.05   5.547   8.13   8.500   3.05   11.67   1.02   2.03   2.500   3.05   5.583   9.14   8.667   3.05   11.67   1.02   2.583   3.05   5.583   9.14   8.667   3.05   11.67   1.02   2.583   3.05   5.583   9.14   8.667   3.05   11.83   2.03   2.667   3.05   5.583   6.760   8.893   3.05   11.83   2.03   2.675   3.05   5.583   6.760   8.917   3.05   11.83   2.03   2.833   3.05   5.5750   9.14   8.893   3.05   12.00   2.03   2.833   3.05   5.917   67.06   9.000   3.05   12.00   2.03   2.917   3.05   6.083   67.06   9.000   3.05   12.00   2.03   3.000   3.05   6.083   67.06   9.167   2.03   12.17   1.02   3.000   3.05   6.083   67.06   9.167   2.03   12.25   1.02   3.083   2.03   6.167   67.06   9.250   2.03   12.17   1.02   3.000   3.05   6.067   67.06   9.250   2.03   12.17   1.02   3.000   3.05   6.067   67.06   9.250   2.03   12.17   1.02   3.000   3.05   6.067   67.06   9.250   2.03   12.17   1.02   3.000   3.05   6.067   67.06   9.250   2.03   12.17   1.02   3.000   3.05   6.057   3.000   3.057   3.000   3.057   3.000   3.057   3.000   3.057   3.000   3.057   3.000   3.057   3.0000   3.0000   3.000   3.0000   3.0000   3.0000   3.0000   3.0000   3.0000   3.0000   3.0000     | 1.917             | 1.02  | 5.000    | 6.10     | 8.083     | 5.08    | 11.17 | 1.02  |
| 2.167   2.03   5.250   5.08   8.333   3.05   11.42   2.03     2.250   2.03   5.333   8.13   8.417   3.05   11.50   2.03     2.333   3.05   5.417   8.13   8.500   3.05   11.58   1.02     2.417   3.05   5.500   8.13   8.583   3.05   11.58   1.02     2.500   3.05   5.583   9.14   8.667   3.05   11.58   1.02     2.583   3.05   5.567   9.14   8.750   3.05   11.75   1.02     2.567   3.05   5.567   9.14   8.750   3.05   11.75   1.02     2.667   3.05   5.583   67.06   8.917   3.05   11.92     2.750   3.05   5.833   67.06   8.917   3.05   12.08   1.02     2.750   3.05   6.833   67.06   9.000   3.05   12.08   1.02     2.917   3.05   6.000   67.06   9.083   2.03   12.17   1.02     3.083   2.03   6.167   67.06   9.250   2.03     3.083   2.03   6.167   67.06   9.250   2.03    Max.Eff.Inten.(mm/hr)  | 2.000             | 1.02  | 5.083    | 5.08     | 8.167     | 5.08    | 11.25 | 1.02  |
| 2.250   2.03   5.333   8.13   8.417   3.05   11.50   2.03  | 2.083             | 2.03  | 5.167    | 5.08     | 8.250     | 5.08    | 11.33 | 2.03  |
| 2.333 3.05   5.417   8.13   8.500   3.05   11.58   1.02  | 2.167             | 2.03  |          |          |           | 3.05    |       | 2.03  |
| 2.417   3.65   5.500   8.13   8.583   3.05   11.67   1.02  | 2.250             | 2.03  | 5.333    | 8.13     | 8.417     | 3.05    | 11.50 | 2.03  |
| 2.590   3.05   5.583   9.14   8.667   3.05   11.75   1.02  | 2.333             | 3.05  | 5.417    | 8.13     | 8.500     | 3.05    | 11.58 | 1.02  |
| 2.583   3.05   5.567   9.14   8.750   3.05   11.93   2.03     2.667   3.05   5.750   9.15   8.833   3.05   11.90   2.03     2.750   3.05   5.833   67.06   8.917   3.05   11.90   2.03     2.833   3.05   5.833   67.06   8.917   3.05   12.00   2.03     2.833   3.05   5.917   67.06   9.000   3.05   12.08   1.02     3.000   3.05   6.000   67.06   9.000   3.05   12.15   1.02     3.000   3.05   6.083   67.06   9.167   2.03   12.15   1.02     3.000   3.05   6.083   67.06   9.167   2.03   12.25   1.02     3.000   3.05   6.083   67.06   9.167   2.03   12.25   1.02     3.000   3.05   6.083   67.06   9.167   2.03   12.25   1.02     3.000   3.05   6.083   67.06   9.167   2.03   12.25   1.02     3.000   3.05   6.083   67.06   9.167   2.03   12.25   1.02     3.000   3.05   6.083   67.06   9.167   2.03   12.25   1.02     4.622   5.000   5.00   5.00     5.000   5.00   5.00   5.00     5.000   5.00   5.00   5.00     5.000   5.000   5.00   5.00     5.000   5.000   5.00   5.00     5.000   5.000   5.00   5.00     5.000   5.000   5.00   5.00     5.000   5.000   5.000   5.00     5.000   5.000   5.000   5.00     5.000   5.000   5.000   5.00     5.000   5.000   5.000   5.00     5.000   5.000   5.000   5.000     5.000   5.000   5.000     |                   |       |          |          |           |         |       |       |
| 2.667   3.05   5.750   9.15   8.833   3.05   11.92   2.03   2.750   3.05   5.750   9.15   8.833   3.05   12.08   2.03   2.833   3.05   5.917   67.06   9.000   3.05   12.08   1.02   2.917   3.05   6.000   67.06   9.0803   2.03   12.17   1.02   3.000   3.05   6.080   67.06   9.167   2.03   12.25   1.02   3.083   2.03   6.167   67.06   9.250   2.03   12.25   1.02   3.083   2.03   6.167   67.06   9.250   2.03   12.25   1.02   3.083   2.03   6.167   67.06   9.250   2.03   12.25   1.02   3.083   3.083   3.083   6.167   67.06   9.250   2.03   12.25   1.02   3.083   3.083   3.083   6.167   67.06   9.250   2.03   12.25   1.02   3.083   3.083   3.083   6.167   67.06   9.250   2.03   12.25   1.02   3.083   3.083   3.05   12.05   3.083   3.083   3.05   12.05   3.083   |                   |       |          |          |           |         |       |       |
| 2.750   3.05   5.833   67.06   8.917   3.05   12.00   2.03   2.93   3.05   5.917   67.06   9.000   3.05   12.08   1.02   2.917   3.05   6.000   67.06   9.083   2.03   12.17   1.02   3.080   3.05   6.083   67.06   9.167   2.03   12.15   1.02   3.083   2.03   61.07   67.06   9.250   2.03   12.15   1.02   3.083   2.03   61.07   67.06   9.250   2.03   12.25   1.02   3.083   2.03   61.07   67.06   9.250   2.03   12.25   1.02   3.083   2.03   61.07   67.06   67.05   67.   |                   |       |          |          |           |         |       |       |
| 2.833 3.05   5.917   67.06   9.000   3.05   12.08   1.02   2.917 3.05   6.000   67.06   9.083   2.03   12.17   1.02   3.000 3.05   6.083   67.06   9.167   2.03   12.25   1.02    Max.Eff.Inten.(mm/hr)=   |                   |       |          |          |           |         |       |       |
| 2.917   3.05   6.000   67.06   9.083   2.03   12.17   1.02     3.000   3.05   6.000   67.06   9.167   2.03   12.25   1.02     3.083   2.03   6.167   67.06   9.250   2.03       Max.Eff.Inten.(mm/hr)  |                   |       |          |          |           |         |       |       |
| 3.000 3.05   6.083   67.06   9.167   2.03   12.25   1.02   3.083   2.03   6.167   67.06   9.250   2.03      Max.Eff.Inten.(mm/hr)=   |                   |       |          |          |           |         |       |       |
| 3.083 2.03   6.167 67.06   9.250 2.03    Max.Eff.Inten.(mm/hr)   |                   |       |          |          |           |         |       |       |
| Max.Eff.Inten.(mm/hr)= 67.06 46.22 over (min) 10.00 15.00 Storage Coeff. (min)= 7.59 (ii) 10.88 (ii) Unit Hyd. Tpeak (min)= 10.00 15.00 Unit Hyd. peak (cms)= 0.13 0.09 **TOTALS**  PEAK FLOW (cms)= 0.14 0.02 0.157 (iii) TIME TO PEAK (hrs)= 6.25 6.33 6.25 RUNOFF VOLUME (mm)= 72.42 39.68 65.21 TOTAL RATNALL (mm)= 74.42 74.42  |                   |       |          |          |           |         |       | 1.02  |
| over (min)         10.00         15.00           Storage Coeff. (min)=         7.59 (ii)         10.88 (ii)           Unit Hyd. Tpeak (min)=         10.00         15.00           Unit Hyd. peak (cms)=         0.13         0.09           PEAK FLOW         (cms)=         0.14         0.02         0.157 (iii)           TIME TO PEAK (hrs)=         6.25         6.33         6.25           RUNOFF VOLUME         (mm)=         72.42         39.68         65.21           TOTAL RAINFALL (mm)=         74.42         74.42         74.42  | 3.083             | 2.03  | 6.167    | 67.06    | 9.250     | 2.03    | l     |       |
| over (min)         10.00         15.00           Storage Coeff. (min)=         7.59 (ii)         10.88 (ii)           Unit Hyd. Tpeak (min)=         10.00         15.00           Unit Hyd. peak (cms)=         0.13         0.09           PEAK FLOW         (cms)=         0.14         0.02         0.157 (iii)           TIME TO PEAK (hrs)=         6.25         6.33         6.25           RUNOFF VOLUME         (mm)=         72.42         39.68         65.21           TOTAL RAINFALL (mm)=         74.42         74.42         74.42  |                   |       |          |          |           |         |       |       |
| Storage Coeff. (min  = 7.59 (ii) 10.88 (ii)  |                   |       |          |          |           |         |       |       |
| Unit Hyd. Tpeak (min)= 10.00 15.00 Unit Hyd. peak (cms)= 0.13 0.09 *TOTALS*  PEAK FLOW (cms)= 0.14 0.02 0.157 (iii) TIME TO PEAK (hrs)= 6.25 6.33 6.25 RUNOFF VOLUME (mm)= 72.42 39.68 65.21 TOTAL RATNFALL (mm)= 74.42 74.42  |                   |       |          |          |           |         |       |       |
| Unit Hyd. peak (cms)= 0.13 0.09 **TOTALS*  PEAK FLOW (cms)= 0.14 0.02 0.157 (iii)  TIME TO PEAK (hrs)= 6.25 6.33 6.25  RUNOFF VOLUME (mm)= 72.42 39.68 65.21  TOTAL RAINFALL (mm)= 74.42 74.42 74.42   |                   |       |          |          |           | )       |       |       |
| PEAK FLOW (cms)= 0.14 0.92 0.157 (iii) TIME TO PEAK (hrs)= 6.25 6.33 6.25 RUNOFF VOLUME (mm)= 72.42 39.68 65.21 TOTAL RATNAFLL (mm)= 74.42 74.42 74.42   |                   |       |          |          |           |         |       |       |
| PEAK FLOW (cms)= 0.14 0.02 0.157 (iii) TIME TO PEAK (hrs)= 6.25 6.33 6.25 RUNOFF VOLUME (mm)= 72.42 39.68 65.21 TOTAL RAINFALL (mm)= 74.42 74.42 74.42   | Unit Hyd. peak (  | cms)= | 0.13     |          | 0.09      |         |       |       |
| TIME TO PEAK (hrs)= 6.25 6.33 6.25<br>RUNOFF VOLUME (mm)= 72.42 39.68 65.21<br>TOTAL RAINFALL (mm)= 74.42 74.42 74.42  |                   |       |          |          |           |         |       |       |
| RUNOFF VOLUME (mm)= 72.42 39.68 65.21<br>TOTAL RAINFALL (mm)= 74.42 74.42 74.42  |                   |       |          |          |           |         |       | )     |
| TOTAL RAINFALL (mm)= 74.42 74.42 74.42   |                   |       |          |          |           |         |       |       |
|  |                   |       |          |          |           |         |       |       |
| KUNUFF CUEFFICIENI = 0.9/ 0.53 0.88  |                   |       |          |          |           |         |       |       |
|  | RUNUFF CUEFFICIEN | . =   | 0.97     |          | v.53      | •       | 0.68  |       |

### LangstaffRd\_EA\_Proposed\_WestDonWatershd

CALIB | CALIB | STANDHYD ( 0205)| |ID= 1 DT= 5.0 min | Area (ha)= 1.11 Total Imp(%)= 77.00 Dir. Conn.(%)= 77.00 Surface Area 0.85 2.00 0.26 5.00 Dep. Storage Average Slope Length Mannings n (mm)= (%)= (m)= = 1.00 2.00

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 2.03     | 6.250   | 67.05 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 2.03     | 6.333   | 13.21 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417   | 13.21 | 9.50  | 3.05  |
| 0.333 | 1.02  | 3.417 | 3.05     | 6.500   | 13.21 | 9.58  | 2.03  |
| 0.417 | 1.02  | 3.500 | 3.05     | 6.583   | 13.21 | 9.67  | 2.03  |
| 0.500 | 1.02  | 3.583 | 3.05     | 6.667   | 13.21 | 9.75  | 2.03  |
| 0.583 | 2.03  | 3.667 | 3.05     | 6.750   | 13.21 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 3.05     | 6.833   | 6.10  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 3.05     | 6.917   | 6.10  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 3.05     | 7.000   | 6.10  | 10.08 | 2.03  |
| 0.917 | 1.02  | 4.000 | 3.05     | 7.083   | 6.10  | 10.17 | 2.03  |
| 1.000 | 1.02  | 4.083 | 3.05     | 7.167   | 6.10  | 10.25 | 2.03  |
| 1.083 | 2.03  | 4.167 | 3.05     | 7.250   | 6.10  | 10.33 | 2.03  |
| 1.167 | 2.03  | 4.250 | 3.05     | 7.333   | 5.08  | 10.42 | 2.03  |
| 1.250 | 2.03  | 4.333 | 5.08     | 7.417   | 5.08  | 10.50 | 2.03  |
| 1.333 | 1.02  | 4.417 | 5.08     | 7.500   | 5.08  | 10.58 | 1.02  |
| 1.417 | 1.02  | 4.500 | 5.08     | 7.583   | 4.06  | 10.67 | 1.02  |
| 1.500 | 1.02  | 4.583 | 5.08     | 7.667   | 4.06  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 5.08     | 7.750   | 4.06  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 5.08     | 7.833   | 4.06  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 6.10     | 7.917   | 4.06  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 6.10     | 8.000   | 4.06  | 11.08 | 1.02  |
| 1.917 | 1.02  | 5.000 | 6.10     | 8.083   | 5.08  | 11.17 | 1.02  |
| 2.000 | 1.02  | 5.083 | 5.08     | 8.167   | 5.08  | 11.25 | 1.02  |
| 2.083 | 2.03  | 5.167 | 5.08     | 8.250   | 5.08  | 11.33 | 2.03  |
| 2.167 | 2.03  | 5.250 | 5.08     | 8.333   | 3.05  | 11.42 | 2.03  |
| 2.250 | 2.03  | 5.333 | 8.13     | 8.417   | 3.05  | 11.50 | 2.03  |

20.00

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LangstaffRd\_EA\_Proposed\_WestDonWatershd AREA QPEAK TPEAK R. (ha) (cms) (hrs) (m) 0) 2.070 0.338 6.25 (6) 2.070 0.173 6.42 (6) INFLOW: ID= 2 ( 0460) OUTFLOW: ID= 1 ( 0525) 65.03

PEAK FLOW REDUCTION [Qout/Qin](%)= 51.32 TIME SHIFT OF PEAK FLOW (min)= 10.00 MAXIMUM STORAGE USED (ha.m.)= 0.0422

CALIB | CALIB | STANDHYD ( 0190)| |ID= 1 DT= 5.0 min | Area (ha)= 0.86 Total Imp(%)= 57.00 Dir. Conn.(%)= 57.00 IMPERVIOUS PERVIOUS (i) Surface Area

0.49 2.00 1.00 0.37 5.00 2.00 (mm)= (%)= (m)= Dep. Storage Average Slope Length Mannings n 340.00 50.00 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TRANSFORMED HYETOGRAPH MSFORMED HYELUGRAPH ---RAIN | TIME RAIN | TIME
mm/hr | hrs mm/hr | hrs
2.03 | 6.250 | 67.05 | 9.33
2.03 | 6.333 | 3.21 | 9.42
3.05 | 6.417 | 13.21 | 9.50
3.05 | 6.500 | 13.21 | 9.58
3.05 | 6.500 | 13.21 | 9.58 RAIN TIME hrs hrs 0.083 0.167 0.250 0.333 0.417 mm/hr 0.00 0.00 0.00 1.02 1.02 9.33 9.42 9.50 9.58 9.67 9.75 mm/hr 3.05 3.05 3.05 2.03 2.03 3.167 3.250 3.333 3.417 3.500 3.583 2,83 | 6,259 | 6,333 | 3,65 | 6,667 | 3,65 | 6,667 | 3,65 | 6,667 | 3,65 | 6,583 | 3,65 | 6,67 | 3,65 | 7,269 | 3,65 | 7,269 | 3,65 | 7,259 | 5,88 | 7,417 | 5,88 | 7,583 | 5,88 | 7,417 | 5,88 | 7,583 | 6,10 | 7,583 | 6,10 | 7,591 | 6,88 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 7,583 | 13.21 0.500 0.583 13.21 2.03 2.03 3.667 13.21 9.83 2.03 2.03 | 3.750 2.03 | 3.833 1.02 | 3.917 1.02 | 4.080 2.03 | 4.167 2.03 | 4.25 2.03 | 4.25 2.03 | 4.50 2.03 | 4.50 2.03 | 4.50 2.03 | 4.50 2.03 | 4.50 1.02 | 4.50 2.03 | 4.50 2.03 | 4.50 2.03 | 4.50 2.03 | 4.50 2.03 | 4.50 2.03 | 5.00 2.03 | 5.00 2.03 | 5.00 2.03 | 5.00 2.03 | 5.00 2.03 | 5.00 2.03 | 5.00 2.03 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 3.00 | 5.00 | 5.00 3.00 | 5.00 | 5.00 3.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5 0.667 2.03 3,750 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6. 9.92 2.03 0.667 0.750 0.833 0.917 1.000 1.083 10.00 10.08 10.17 10.25 10.33 2.03 2.03 2.03 2.03 2.03 2.03 1.167 10.42 2.03 1.250 10.50 2.03 1.333 10.58 1.02 1.417 1.500 1.583 1.667 10.67 10.75 10.83 10.92 1.02 1.02 2.03 2.03 2.03 1.750 11.00 1.833 11.08 1.02 1.917 11.17 1.02 1 02 11.33

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| 2 222  | Langstat         | TRO_EA_PI      | oposed_Wes         | tDonWate     | ershd                  | 1 02 |
|--|------------------|----------------|--------------------|--------------|------------------------|------|
| 2.333  | 3.05   5.        | .41/ 8         | .13   8.506        | 3.0          | 5   11.58              | 1.02 |
| 2.41/  | 3.05   5.        | .500 6         | 14   0.56          | 7 2 0        | 5   11.0/              | 1.02 |
| 2.300  | 3.03   3.        | . 565 5        | 14   0.007         | 3.0          | 5   11.75<br>E   11.00 | 2.02 |
| 2.363  | 3.65   5         | 750 0          | 15   8 83          | 3.0          | 5   11.03              | 2.03 |
| 2.007  | 3.65   5         | 833 67         | A6   8 Q1          | 7 3.0        | 5   11.92              | 2.03 |
| 2.730  | 3.65   5         | 917 67         | as   9 aa          | 3.0          | 5   12.00              | 1 02 |
| 2.033  | 3.65   5.        | 000 67         | a6   9.000         | 2 2 0        | 3   12.00              | 1 02 |
| 3 000  | 3.65   6         | 083 67         | 06   9.08.         | 7 2.0        | 3   12.17              | 1 02 |
| 3.083  | 2.03   6.        | .167 67        | .06   9.256        | 2.0          | Prind    11.58         | 1.02 |
| Max.Eff.Inten.(mm/<br>over (m<br>Storage Coeff. (m<br>Unit Hyd. Tpeak (m<br>Unit Hyd. peak (co |                  |                |                    |              |                        |      |
| over (m  | in) 1            | L0.00          | 15.00              |              |                        |      |
| Storage Coeff. (m  | in)=             | 7.59 (ii       | ) 10.96 (          | (ii)         |                        |      |
| Unit Hyd. Tpeak (m   | in)= 1           | 10.00          | 15.00              |              |                        |      |
| Unit Hyd. peak (c  | ms)=             | 0.13           | 0.09               |              |                        |      |
|  |                  |                |                    | *            | TOTALS*                |      |
| PEAK FLOW (ci  | ms)=             | 0.16           | 0.03               |              | 0.181 (iii)            | )    |
| TIME TO PEAK (h  | rs)=             | 6.25           | 6.33               |              | 6.25                   |      |
| RUNOFF VOLUME (  | mm)= 7           | 72.42          | 39.68              |              | 64.89                  |      |
| PEAK FLOW (CI TIME TO PEAK (h<br>RUNOFF VOLUME (I<br>TOTAL RAINFALL (I<br>RUNOFF COEFFICIENT   | mm)= 7           | 74.42          | 74.42              |              | 74.42                  |      |
| RUNOFF COEFFICIENT   | =                | 0.97           | 0.53               |              | 0.87                   |      |
| ADD HYD ( 0460)  |                  |                |                    |              |                        |      |
| 1 + 2 = 3  | AREA             | QPEAK          | TPEAK              | R.V.         |                        |      |
| 1 + 2 - 3  | (ha)             | (cms)          | (hrs)              | (mm)         |                        |      |
| ID1= 1 ( 0205)   | : 1.11           | 0.181          | 6.25               | 64.89        |                        |      |
| ID1= 1 ( 0205)<br>+ ID2= 2 ( 0210)   | : 0.96           | 0.157          | 6.25               | 65.21        |                        |      |
| ID = 3 ( 0460)   |                  |                |                    |              |                        |      |
| NOTE: PEAK FLOWS   |                  |                |                    |              |                        |      |
|  |                  |                |                    |              |                        |      |
|  | OVERFLOW         | TS OFF         |                    |              |                        |      |
| TN 3 CUT 4 I   |                  |                |                    |              |                        |      |
| DT= 5.0 min  | OUTFI OW         | STORAG         | F   OUTS           | -I OW        | STORAGE                |      |
| TN= 2> UUT= 1  <br>DT= 5.0 min   | (cms)            | (ha.m.         | ) ( (cr            | ns)          | (ha.m.)                |      |
|  | 0.0000           | 0.000          | ο i ο.e            | 9733         | 0.0214                 |      |
|  | 0.0274           | 0.002          | 6   0.6            | 9831         | 0.0278                 |      |
|  |                  |                |                    | 440          | 0.0274                 |      |
|  | 0.0478           | 0.008          | 4   0.1            |              |                        |      |
|  | 0.0478<br>0.0619 | 0.008<br>0.014 | 4   0.1<br>9   0.6 | 1449<br>9000 | 0.0374                 |      |
|  | 0.0478<br>0.0619 | 0.008<br>0.014 | 9   0.0            | 0000         | 0.0000                 |      |

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|                    | LangstaffRd_ |        |            |      |            |   |
|--------------------|--------------|--------|------------|------|------------|---|
| 2.167              | 2.03   5.250 |        |            | 3.05 |            | 2 |
| 2.250              | 2.03   5.333 |        | 8.417      | 3.05 | 11.50      | 2 |
| 2.333              | 3.05   5.417 |        |            | 3.05 |            | 1 |
| 2.417              | 3.05   5.500 |        |            | 3.05 |            | 1 |
| 2.500              | 3.05   5.583 |        |            | 3.05 |            | 1 |
| 2.583              | 3.05   5.667 |        |            | 3.05 |            | 2 |
| 2.667              | 3.05   5.750 |        |            | 3.05 |            | 2 |
| 2.750              | 3.05   5.833 | 67.06  | 8.917      | 3.05 | 12.00      | 2 |
| 2.833              | 3.05   5.917 | 67.06  |            | 3.05 |            | 1 |
| 2.917              | 3.05   6.000 |        | 9.083      | 2.03 | 12.17      | 1 |
| 3.000              | 3.05   6.083 | 67.06  | 9.167      | 2.03 | 12.25      | 1 |
| 3.083              | 2.03   6.167 | 67.06  | 9.250      | 2.03 | I          |   |
| Max.Eff.Inten.(mm/ | nr)= 67.06   |        | 44.81      |      |            |   |
| over (m            | in) 5.06     | ) :    | 20.00      |      |            |   |
| Storage Coeff. (m. | in)= 6.25    | (ii) : | 17.37 (ii) |      |            |   |
| Unit Hyd. Tpeak (m | in)= 5.00    | ) :    | 20.00      |      |            |   |
| Unit Hyd. peak (c  | ns)= 0.19    |        | 0.06       |      |            |   |
|                    |              |        |            | *T0  | TALS*      |   |
| PEAK FLOW (cr      | ms)= 0.09    |        | 0.03       | 0    | .119 (iii) |   |
| TIME TO PEAK (h    | rs)= 6.25    |        | 6.42       |      | 6.25       |   |
| RUNOFF VOLUME (    | nm)= 72.42   | ! :    | 39.68      | 5    | 8.33       |   |
| TOTAL RAINFALL (   | nm)= 74.42   |        | 74.42      | 7-   | 4.42       |   |
| RUNOFF COEFFICIENT | = 0.97       |        | 0.53       |      | 0.78       |   |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
- CN\* = 83.0 Ia = Dep. Storage (Above)
  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
  THAN THE STORAGE COEFFICIENT.
  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB | | CALIB | | STANDHYD ( 0195) | |ID= 1 DT= 5.0 min | Area (ha)= 0.79 Total Imp(%)= 75.00 Dir. Conn.(%)= 75.00 IMPERVIOUS 0.59 2.00 1.00 PERVIOUS (i) 0.20 5.00 (mm) = (%) = (m) = Dep. Storage Average Slope 2.00 Length 340.00 20.00 Mannings n 0.013 0.250 NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

> TRANSFORMED HYETOGRAPH TIME RAIN TIME RAIN | TIME RAIN | TIME hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs RAIN

|       | Langs | taffRd_E | A_Propos | ed_WestD | onWaters | hd    |      |
|-------|-------|----------|----------|----------|----------|-------|------|
| 0.250 | 0.00  | 3.333    | 3.05     | 6.417    | 13.21    | 9.50  | 3.05 |
| 0.333 | 1.02  | 3.417    | 3.05     | 6.500    | 13.21    | 9.58  | 2.03 |
| 0.417 | 1.02  | 3.500    | 3.05     | 6.583    | 13.21    | 9.67  | 2.03 |
| 0.500 | 1.02  | 3.583    | 3.05     | 6.667    | 13.21    | 9.75  | 2.03 |
| 0.583 | 2.03  | 3.667    | 3.05     | 6.750    | 13.21    | 9.83  | 2.03 |
| 0.667 | 2.03  | 3.750    | 3.05     | 6.833    | 6.10     | 9.92  | 2.03 |
| 0.750 | 2.03  | 3.833    | 3.05     | 6.917    | 6.10     | 10.00 | 2.03 |
| 0.833 | 1.02  | 3.917    | 3.05     | 7.000    | 6.10     | 10.08 | 2.03 |
| 0.917 | 1.02  | 4.000    | 3.05     | 7.083    | 6.10     | 10.17 | 2.03 |
| 1.000 | 1.02  | 4.083    | 3.05     | 7.167    | 6.10     | 10.25 | 2.03 |
| 1.083 | 2.03  | 4.167    | 3.05     | 7.250    | 6.10     | 10.33 | 2.03 |
| 1.167 | 2.03  | 4.250    | 3.05     | 7.333    | 5.08     | 10.42 | 2.03 |
| 1.250 | 2.03  | 4.333    | 5.08     | 7.417    | 5.08     | 10.50 | 2.03 |
| 1.333 | 1.02  | 4.417    | 5.08     | 7.500    | 5.08     | 10.58 | 1.02 |
| 1.417 | 1.02  | 4.500    | 5.08     | 7.583    | 4.06     | 10.67 | 1.02 |
| 1.500 | 1.02  | 4.583    | 5.08     | 7.667    | 4.06     | 10.75 | 1.02 |
| 1.583 | 2.03  | 4.667    | 5.08     | 7.750    | 4.06     | 10.83 | 2.03 |
| 1.667 | 2.03  | 4.750    | 5.08     | 7.833    | 4.06     | 10.92 | 2.03 |
| 1.750 | 2.03  | 4.833    | 6.10     | 7.917    | 4.06     | 11.00 | 2.03 |
| 1.833 | 1.02  | 4.917    | 6.10     | 8.000    | 4.06     | 11.08 | 1.02 |
| 1.917 | 1.02  | 5.000    | 6.10     | 8.083    | 5.08     | 11.17 | 1.02 |
| 2.000 | 1.02  | 5.083    | 5.08     | 8.167    | 5.08     | 11.25 | 1.02 |
| 2.083 | 2.03  | 5.167    | 5.08     | 8.250    | 5.08     | 11.33 | 2.03 |
| 2.167 | 2.03  | 5.250    | 5.08     | 8.333    | 3.05     | 11.42 | 2.03 |
| 2.250 | 2.03  | 5.333    | 8.13     | 8.417    | 3.05     | 11.50 | 2.03 |
| 2.333 | 3.05  | 5.417    | 8.13     | 8.500    | 3.05     | 11.58 | 1.02 |
| 2.417 | 3.05  | 5.500    | 8.13     | 8.583    | 3.05     | 11.67 | 1.02 |
| 2.500 | 3.05  | 5.583    | 9.14     | 8.667    | 3.05     | 11.75 | 1.02 |
| 2.583 | 3.05  | 5.667    | 9.14     | 8.750    | 3.05     | 11.83 | 2.03 |
| 2.667 | 3.05  | 5.750    | 9.15     | 8.833    | 3.05     | 11.92 | 2.03 |
| 2.750 | 3.05  | 5.833    | 67.06    | 8.917    | 3.05     | 12.00 | 2.03 |
| 2.833 | 3.05  | 5.917    | 67.06    | 9.000    | 3.05     | 12.08 | 1.02 |
| 2.917 | 3.05  | 6.000    | 67.06    | 9.083    | 2.03     | 12.17 | 1.02 |
| 3.000 | 3.05  | 6.083    | 67.06    | 9.167    | 2.03     | 12.25 | 1.02 |
| 3.083 | 2.03  | 6.167    | 67.06    | 9.250    | 2.03     |       |      |

67.06 5.00 6.25 (ii) 5.00 0.19 46.22 10.00 9.77 (ii) over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)= 0.11 \*TOTALS\* PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 0.131 (iii) 6.25 64.23 74.42 a a2 6.25 39.68 74.42 0.97 0.53

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  $CN^*=83.0$  Ia=Dep. Storage (Above) (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

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LangstaffRd\_EA\_Proposed\_WestDonWatershd ata\Local\Temp\ e8da0adc-3b43-467d-984d-5ab4a7d3492c\d7466973 Comments: 50yr-12hrSCS Ptotal= 82.04 mm RAIN | RAIN | TTME TTMF TTMF mm/hr 0.00 2.03 1.02 2.03 mm/hr 3.05 3.05 4.06 3.05 1 ME RAIN hrs mm/hr 6.75 14.22 | 7.00 7.11 | 7.25 6.10 | 7.50 5.08 | 7.75 5.08 | 8.00 5.08 | | IIME | hrs 10.00 10.25 10.50 10.75 mm/hr 3.05 2.03 2.03 1.02 hrs 3.50 3.75 4.00 4.25 0.25 0.50 0.75 1.00 1.25 5.08 6.10 1.02 4.50 11.00 2.03 1.50 4.75 11.25 2.03 6.10 5.08 10.16 10.16 73.15 74.17 8.25 8.50 8.75 9.00 9.25 2.03 1.02 2.03 3.05 3.05 4.06 4.06 3.05 3.05 3.05 1.75 5.00 11.50 1.02 2.00 2.25 2.50 2.75 5.25 5.50 5.75 6.00 6.25

3.25 3.05 | 6.50 15.24 9.75 2.03

| CALIB | | STANDHYD ( 0165)| |ID= 1 DT= 5.0 min | Area (ha)= 0.60 Total Imp(%)= 72.00 Dir. Conn.(%)= 72.00 IMPERVIOUS PERVIOUS (i) (ha)= (mm)= (%)= (m)= 0.43 2.00 1.00 250.00 0.013 0.17 5.00 2.00 20.00 Surface Area Dep. Storage Average Slope Length Mannings n 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

\$FORMED HYETOGR RAIN | TIME mn/hr | TIME mn/hr | TIME mn/hr | Time 3.05 | 6.258 | 3.05 | 6.417 | 3.05 | 6.503 | 3.05 | 6.503 | 3.05 | 6.503 | 3.05 | 6.503 | 3.05 | 6.750 | 3.05 | 6.750 | 4.06 | 7.000 | 4.06 | 7.083 | 3.05 | 7.083 | 3.05 | 7.250 | 7.250 TRANSFORMED HYETOGRAPH RAPH ---RAIN | TIME
mm/hr | hrs
74.17 | 9.33
15.24 | 9.42
15.24 | 9.50 RAIN | mm/hr | 3.05 | TIME hrs 0.083 RAIN | mm/hr | 0.00 | 0.00 | TIME hrs 3.167 mm/hr 3.05 0.167 3.250 0.250 0.00 3.333 3.05 0.333 3.417 15.24 9.58 2.03 2.03 2.03 2.03 3.05 3.05 3.05 0.417 0.500 0.583 0.667 2.03 2.03 1.02 1.02 3.500 3.583 3.667 3.750 14.22 14.22 14.22 7.11 7.11 9.67 9.75 9.83 9.92 3.833 10.00 0.750 1.02 0.833 2.03 3.917 7.11 10.08 2.03 2.03 | 4.000 2.03 | 4.083 1.02 | 4.167 0.917 6.10 10.17 2.03 6.10 2 03

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LangstaffRd\_EA\_Proposed\_WestDonWatershd (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0455)| | 1 + 2 = 3 | (ha) 0.86 (cms) (hrs) 6.25 (mm) 58.33 ID1= 1 ( 0190): + ID2= 2 ( 0195): 0.119 0.79 64.23 ID = 3 ( 0455): 1.65 0.250 6.25 61.16

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOTR( 0555)| OVERFLOW IS OFF RESERVUIK( , IN= 2---> OUT= 1 DT= 5.0 min OUTFLOW OUTFLOW STORAGE STORAGE (cms) 0.0000 0.0104 (ha.m.) 0.0000 0.0024 0.0079 (ha.m.) 0.0199 0.0259 0.0024 | 0.0079 | 0.0139 | 0.0162 0.0825 0.0346 0.0203 0.0000 0.0000 TΡΕΔΚ R V

AREA QPEAK
(ha) (cms)
1.650 0.250
1.650 0.112 (ha) 1.650 1.650 INFLOW: ID= 2 ( 0455) OUTFLOW: ID= 1 ( 0555)

| ADD HYD ( 0465)| | 1 + 2 = 3 | AREA (ha) (cms) 2.07 0.173 (cms) (hrs) 6.42 (mm) 65.03 ID1= 1 ( 0525): + ID2= 2 ( 0555): 1.65 0.112 6.42 61.12 ID = 3 ( 0465): 3.72 0.285

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

\* 

READ STORM | Filename: C:\Users\ray.zhao\AppD

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LangstaffRd\_EA\_Pro 1.02 | 4.250 3. 1.02 | 4.333 5. 2.03 | 4.417 5. 1.167 1.250 1.333 10.58 5.08 1.02 4.417 4.500 4.583 4.667 4.750 4.833 4.917 5.000 1.417 2.03 5.08 7.583 7.667 7.750 7.833 7.917 8.000 8.083 8.167 8.250 8.333 8.417 8.500 8.583 8.667 8.750 10.67 1.02 1.500 2.03 6.10 5.08 5.08 10.75 1.02 2 03 6 10 10 83 1.667 1.750 1.833 1.917 2.03 2.03 2.03 1.02 1.02 6.10 6.10 6.10 6.10 6.10 10.83 10.92 11.00 11.08 11.17 5.083 2.000 2.083 1.02 4.06 11.25 2.03 2.03 5.167 5.08 4.06 11.33 1.02 11.42 11.50 11.58 11.67 11.75 2.167 2.03 5.250 5.333 5.417 5.500 5.583 5.667 5.750 5.833 5.917 6.000 6.083 6.167 5.08 4.06 1.02 2.03 2.03 3.05 3.05 3.05 3.05 3.05 10 16 2.250 2.333 2.417 2.500 2.583 2.03 2.03 2.03 10.16 11.83 1.02 8.833 8.917 9.000 9.083 9.167 9.250 2.667 10.16 3.05 11.92 1.02 2.750 3.05 73.15 3.05 12.00 1.02 2.833 2.917 3.000 3.083 4.06 4.06 4.06 3.05 73.15 | 73.15 | 73.15 | 74.17 | 3.05 3.05 3.05 3.05 3.05 12.08 2.03

Max.Eff.Inten.(mm/hr)= 74.17 53.29 over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 5.00 4.99 (ii) 10.00 8.59 (ii) 5.00 10.00 \*TOTALS\* PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 0.111 (iii) 6.25 80.04 6.25 6.25 70.50 45.99 82.04 82.04 82.04 0.98

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB | STANDHYD ( 0170)| Area (ha)= 0.43 |ID= 1 DT= 5.0 min | Total Imp(%)= 98.00 Dir. Conn.(%)= 98.00 IMPERVIOUS PERVIOUS (i) ha)= 0.42 0.01 Surface Area (ha)=

LangstaffRd\_EA\_Proposed\_WestDonWatershd
Dep. Storage (mm)= 2 00 5 00

| Dep. Storage  | (11111)- | 2.00   | 3.00  |
|---------------|----------|--------|-------|
| Average Slope | (%)=     | 1.00   | 2.00  |
| Length        | (m)=     | 250.00 | 20.00 |
| Mannings n    | =        | 0.013  | 0.250 |
|               |          |        |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|                          | TR/   | NSFORME | D HYETOGRA | ΔPH   |       |       |
|--------------------------|-------|---------|------------|-------|-------|-------|
| TIME RAIN                | TIME  | RAIN    |            | RAIN  |       | RAIN  |
| hrs mm/hr                | hrs   | mm/hr   | ' hrs      | mm/hr |       | mm/hr |
| 0.083 0.00               | 3.167 | 3.05    | 6.250      | 74.17 |       | 3.05  |
|                          | 3.250 | 3.05    | 6.333      | 15.24 |       | 3.05  |
|                          | 3.333 | 3.05    | 6.417      | 15.24 | 9.50  | 3.05  |
|                          | 3.417 |         | 6.500      | 15.24 |       | 2.03  |
| 0.417 2.03               |       | 3.05    |            | 14.22 |       | 2.03  |
|                          | 3.583 |         | 6.667      | 14.22 | 9.75  | 2.03  |
|                          | 3.667 |         | 6.750      | 14.22 |       | 3.05  |
|                          | 3.750 | 3.05    |            | 7.11  | 9.92  | 3.05  |
|                          | 3.833 |         | 6.917      | 7.11  |       | 3.05  |
| 0.833 2.03               | 3.917 | 4.06    | 7.000      | 7.11  | 10.08 | 2.03  |
| 0.917 2.03               | 4.000 | 4.06    | 7.083      | 6.10  | 10.17 | 2.03  |
| 1.000 2.03               | 4.083 | 3.05    | 7.167      | 6.10  | 10.25 | 2.03  |
| 1.083 1.02               | 4.167 | 3.05    | 7.250      | 6.10  | 10.33 | 2.03  |
| 1.167 1.02               | 4.250 | 3.05    | 7.333      | 5.08  | 10.42 | 2.03  |
| 1.250 1.02               | 4.333 | 5.08    | 7.417      | 5.08  | 10.50 | 2.03  |
| 1.333 2.03               | 4.417 | 5.08    | 7.500      | 5.08  | 10.58 | 1.02  |
| 1.417 2.03               | 4.500 | 5.08    | 7.583      | 5.08  | 10.67 | 1.02  |
|                          | 4.583 | 6.10    |            | 5.08  |       | 1.02  |
|                          | 4.667 | 6.10    |            | 5.08  | 10.83 | 2.03  |
|                          | 4.750 | 6.10    | 7.833      | 5.08  |       | 2.03  |
|                          | 4.833 | 6.10    | 7.917      | 5.08  |       | 2.03  |
|                          | 4.917 |         | 8.000      |       | 11.08 | 2.03  |
|                          | 5.000 | 6.10    |            | 4.06  |       | 2.03  |
|                          | 5.083 |         | 8.167      |       | 11.25 | 2.03  |
|                          | 5.167 | 5.08    | 8.250      | 4.06  | 11.33 | 1.02  |
|                          | 5.250 | 5.08    |            | 4.06  | 11.42 | 1.02  |
|                          | 5.333 |         | 8.417      |       | 11.50 | 1.02  |
|                          | 5.417 | 10.16   |            | 4.06  |       | 2.03  |
| 2.417 3.05               |       |         | 8.583      |       | 11.67 | 2.03  |
| 2.500 3.05               |       | 10.16   |            | 3.05  |       | 2.03  |
|                          | 5.667 |         | 8.750      | 3.05  | 11.83 | 1.02  |
|                          | 5.750 |         | 8.833      |       |       | 1.02  |
| 2.750 3.05<br>2.833 4.06 | 5.833 | 73.15   |            | 3.05  | 12.00 | 1.02  |
|                          |       | 73.15   | 9.000      |       | 12.00 |       |
| 2.917 4.06<br>3.000 4.06 | 6.000 | 74.17   | 9.083      | 3.05  | 12.17 | 2.03  |
| 3.083 3.05               |       | 74.17   | 9.250      | 3.05  |       | 2.03  |
| 3.063 3.03               | 0.10/ | /4.1/   | 9.250      | 3.05  | l     |       |
| Max.Eff.Inten.(mm/hr)=   | 74.17 |         | 61.96      |       |       |       |
| over (min)               | 5.00  |         | 10.00      |       |       |       |
| Storage Coeff. (min)=    | 4.99  | (ii)    | 6.10 (ii)  | )     |       |       |
| Unit Hyd. Tpeak (min)=   | 5.00  |         | 10.00      |       |       |       |

74.17 61.96 5.00 10.00 4.99 (ii) 6.10 (ii) 5.00 10.00 Page 133

|                     | Langs | taffRd E | A Propos | ed_WestDon | Waters | hd         |      |
|---------------------|-------|----------|----------|------------|--------|------------|------|
| 1.583               | 2.03  | 4.667    | 6.10     | 7.750      | 5.08   | 10.83      | 2.03 |
| 1.667               | 2.03  | 4.750    | 6.10     | 7.833      | 5.08   | 10.92      | 2.03 |
| 1.750               | 2.03  | 4.833    | 6.10     | 7.917      | 5.08   | 11.00      | 2.03 |
| 1.833               | 1.02  | 4.917    | 6.10     | 8.000      | 5.08   | 11.08      | 2.03 |
| 1.917               | 1.02  | 5.000    | 6.10     | 8.083      | 4.06   | 11.17      | 2.03 |
| 2.000               | 1.02  | 5.083    | 5.08     | 8.167      | 4.06   | 11.25      | 2.03 |
| 2.083               | 2.03  | 5.167    | 5.08     | 8.250      | 4.06   | 11.33      | 1.02 |
| 2.167               | 2.03  | 5.250    | 5.08     | 8.333      | 4.06   | 11.42      | 1.02 |
| 2.250               | 2.03  | 5.333    | 10.16    | 8.417      | 4.06   | 11.50      | 1.02 |
| 2.333               | 3.05  | 5.417    | 10.16    | 8.500      | 4.06   | 11.58      | 2.03 |
| 2.417               | 3.05  | 5.500    | 10.16    | 8.583      | 3.05   | 11.67      | 2.03 |
| 2.500               | 3.05  | 5.583    | 10.16    | 8.667      | 3.05   | 11.75      | 2.03 |
| 2.583               | 3.05  | 5.667    | 10.16    | 8.750      | 3.05   | 11.83      | 1.02 |
| 2.667               | 3.05  | 5.750    | 10.16    | 8.833      | 3.05   | 11.92      | 1.02 |
| 2.750               | 3.05  | 5.833    | 73.15    | 8.917      | 3.05   | 12.00      | 1.02 |
| 2.833               | 4.06  | 5.917    | 73.15    | 9.000      | 3.05   | 12.08      | 2.03 |
| 2.917               | 4.06  | 6.000    | 73.15    | 9.083      | 3.05   | 12.17      | 2.03 |
| 3.000               | 4.06  | 6.083    | 74.17    | 9.167      | 3.05   | 12.25      | 2.03 |
| 3.083               | 3.05  | 6.167    | 74.17    | 9.250      | 3.05   |            |      |
| Max.Eff.Inten.(mm/h | r)=   | 74.17    |          | 53.29      |        |            |      |
| over (mi            |       | 5.00     |          | 15.00      |        |            |      |
|                     | n)=   | 2.24     |          | 11.32 (ii) |        |            |      |
| Unit Hyd. Tpeak (mi |       | 5.00     |          | 15.00      |        |            |      |
| Unit Hyd. peak (cm  |       | 0.30     |          | 0.09       |        |            |      |
| (                   | -,    |          |          |            | *T0    | TALS*      |      |
| PEAK FLOW (cm       | s)=   | 0.07     |          | 0.04       |        | .105 (iii) |      |
| TIME TO PEAK (hr.   |       | 6.25     |          | 6.33       |        | 6.25       |      |
|                     | m)=   | 80.04    |          | 45.99      |        | 3.69       |      |
|                     | m)=   | 82.04    |          | 82.04      |        | 2.04       |      |
| RUNOFF COEFFICIENT  | =     | 0.98     |          | 0.56       |        | 0.78       |      |

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

| THAN THE S        | TORÁGE C | OEFFICIE | NT.    |                |       |
|-------------------|----------|----------|--------|----------------|-------|
| (iii) PEAK FLOW   | DOES NOT | INCLUDE  | BASEFL | OW IF ANY.     |       |
| , ,               |          |          |        |                |       |
|                   |          |          |        |                |       |
|                   |          |          |        |                |       |
| CALIB             |          |          |        |                |       |
| STANDHYD ( 0185)  | Area     | (ha)=    | 0.47   |                |       |
| ID= 1 DT= 5.0 min | Total    | Imp(%)=  | 72.00  | Dir. Conn.(%)= | 72.00 |
|                   |          |          |        |                |       |
|                   |          | IMPERVI  | OUS    | PERVIOUS (i)   |       |
| Surface Area      | (ha)=    | 0.3      | 4      | 0.13           |       |
| Dep. Storage      | (mm)=    | 2.0      | 0      | 5.00           |       |
| Average Slope     | (%)=     | 1.0      | 0      | 2.00           |       |
| Length            | (m)=     | 240.0    | 0      | 20.00          |       |
| Mannings n        | =        | 0.01     | 3      | 0.350          |       |
|                   |          |          |        |                |       |

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### LangstaffRd\_EA\_Proposed\_WestDonWatershd

| Unit Hyd. peak  | (cms)= | 0.22  | 0.15  |             |
|-----------------|--------|-------|-------|-------------|
|                 |        |       |       | *TOTALS*    |
| PEAK FLOW       | (cms)= | 0.09  | 0.00  | 0.088 (iii) |
| TIME TO PEAK    | (hrs)= | 6.25  | 6.25  | 6.25        |
| RUNOFF VOLUME   | (mm)=  | 80.04 | 54.74 | 79.53       |
| TOTAL RAINFALL  | (mm)=  | 82.04 | 82.04 | 82.04       |
| RUNOFF COEFFICI | ENT =  | 0.98  | 0.67  | 0.97        |
|                 |        |       |       |             |

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 89.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |         |       |         |           |       |  |
|-------------------|-------|---------|-------|---------|-----------|-------|--|
| STANDHYD ( 0180)  | Area  | (ha)=   | 0.65  |         |           |       |  |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 52.00 | Dir.    | Conn.(%)= | 52.00 |  |
| ii                |       |         |       |         |           |       |  |
|                   |       | IMPERVI | OUS   | PERVIOL | JS (i)    |       |  |
| Surface Area      | (ha)= | 0.3     | 4     | 0.31    |           |       |  |
| Dep. Storage      | (mm)= | 2.0     | 0     | 5.00    | )         |       |  |
| Average Slope     | (%)=  | 1.0     | 0     | 2.00    | )         |       |  |
| Length            | (m)=  | 65.8    | 3     | 40.00   | )         |       |  |
| Mannings n        | =     | 0.01    | 3     | 0.250   | )         |       |  |
|                   |       |         |       |         |           |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TD    | ANCEODME | HYFTOGR | ADII  |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
|       |       |       |          |         |       |       |       |
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05     | 6.250   | 74.17 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05     | 6.333   | 15.24 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417   | 15.24 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 3.05     | 6.500   | 15.24 | 9.58  | 2.03  |
| 0.417 | 2.03  | 3.500 | 3.05     | 6.583   | 14.22 | 9.67  | 2.03  |
| 0.500 | 2.03  | 3.583 | 3.05     | 6.667   | 14.22 | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 3.05     | 6.750   | 14.22 | 9.83  | 3.05  |
| 0.667 | 1.02  | 3.750 | 3.05     | 6.833   | 7.11  | 9.92  | 3.05  |
| 0.750 | 1.02  | 3.833 | 4.06     | 6.917   | 7.11  | 10.00 | 3.05  |
| 0.833 | 2.03  | 3.917 | 4.06     | 7.000   | 7.11  | 10.08 | 2.03  |
| 0.917 | 2.03  | 4.000 | 4.06     | 7.083   | 6.10  | 10.17 | 2.03  |
| 1.000 | 2.03  | 4.083 | 3.05     | 7.167   | 6.10  | 10.25 | 2.03  |
| 1.083 | 1.02  | 4.167 | 3.05     | 7.250   | 6.10  | 10.33 | 2.03  |
| 1.167 | 1.02  | 4.250 | 3.05     | 7.333   | 5.08  | 10.42 | 2.03  |
| 1.250 | 1.02  | 4.333 | 5.08     | 7.417   | 5.08  | 10.50 | 2.03  |
| 1.333 | 2.03  | 4.417 | 5.08     | 7.500   | 5.08  | 10.58 | 1.02  |
| 1.417 | 2.03  | 4.500 | 5.08     | 7.583   | 5.08  | 10.67 | 1.02  |
| 1.500 | 2.03  | 4.583 | 6.10     | 7.667   | 5.08  | 10.75 | 1.02  |
|       |       |       | Dago     | 124     |       |       |       |

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LangstaffRd\_EA\_Proposed\_WestDonWatershd
NOTE: RAINFALL WAS TRANSFORMED TO 5 0 MTN TIME CITE

| :  | RAINF                   | ALL WAS          | TRANSFORM                              | D TO   | 5.0 MIN.                | TIME STE | Ρ.    |      |
|----|-------------------------|------------------|--|--------|-------------------------|----------|-------|------|
|    |                         |                  |  |        |                         |          |       |      |
|    |                         |                  |  | NCFORM | D HYETOGE               |          |       |      |
|    | TTME                    | RAIN             |  | RAIN   |                         |          | TIME  | DATM |
|    |                         |                  |  |        |                         |          |       |      |
|    |                         | mm/hr            |  | mm/nr  | hrs                     | mm/nr    | l nrs |      |
|    | 0.083                   | 0.00             | 3.167                                  | 3.05   | 6.250                   | /4.1/    | 9.33  | 3.05 |
|    | 0.16/                   | 0.00             | 3.250                                  | 3.05   | 6.333                   | 15.24    | 9.42  | 3.05 |
|    | 0.250                   |                  | 3.333                                  | 3.05   | 6.417                   | 15.24    | 9.50  | 3.05 |
|    | 0.333                   |                  |  | 3.05   | 6.500                   | 15.24    | 9.58  | 2.03 |
|    | 0.417<br>0.500          | 2.03             | 3.500                                  | 3.05   | 6.583                   | 14.22    | 9.67  | 2.03 |
|    | 0.500                   | 2.03             | 3.583                                  |        |                         | 14.22    | 9.75  | 2.03 |
|    | 0.583                   |                  | 3.667                                  | 3.05   | 6.750                   |          |       | 3.05 |
|    | 0.667                   |                  | 3.750                                  | 3.05   | 6.833                   |          | 9.92  | 3.05 |
|    | 0.750                   | 1.02             | 3.833                                  | 4.06   | 6.917                   | 7.11     | 10.00 | 3.05 |
|    | 0.833                   | 2.03             | 3.917                                  | 4.06   | 1 /.000                 | /.11     | 10.08 | 2.03 |
|    | 0.917                   | 2.03             | 4.000                                  | 4.06   | 7.083                   | 6.10     | 10.17 | 2.03 |
|    | 1.000                   | 2.03             | 4.083                                  | 3.05   | 7.167<br>7.250<br>7.333 | 6.10     | 10.25 | 2.03 |
|    | 1.083                   | 1.02             | 4.167                                  | 3.05   | 7.250                   | 6.10     | 10.33 | 2.03 |
|    | 1.167                   | 1.02             | 4.250                                  | 3.05   |                         |          | 10.42 | 2.03 |
|    | 1.250                   | 1.02             | 4.333                                  | 5.08   | 7.417                   |          | 10.50 |      |
|    | 1.333                   | 2.03             | 4.250<br>  4.333<br>  4.417<br>  4.500 | 5.08   | 7.500                   |          | 10.58 | 1.02 |
|    | 1.417                   | 2.03             | 4.500                                  | 5.08   | 7.583                   |          | 10.67 | 1.02 |
|    | 1.500                   |                  | 4.583                                  |        | 7.667                   |          | 10.75 | 1.02 |
|    | 1.583                   | 2.03             | 4.667                                  | 6.10   | 7.750                   |          | 10.83 | 2.03 |
|    | 1.667                   |                  | 4.750                                  |        | 7.833                   |          | 10.92 | 2.03 |
|    | 1.750                   |                  | 4.833                                  |        | 7.917                   |          | 11.00 | 2.03 |
|    | 1.833                   | 1.02             | 4.917                                  | 6.10   | 8.000                   | 5.08     | 11.08 | 2.03 |
|    | 1.833<br>1.917<br>2.000 | 1.02             | 5.000                                  |        | 8.083                   |          | 11.17 | 2.03 |
|    |                         | 1.02             | 5.083                                  | 5.08   | 8.167                   |          | 11.25 | 2.03 |
|    | 2.083                   | 2.03             | 5.167                                  | 5.08   | 8.250                   | 4.06     | 11.33 | 1.02 |
|    | 2.167                   | 2.03             | 5.250                                  | 5.08   | 8.333                   | 4.06     | 11.42 | 1.02 |
|    | 2.250                   | 2.03             | 5.333                                  | 10.16  | 8.417                   | 4.06     | 11.50 | 1.02 |
|    | 2.333                   | 3.05             | 5.417                                  | 10.16  | 8.500                   | 4.06     | 11.58 | 2.03 |
|    | 2.417                   | 3.05             | 5.500                                  | 10.16  | 8.583                   | 3.05     | 11.67 | 2.03 |
|    | 2.500                   | 3.05             | 5.583                                  | 10.16  | 8.667                   | 3.05     | 11.75 | 2.03 |
|    | 2.583                   | 3.05             | 5.667                                  | 10.16  | 8.750                   | 3.05     | 11.83 | 1.02 |
|    | 2.667                   | 3.05             | 5.750                                  | 10.16  | 8.833                   | 3.05     | 11.92 | 1.02 |
|    |                         |                  |  |        |                         |          | 12.00 | 1.02 |
|    |                         |                  | 5.917                                  |        |                         |          | 12.08 | 2.03 |
|    | 2.917                   |                  | 6.000                                  |        | 9.083                   |          | 12.17 | 2.03 |
|    | 3.000                   |                  | 6.083                                  |        |                         |          | 12.25 | 2.03 |
|    | 3.083                   | 3.05             | 6.167                                  | 74.17  | 9.250                   | 3.05     |       |      |
| т. | nten /~                 | m/hr)-           | 74.17                                  |        | 47.96                   |          |       |      |
|    |                         | (min)            |  |        | 10.00                   |          |       |      |
| c  | neff                    | (min)=           | 4 87                                   |        | 9.27 (i                 | i )      |       |      |
| 1  | Tneak                   | (min)=<br>(min)= | 5.00                                   |        | 10.00                   | -,       |       |      |
|    |                         | (cms)=           |  |        | 0.12                    |          |       |      |
|    |                         |                  |  |        |                         |          |       |      |

| Max.Eff.Inten.( | mm/hr)= | 74.17     | 47.96     |             |
|-----------------|---------|-----------|-----------|-------------|
| over            | (min)   | 5.00      | 10.00     |             |
| Storage Coeff.  | (min)=  | 4.87 (ii) | 9.27 (ii) |             |
| Unit Hyd. Tpeak | (min)=  | 5.00      | 10.00     |             |
| Unit Hyd. peak  | (cms)=  | 0.22      | 0.12      |             |
|                 |         |           |           | *TOTALS*    |
| PEAK FLOW       | (cms)=  | 0.07      | 0.02      | 0.085 (iii) |
| TIME TO PEAK    | (hrs)=  | 6.25      | 6.25      | 6.25        |
| RUNOFF VOLUME   | (mm)=   | 80.04     | 41.06     | 69.12       |
|                 |         |           |           |             |

LangstaffRd\_EA\_Proposed\_WestDonWatershd (mm)= 82.04 82.04 82.0 NT = 0.98 0.50 0.8 TOTAL RAINFALL RUNOFF COEFFICIENT

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
- CN\* = 79.0 Ia = Dep. Storage (Above)
  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
  THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0445) <br>  1 + 2 = 3 | AREA<br>(ha) | QPEAK<br>(cms) | TPEAK<br>(hrs) | R.V.  |
|---------------------------------|--------------|----------------|----------------|-------|
| /                               |              |                |                |       |
| ID1= 1 ( 0180):                 | 0.65         | 0.105          | 6.25           | 63.69 |
| + ID2= 2 ( 0185):               | 0.47         | 0.085          | 6.25           | 69.12 |
| ID = 3 ( 0445):                 | 1.12         | 0.190          | 6.25           | 65.97 |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD (<br>  1 + 2 =<br>  ID1=<br>  + ID2= | 1 ( | 0165): | AREA<br>(ha)<br>0.60<br>0.43 | QPEAK<br>(cms)<br>0.111<br>0.088 | TPEAK<br>(hrs)<br>6.25<br>6.25 | R.V.<br>(mm)<br>70.50<br>79.53 |
|--|-----|--------|------------------------------|----------------------------------|--------------------------------|--------------------------------|
| ID =   | 3 ( | 0450): | 1.03                         | 0.199                            | 6.25                           | 74.27                          |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD ( 0450)   |      |       |       |       |
|-------------------|------|-------|-------|-------|
| 3 + 2 = 1         | AREA | QPEAK | TPEAK | R.V.  |
|                   | (ha) | (cms) | (hrs) | (mm)  |
| ID1= 3 ( 0450):   | 1.03 | 0.199 | 6.25  | 74.27 |
| + ID2= 2 ( 0445): | 1.12 | 0.190 | 6.25  | 65.97 |
| ================= |      |       |       |       |
| ID = 1 ( 0450):   | 2.15 | 0.389 | 6.25  | 69.94 |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

|                  |          |         | <br>    |         |  |
|------------------|----------|---------|---------|---------|--|
|                  |          |         |         |         |  |
| RESERVOIR( 0520) | OVERFLOW | IS OFF  |         |         |  |
| IN= 2> OUT= 1    |          |         |         |         |  |
| DT= 5.0 min      | OUTFLOW  | STORAGE | OUTFLOW | STORAGE |  |
|                  | (cms)    | (ha.m.) | (cms)   | (ha.m.) |  |
|                  |          |         |         |         |  |

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| LangstaffRd EA Proposed WestDonWatershd |      |       |       |            |      |           |      |  |
|---|------|-------|-------|------------|------|-----------|------|--|
| 1.750                                   | 2.03 | 4.833 | 6.10  | 7.917      | 5.08 | 11.00     | 2.03 |  |
| 1.833                                   | 1.02 | 4.917 | 6.10  | 8.000      | 5.08 | 11.08     | 2.03 |  |
| 1.917                                   | 1.02 | 5.000 | 6.10  | 8.083      | 4.06 | 11.17     | 2.03 |  |
| 2.000                                   | 1.02 | 5.083 | 5.08  | 8.167      | 4.06 | 11.25     | 2.03 |  |
| 2.083                                   | 2.03 | 5.167 | 5.08  | 8.250      | 4.06 | 11.33     | 1.02 |  |
| 2.167                                   | 2.03 | 5.250 | 5.08  | 8.333      | 4.06 | 11.42     | 1.02 |  |
| 2.250                                   | 2.03 | 5.333 | 10.16 | 8.417      | 4.06 | 11.50     | 1.02 |  |
| 2.333                                   | 3.05 | 5.417 | 10.16 | 8.500      | 4.06 | 11.58     | 2.03 |  |
| 2.417                                   | 3.05 | 5.500 | 10.16 | 8.583      | 3.05 | 11.67     | 2.03 |  |
| 2.500                                   | 3.05 | 5.583 | 10.16 | 8.667      | 3.05 | 11.75     | 2.03 |  |
| 2.583                                   | 3.05 | 5.667 | 10.16 | 8.750      | 3.05 | 11.83     | 1.02 |  |
| 2.667                                   | 3.05 | 5.750 | 10.16 | 8.833      | 3.05 | 11.92     | 1.02 |  |
| 2.750                                   | 3.05 | 5.833 | 73.15 | 8.917      | 3.05 | 12.00     | 1.02 |  |
| 2.833                                   | 4.06 | 5.917 | 73.15 | 9.000      | 3.05 | 12.08     | 2.03 |  |
| 2.917                                   | 4.06 | 6.000 | 73.15 | 9.083      | 3.05 | 12.17     | 2.03 |  |
| 3.000                                   | 4.06 | 6.083 | 74.17 | 9.167      | 3.05 | 12.25     | 2.03 |  |
| 3.083                                   | 3.05 | 6.167 | 74.17 | 9.250      | 3.05 | l         |      |  |
| Max.Eff.Inten.(mm/                      | hr)= | 74.17 |       | 57.55      |      |           |      |  |
| over (m                                 |      | 10.00 |       | 20.00      |      |           |      |  |
|   | in)= |       | (ii)  | 16.64 (ii) |      |           |      |  |
| Unit Hyd. Tpeak (m                      |      | 10.00 | (/    | 20.00      |      |           |      |  |
|   | ms)= | 0.13  |       | 0.06       |      |           |      |  |
| , p (                                   |      |       |       |            | *T0  | TALS*     |      |  |
| PEAK FLOW (c                            | ms)= | 0.46  |       | 0.08       |      | .536 (iii | )    |  |
|   | rs)= | 6.25  |       | 6.42       |      | 5.25      | ,    |  |
|   | mm)= | 80.04 |       | 50.13      |      | 2.86      |      |  |
|   | mm)= | 82.04 |       | 82.04      |      | 2.04      |      |  |
| RUNOFF COEFFICIENT                      | ´=   | 0.98  |       | 0.61       |      | 2.89      |      |  |
|   |      |       |       |            |      |           |      |  |
|   |      |       |       |            |      |           |      |  |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

- CN\* = 86.0 Ia = Dep. Storage (Above)
  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
  THAN THE STORAGE COEFFICIENT.
  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| l cauro l         |       |                |                |       |
|-------------------|-------|----------------|----------------|-------|
| CALIB             |       |                |                |       |
| STANDHYD ( 0135)  | Area  | (ha)= 1.43     | 3              |       |
| ID= 1 DT= 5.0 min | Total | Imp(%) = 99.06 | Dir. Conn.(%)= | 99.00 |
|                   |       |                |                |       |
|                   |       | IMPERVIOUS     | PERVIOUS (i)   |       |
| Surface Area      | (ha)= | 1.42           | 0.01           |       |
| Dep. Storage      | (mm)= | 2.00           | 5.00           |       |
| Average Slope     | `(%)= | 1.00           | 2.00           |       |
| Length            | (m)=  | 503.00         | 30.00          |       |
|                   |       |                |                |       |
| Mannings n        | =     | 0.013          | 0.250          |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

LangstaffRd\_EA\_Proposed\_WestDonWatershd 0.0000 0.0000 0.0181 0.0203 0.0552 0.0732 0.0123 0.0192 0.0224 0.1152

(cms) 0.389 0.022 (ha) 2.150 (hrs) INFLOW: ID= 2 ( 0450) OUTFLOW: ID= 1 ( 0520) 6.25 8.50 2.150 69.88

PEAK FLOW REDUCTION [Qout/Qin](%)= 5.59TIME SHIFT OF PEAK FLOW (min)=135.00MAXIMUM STORAGE USED (ha.m.)= 0.1021

CAL TB Area (ha)= 3.05 Total Imp(%)= 76.00 Dir. Conn.(%)= 76.00 IMPERVIOUS PERVIOUS (i) Surface Area

(ha)= (mm)= (%)= (m)= 2.32 2.00 1.00 0.73 5.00 Dep. Storage Average Slope Length Mannings n 2.00 531.00 40.00 0.013 0 250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TRANSFORMED HYETOGRAPH TIME RAIN | TIME RAIN | TIME RAIN | TIME mm/hr | hrs RAIN mm/hr 0.00 0.00 2.03 2.03 2.03 mm/hr 3.05 3.05 3.05 3.05 3.05 3.05 mm/hr 3.05 3.05 3.05 2.03 2.03 9.33 9.42 9.50 9.58 9.67 9.75 9.83 9.92 10.00 10.08 10.17 10.25 10.33 hrs 0.083 0.167 0.250 0.333 0.417 0.500 0.583 0.667 hrs 3.167 mm/hr 74.17 | 15.24 | 15.24 | 15.24 | 14.22 | 14.22 | 3.65 | 6.250 3.65 | 6.333 3.65 | 6.417 3.65 | 6.583 3.65 | 6.667 3.65 | 6.667 3.65 | 6.750 4.66 | 7.083 3.65 | 7.250 3.65 | 7.250 3.65 | 7.250 3.65 | 7.333 3.65 | 7.333 3.65 | 7.583 6.10 | 7.697 5.08 | 7.417 5.08 | 7.583 6.10 | 7.687 6.10 | 7.687 6.10 | 7.833 3.167 3.250 3.333 3.417 3.500 3.583 2.03 1.02 3.667 3.750 14.22 3.05 7.11 7.11 7.11 6.10 6.10 6.10 5.08 1.02 3.05 0.667 0.750 0.833 0.917 1.000 1.083 1.167 1.02 2.03 2.03 2.03 1.02 1.02 3.05 2.03 2.03 2.03 2.03 2.03 3.833 3.917 4.000 4.083 4.167 4.250 4.333 4.417 4.500 4.583 4.667 4.750 1.250 1.02 5.08 5.08 10.50 10.58 2.03 2.03 1.02 1.417 1.500 1.583 1.667 2.03 2.03 2.03 2.03 2.03 5.08 | 5.08 | 5.08 | 5.08 | 10.67 10.75 10.83 10.92 1.02 1.02 2.03 2.03

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LangstaffRd FA Proposed WestDonWatershd

| L                      | angstaffRd_E |       |          |       |           |      |
|------------------------|--------------|-------|----------|-------|-----------|------|
|                        |              |       | HYETOGR  |       |           |      |
|                        | IN   TIME    | RAIN  |          | RAIN  |           |      |
|                        | hr hrs       |       | ' hrs    |       |           |      |
|                        | 00   3.167   |       | 6.250    |       |           | 3.05 |
|                        | 00   3.250   | 3.05  |          | 15.24 |           | 3.05 |
|                        | 00   3.333   |       | 6.417    | 15.24 |           | 3.05 |
|                        | 03   3.417   | 3.05  |          | 15.24 |           | 2.03 |
|                        | 03   3.500   |       | 6.583    | 14.22 |           | 2.03 |
|                        | 03   3.583   | 3.05  |          | 14.22 |           | 2.03 |
|                        | 02   3.667   |       | 6.750    | 14.22 |           | 3.05 |
| 0.667 1.               | 02   3.750   | 3.05  | 6.833    | 7.11  | 9.92      | 3.05 |
|                        | 02   3.833   | 4.06  | 6.917    | 7.11  |           | 3.05 |
| 0.833 2.               | 03   3.917   | 4.06  | 7.000    | 7.11  | 10.08     | 2.03 |
| 0.917 2.               | 03   4.000   | 4.06  | 7.083    | 6.10  | 10.17     | 2.03 |
| 1.000 2.               | 03   4.083   | 3.05  | 7.167    | 6.10  | 10.25     | 2.03 |
| 1.083 1.               | 02   4.167   | 3.05  | 7.250    | 6.10  | 10.33     | 2.03 |
| 1.167 1.               | 02   4.250   | 3.05  | 7.333    | 5.08  | 10.42     | 2.03 |
| 1.250 1.               | 02   4.333   | 5.08  | 7.417    | 5.08  | 10.50     | 2.03 |
| 1.333 2.               | 03   4.417   | 5.08  | 7.500    | 5.08  | 10.58     | 1.02 |
| 1.417 2.               | 03   4.500   | 5.08  | 7.583    | 5.08  | 10.67     | 1.02 |
| 1.500 2.               | 03   4.583   | 6.10  | 7.667    | 5.08  | 10.75     | 1.02 |
| 1.583 2.               | 03   4.667   | 6.10  | 7.750    | 5.08  | 10.83     | 2.03 |
| 1.667 2.               | 03   4.750   | 6.10  | 7.833    | 5.08  | 10.92     | 2.03 |
| 1.750 2.               | 03   4.833   | 6.10  | 7.917    | 5.08  | 11.00     | 2.03 |
| 1.833 1.               | 02   4.917   | 6.10  | 8.000    | 5.08  | 11.08     | 2.03 |
| 1.917 1.               | 02   5.000   | 6.10  | 8.083    | 4.06  | 11.17     | 2.03 |
| 2.000 1.               | 02   5.083   | 5.08  | 8.167    | 4.06  | 11.25     | 2.03 |
| 2.083 2.               | 03   5.167   | 5.08  | 8.250    | 4.06  | 11.33     | 1.02 |
| 2.167 2.               | 03   5.250   | 5.08  | 8.333    | 4.06  | 11.42     | 1.02 |
| 2.250 2.               | 03   5.333   | 10.16 | 8.417    | 4.06  | 11.50     | 1.02 |
| 2.333 3.               | 05   5.417   | 10.16 | 8.500    | 4.06  | 11.58     | 2.03 |
| 2.417 3.               | 05   5.500   | 10.16 | 8.583    | 3.05  | 11.67     | 2.03 |
| 2.500 3.               | 05   5.583   | 10.16 | 8.667    | 3.05  | 11.75     | 2.03 |
| 2.583 3.               | 05   5.667   | 10.16 | 8.750    | 3.05  | 11.83     | 1.02 |
| 2.667 3.               | 05   5.750   | 10.16 | 8.833    | 3.05  | 11.92     | 1.02 |
|                        | 05   5.833   |       | 8.917    | 3.05  | 12.00     | 1.02 |
| 2.833 4.               | 06   5.917   | 73.15 | 9.000    | 3.05  | 12.08     | 2.03 |
| 2.917 4.               | 06   6.000   | 73.15 | 9.083    | 3.05  | 12.17     | 2.03 |
| 3.000 4.               | 06   6.083   | 74.17 | 9.167    | 3.05  | 12.25     | 2.03 |
| 3.083 3.               | 05   6.167   | 74.17 | 9.250    | 3.05  |           |      |
|                        |              |       |          |       |           |      |
| Max.Eff.Inten.(mm/hr)= | 74.17        | !     | 54.69    |       |           |      |
| over (min)             | 10.00        |       | 10.00    |       |           |      |
| Storage Coeff. (min)=  | 7.59         | (ii)  | 8.65 (ii | )     |           |      |
| Unit Hyd. Tpeak (min)= | 10.00        |       | 10.00    |       |           |      |
| Unit Hyd. peak (cms)=  | 0.13         |       | 0.12     |       |           |      |
|                        |              |       |          | *T0T  | ALS*      |      |
| PEAK FLOW (cms)=       | 0.28         |       | 0.00     | 0.    | 285 (iii) | )    |
| TIME TO PEAK (hrs)=    | 6.25         |       | 6.25     |       | .25       |      |
| RUNOFF VOLUME (mm)=    | 80.04        |       | 47.32    | 79    | .71       |      |
| TOTAL RAINFALL (mm)=   | 82.04        |       | 82.04    | 82    | 2.04      |      |
| RUNOFF COEFFICIENT =   | 0.98         |       | 0.58     | 6     | .97       |      |
|                        |              |       |          |       |           |      |

### LangstaffRd\_EA\_Proposed\_WestDonWatershd

| CALIB | STANDHYD ( 0140)| |ID= 1 DT= 5.0 min | Area (ha)= 1.27 Total Imp(%)= 91.00 Dir. Conn.(%)= 91.00 PERVIOUS (i) Surface Area 1.16 0.11 5.00 (mm)= (%)= (m)= Dep. Storage Average Slope 1.00 2.00 Length Mannings n 25.00 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR/   | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05     | 6.250   | 74.17 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05     | 6.333   | 15.24 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417   | 15.24 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 3.05     | 6.500   | 15.24 | 9.58  | 2.03  |
| 0.417 | 2.03  | 3.500 | 3.05     | 6.583   | 14.22 | 9.67  | 2.03  |
| 0.500 | 2.03  | 3.583 | 3.05     | 6.667   | 14.22 | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 3.05     | 6.750   | 14.22 | 9.83  | 3.05  |
| 0.667 | 1.02  | 3.750 | 3.05     | 6.833   | 7.11  | 9.92  | 3.05  |
| 0.750 | 1.02  | 3.833 | 4.06     | 6.917   | 7.11  | 10.00 | 3.05  |
| 0.833 | 2.03  | 3.917 | 4.06     | 7.000   | 7.11  | 10.08 | 2.03  |
| 0.917 | 2.03  | 4.000 | 4.06     | 7.083   | 6.10  | 10.17 | 2.03  |
| 1.000 | 2.03  | 4.083 | 3.05     | 7.167   | 6.10  | 10.25 | 2.03  |
| 1.083 | 1.02  | 4.167 | 3.05     | 7.250   | 6.10  | 10.33 | 2.03  |
| 1.167 | 1.02  | 4.250 | 3.05     | 7.333   | 5.08  | 10.42 | 2.03  |
| 1.250 | 1.02  | 4.333 | 5.08     | 7.417   | 5.08  | 10.50 | 2.03  |
| 1.333 | 2.03  | 4.417 | 5.08     | 7.500   | 5.08  | 10.58 | 1.02  |
| 1.417 | 2.03  | 4.500 | 5.08     | 7.583   | 5.08  | 10.67 | 1.02  |
| 1.500 | 2.03  | 4.583 | 6.10     | 7.667   | 5.08  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 6.10     | 7.750   | 5.08  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 6.10     | 7.833   | 5.08  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 6.10     | 7.917   | 5.08  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 6.10     | 8.000   | 5.08  | 11.08 | 2.03  |
| 1.917 | 1.02  | 5.000 | 6.10     | 8.083   | 4.06  | 11.17 | 2.03  |
| 2.000 | 1.02  | 5.083 | 5.08     | 8.167   | 4.06  | 11.25 | 2.03  |
| 2.083 | 2.03  | 5.167 | 5.08     | 8.250   | 4.06  | 11.33 | 1.02  |
| 2.167 | 2.03  | 5.250 | 5.08     | 8.333   | 4.06  | 11.42 | 1.02  |
| 2.250 | 2.03  | 5.333 | 10.16    | 8.417   | 4.06  | 11.50 | 1.02  |
|       |       |       |          |         |       |       |       |

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```
INFLOW: ID= 2 ( 0420)
OUTFLOW: ID= 1 ( 0530)
                                                         0.531
                                                                     6.25
7.25
                                          2.700
                                                                                       78.31
                         PEAK FLOW REDUCTION [Qout/Qin](%)= 8.96
TIME SHIFT OF PEAK FLOW (min)= 60.00
MAXIMUM STORAGE USED (ha.m.)= 0.144
                                                                 (min)= 60.00
(ha.m.)= 0.1448
ADD HYD ( 0425)|
1 + 2 = 3 |
                                                QPEAK
(cms)
0.536
0.048
                                                                         R.V.
(mm)
72.86
78.31
                                       ΔRFΔ
                                                              TΡΕΔΚ
                                      (ha)
3.05
2.70
                                                              (hrs)
6.25
7.25
      ID1= 1 ( 0145):
+ ID2= 2 ( 0530):
        ID = 3 ( 0425):
                                      5.75 0.565
                                                              6.25
                                                                         75.42
     NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
 RESERVOIR( 0512)|
IN= 2---> OUT= 1 |
DT= 5.0 min |
                                 OUTFLOW
                                                STORAGE
                                                                  OUTFLOW
                                  (cms)
0.0000
                                                (ha.m.)
                                                                   (cms)
0.0471
                                                                                  (ha.m.)
0.1003
                                                  0.0000
                                  0.0071
0.0098
                                                  0.0165
                                                                    0.0636
0.0763
                                                                                    0.1284
                                                 0.0331
0.0526
0.0750
                                  0.0119
0.0138
                                                                    0.0870
0.0964
                                                                                    0.1934
0.2308
                                                       QPEAK
                                                                     TPEAK
                                                                                     R.V.
                                           AREA
                                                       (cms)
0.565
0.080
                                                                     (hrs)
6.25
8.50
                                                                                     (mm)
75.42
75.32
                                           (ha)
5.750
   INFLOW: ID= 2 ( 0425)
OUTFLOW: ID= 1 ( 0512)
                                          5.750
                         ......
CALIB
| STANDHYD ( 0215)|
|ID= 1 DT= 5.0 min |
                              Area (ha)= 0.58
Total Imp(%)= 81.00
                                                            Dir. Conn.(%)= 81.00
                                                           PERVIOUS (i)
                                        IMPERVIOUS
      Surface Area
                             (ha)=
                                             0.47
2.00
                                                               0.11
5.00
     Dep. Storage
Average Slope
Length
                             (mm)=
(%)=
(m)=
                                              1 00
                                                                2 00
                                           260.00
                                                              30.00
```

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```
LangstaffRd EA Proposed WestDonWatershd
3.65 | 5.417 | 10.16 | 8.500 | 4.06 | 1
3.65 | 5.500 | 10.16 | 8.500 | 3.05 | 1
3.65 | 5.533 | 10.16 | 8.657 | 3.05 | 1
3.65 | 5.657 | 10.16 | 8.750 | 3.05 | 1
3.65 | 5.750 | 10.16 | 8.833 | 3.05 | 1
3.05 | 5.750 | 10.16 | 8.833 | 3.05 | 1
3.05 | 5.730 | 73.15 | 8.917 | 3.05 | 3.05 | 1
4.06 | 5.917 | 73.15 | 9.000 | 3.05 | 1
4.06 | 6.000 | 73.15 | 9.083 | 3.05 | 1
4.06 | 6.083 | 74.17 | 9.167 | 3.05 | 1
3.05 | 6.167 | 74.17 | 9.250 | 3.05 |
                                                                                                                                                                   NWatershd
4.06 | 11.58
3.05 | 11.67
3.05 | 11.75
3.05 | 11.83
3.05 | 11.92
3.05 | 12.00
3.05 | 12.08
3.05 | 12.17
                                             2.333
                                             2.417
                                             2.417
2.500
2.583
2.667
2.750
2.833
                                                                                                                                                                                                                   2.03
1.02
1.02
1.02
2.03
                                             2.917
                                                                                                                                                                                                                    2.03
                                             3.000
                                                                                                                                                                                        12.25
                                             3.083
            Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                                                                                                      53 29
                                                                                               74.17
10.00
7.59 (ii)
10.00
0.13
                                                                                                                                     10.00
9.97 (ii)
                                                                                                                                     10.00
                                                                                                                                                                             *TOTALS*
                                                                                                                                                                                0.246 (iii)
6.25
76.97
82.04
             PEAK FLOW
                                                                                                 0.23
                                                                                                                                        0.01
             TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                                                               6.25
80.04
82.04
0.98
                                                                                                                                    6.25
45.99
82.04
0.56
                   (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             (1) ON PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN* = 83.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
| ADD HYD ( 0420)|
| 1 + 2 = 3 |
                                                                                   AREA
(ha)
1.43
1.27
                                                                                                      QPEAK
(cms)
0.285
0.246
                                                                                                                                    TPEAK
(hrs)
6.25
6.25
                                                                                                                                                           R.V.
(mm)
79.71
76.97
              ID1= 1 ( 0135):
+ ID2= 2 ( 0140):
                 ID = 3 ( 0420):
                                                                                  2.70 0.531
                                                                                                                                   6.25
                                                                                                                                                           78.42
            NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
   RESERVOIR( 0530)|
IN= 2---> OUT= 1 |
DT= 5.0 min |
                                                                       OUTFLOW
                                                                                                         STORAGE
                                                                                                                                             OUTFLOW
                                                                                                                                                                             (ha.m.)
0.0823
0.1093
0.1598
                                                                          (cms)
0.0000
                                                                                                         (ha.m.)
0.0000
                                                                                                                                                (cms)
0.0122
                                                                                                                                                0.0382
0.0516
0.0000
                                                                           0.0056
0.0084
                                                                                                          0.0072
                                                                                                                      Page 142
```

LangstaffRd\_EA\_Proposed\_WestDonWatershd = 0.013 0.250 Mannings n

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|     | NOTE.     | KATIVI | ALL WAS     | INANSFORM | -0 10     | J. O PIIN. | I I I I I I I I | .r.       |      |
|-----|-----------|--------|-------------|-----------|-----------|------------|-----------------|-----------|------|
|     |           |        |             |           |           |            |                 |           |      |
|     |           |        |             | TD        | NIC EODMI | D HYETOGR  | ADLI .          |           |      |
|     |           | TIM    | RAIN        |           | RAIN      |            | RAIN            |           | RAIN |
|     |           | hrs    |             |           | mm/hr     | ' hrs      |                 |           |      |
|     |           | 0.08   |             | 3.167     |           | 6.250      | 74.17           |           | 3.05 |
|     |           | 0.16   |             | 3.250     |           | 6.333      | 15.24           |           | 3.05 |
|     |           | 0.25   |             | 3.333     |           | 6.417      | 15.24           |           | 3.05 |
|     |           | 0.33   |             | 3.417     |           | 6.500      | 15.24           |           | 2.03 |
|     |           | 0.41   |             | 3.500     | 2.05      | 6.583      | 14 22           | 9.67      | 2.03 |
|     |           | 0.500  |             | 3.583     |           | 6.667      |                 | 9.75      | 2.03 |
|     |           | 0.583  |             | 3.667     |           | 6.750      |                 | 9.83      | 3.05 |
|     |           | 0.66   |             | 3.750     |           | 6.833      | 7.11            |           | 3.05 |
|     |           | 0.75   |             | 3.833     |           | 6.917      | 7.11            |           | 3.05 |
|     |           | 0.833  |             | 3.917     |           | 7.000      | 7.11            |           | 2.03 |
|     |           | 0.91   | 7 2.03      |           |           | 7.083      | 6.10            |           | 2.03 |
|     |           | 1.000  |             | 4.083     |           | 7.167      |                 | 10.17     | 2.03 |
|     |           | 1.08   |             | 4.167     |           | 7.250      | 6.10            |           | 2.03 |
|     |           | 1.16   |             | 4.250     |           | 7.333      |                 | 10.42     | 2.03 |
|     |           | 1.256  |             | 4.230     |           | 7.417      | 5.08            |           | 2.03 |
|     |           | 1.33   |             | 4.417     |           | 7.500      |                 | 10.58     | 1.02 |
|     |           | 1.41   |             | 4.500     |           | 7.583      | 5.08            |           | 1.02 |
|     |           | 1.500  |             | 4.583     |           | 7.667      |                 | 10.75     | 1.02 |
|     |           | 1.583  |             | 4.667     |           | 7.750      | 5.08            |           | 2.03 |
|     |           | 1.66   |             | 4.750     |           | 7.730      | 5.08            |           | 2.03 |
|     |           | 1.75   |             | 4.833     |           | 7.917      | 5.08            |           | 2.03 |
|     |           | 1.83   |             | 4.917     |           | 8.000      | 5.08            |           | 2.03 |
|     |           | 1.91   |             | 5.000     |           | 8.083      | 4.06            |           | 2.03 |
|     |           | 2.000  |             | 5.083     |           |            | 4.06            |           | 2.03 |
|     |           | 2.08   |             | 5.167     |           | 8.250      |                 | 11.23     | 1.02 |
|     |           | 2.16   |             | 5.250     |           |            | 4.06            |           | 1.02 |
|     |           | 2.25   | 2.03        | 5.333     |           | 8.417      |                 | 11.50     | 1.02 |
|     |           | 2.33   |             | 5.417     |           | 8.500      | 4.06            |           | 2.03 |
|     |           | 2.41   |             | 5.500     |           | 8.583      |                 | 11.67     | 2.03 |
|     |           | 2.500  |             | 5.583     |           | 8.667      | 3.05            |           | 2.03 |
|     |           | 2.583  | 3 05        | 5.667     | 10.10     | 8.750      |                 | 11.83     | 1.02 |
|     |           | 2.66   |             | 5.750     |           | 8.833      | 3.05            |           | 1.02 |
|     |           | 2.75   |             | 5.833     |           | 8.917      | 3.05            |           | 1.02 |
|     |           | 2.83   |             | 5.917     |           | 9.000      | 3.05            |           | 2.03 |
|     |           | 2.91   |             | 6.000     |           | 9.083      | 3.05            |           | 2.03 |
|     |           | 3.000  |             | 6.083     |           | 9.167      | 3.05            |           | 2.03 |
|     |           | 3.083  |             | 6.167     |           | 9.250      |                 |           | 2.03 |
|     |           | 5.00.  | , 3.03      | 0.107     | /4.1/     | 7 3.230    | 5.05            | '         |      |
| м   | ax.Eff.In | tan (r | m/hr)-      | 74.17     |           | 53.29      |                 |           |      |
| 110 | ux.L11.11 |        | (min)       | 5.00      |           | 10.00      |                 |           |      |
| Ç.  | torage Co |        | (min)=      |           | (ii)      | 8.86 (ii   | )               |           |      |
|     | nit Hyd.  |        |             | 5.00      |           | 10.00      | ,               |           |      |
|     | nit Hyd.  |        |             | 0.21      |           | 0.12       |                 |           |      |
| U   | niic nyu. | peak   | ( - ( -     | 0.21      |           | 0.12       | ****            | TALS*     |      |
| р   | EAK FLOW  |        | (cms)=      | 0.10      |           | 0.01       |                 | .111 (iii | )    |
|     | LAN I LOW |        | ( = 113 ) = | 0.10      |           | 5.01       |                 |           | ,    |
|     |           |        |             |           |           |            |                 |           |      |

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|                 | Lang   | staffRd_EA_P | roposed_WestDor | Watershd |
|-----------------|--------|--------------|-----------------|----------|
| TIME TO PEAK    | (hrs)= | 6.25         | 6.25            | 6.25     |
| RUNOFF VOLUME   | (mm)=  | 80.04        | 45.99           | 73.56    |
| TOTAL RAINFALL  | (mm)=  | 82.04        | 82.04           | 82.04    |
| RUNOFF COEFFICI | ENT =  | 0.98         | 0.56            | 0.90     |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
- CN\* = 83.0 SIa = Dep. Storage (Above)
  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
  THAN THE STORAGE COEFFICIENT.
  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

Area (ha)= 0.65 Total Imp(%)= 66.00 Dir. Conn.(%)= 66.00 TMPERVTOUS PERVIOUS (i) Surface Area Dep. Storage Average Slope Length (ha)= (mm)= (%)= (m)= Mannings n 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR/   | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05     | 6.250   | 74.17 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05     | 6.333   | 15.24 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417   | 15.24 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 3.05     | 6.500   | 15.24 | 9.58  | 2.03  |
| 0.417 | 2.03  | 3.500 | 3.05     | 6.583   | 14.22 | 9.67  | 2.03  |
| 0.500 | 2.03  | 3.583 | 3.05     | 6.667   | 14.22 | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 3.05     | 6.750   | 14.22 | 9.83  | 3.05  |
| 0.667 | 1.02  | 3.750 | 3.05     | 6.833   | 7.11  | 9.92  | 3.05  |
| 0.750 | 1.02  | 3.833 | 4.06     | 6.917   | 7.11  | 10.00 | 3.05  |
| 0.833 | 2.03  | 3.917 | 4.06     | 7.000   | 7.11  | 10.08 | 2.03  |
| 0.917 | 2.03  | 4.000 | 4.06     | 7.083   | 6.10  | 10.17 | 2.03  |
| 1.000 | 2.03  | 4.083 | 3.05     | 7.167   | 6.10  | 10.25 | 2.03  |
| 1.083 | 1.02  | 4.167 | 3.05     | 7.250   | 6.10  | 10.33 | 2.03  |
| 1.167 | 1.02  | 4.250 | 3.05     | 7.333   | 5.08  | 10.42 | 2.03  |
| 1.250 | 1.02  | 4.333 | 5.08     | 7.417   | 5.08  | 10.50 | 2.03  |
| 1.333 | 2.03  | 4.417 | 5.08     | 7.500   | 5.08  | 10.58 | 1.02  |
| 1.417 | 2.03  | 4.500 | 5.08     | 7.583   | 5.08  | 10.67 | 1.02  |
| 1.500 | 2.03  | 4.583 | 6.10     | 7.667   | 5.08  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 6.10     | 7.750   | 5.08  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 6.10     | 7.833   | 5.08  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 6.10     | 7.917   | 5.08  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 6.10     | 8.000   | 5.08  | 11.08 | 2.03  |
|       |       |       |          |         |       |       |       |

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|                  | Lang  | LangstaffRd_EA_Proposed_WestDonWatershd |                |                |              |  |  |  |
|------------------|-------|---|----------------|----------------|--------------|--|--|--|
|                  | 0.00  | 900 0                                   | .0000          | 0.0116         | 0.0367       |  |  |  |
|                  | 0.00  | 953 0                                   | .0048          | 0.0131         | 0.0474       |  |  |  |
|                  | 0.00  | 980 0                                   | .0154          | 0.0202         | 0.0639       |  |  |  |
|                  | 0.01  | 100 0                                   | .0261          | 0.0000         | 0.0000       |  |  |  |
|                  |       | AREA<br>(ha)                            | QPEAK<br>(cms) | TPEAK<br>(hrs) | R.V.<br>(mm) |  |  |  |
| INFLOW : ID= 2 ( | 0470) | 1.230                                   | 0.228          | 6.25           | 70.87        |  |  |  |
| OUTFLOW: ID= 1 ( | 0535) | 1.230                                   | 0.017          | 7.42           | 70.69        |  |  |  |

TMPERVTOUS PERVIOUS (i)

(ha)= (mm)= (%)= (m)= 0.50 2.00 1.00 320.00 0.10 5.00 2.00 10.00 Dep. Storage Average Slope Length Mannings n 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TRANSFORMED HYETOGRAPH ME RAIN | TIME F rs mm/hr | hrs mn 67 3.05 | 6.250 74. RAIN | TIME mm/hr | hrs 74.17 | 9.33 RAIN | mm/hr | 0.00 | hrs 0.083 hrs 3.167 mm/hr 3.05 mm/nr | nrs 3.65 | 6.250 3.65 | 6.333 3.65 | 6.417 3.65 | 6.590 3.65 | 6.560 3.65 | 6.667 3.65 | 6.783 3.65 | 6.833 4.66 | 6.917 4.66 | 7.080 4.66 | 7.083 3.65 | 7.333 3.65 | 7.333 3.65 | 7.333 5.65 | 7.333 5.65 | 7.333 5.65 | 7.333 5.65 | 7.333 5.65 | 7.333 5.65 | 7.333 5.65 | 7.333 5.65 | 7.333 5.65 | 7.333 5.65 | 7.333 5.65 | 7.333 5.65 | 7.333 5.65 | 7.333 5.65 | 7.333 0.167 0.250 0.00 3.250 15.24 | 15.24 | 9.42 3.05 3.05 0.250 0.333 0.417 0.500 0.583 0.667 0.750 2.03 2.03 2.03 1.02 1.02 3.333 3.417 3.500 3.583 3.667 3.750 3.833 15.24 15.24 14.22 14.22 14.22 7.11 7.11 2.03 2.03 2.03 3.05 3.05 3.05 9.58 9.67 9.75 9.83 9.92 0.833 2.03 3.917 10.08 2.03 2.03 | 3.917 2.03 | 4.000 2.03 | 4.083 1.02 | 4.167 1.02 | 4.250 1.02 | 4.333 2.03 | 4.417 2.03 | 4.503 2.03 | 4.667 2.03 | 4.750 0.917 1.000 1.083 1.167 1.250 1.333 10.17 10.25 10.33 10.42 10.50 10.58 1.02 1.417 10.67 1.02 10.75 1.02 1 583 2 03

| Lang     | staffRd E  | A Propos   | sed WestDon  | Waters                       | hd              |      |
|----------|--|--|--|------------------------------|-----------------|------|
| 1.02     | 5.000  | 6.10   | 8.083  | 4.06                         | 11.17           | 2.03 |
| 00 1.02  | 5.083  | 5.08   | 8.167  | 4.06                         | 11.25           | 2.03 |
| 33 2.03  | 5.167  | 5.08   | 8.250  | 4.06                         | 11.33           | 1.0  |
| 57 2.03  | 5.250  | 5.08   | 8.333  | 4.06                         | 11.42           | 1.0  |
| 2.03     | 5.333  | 10.16  | 8.417  | 4.06                         | 11.50           | 1.0  |
| 33 3.05  | 5.417  | 10.16  | 8.500  | 4.06                         | 11.58           | 2.0  |
| 17 3.05  | 5.500  | 10.16  | 8.583  | 3.05                         | 11.67           | 2.0  |
| 3.05     | 5.583  | 10.16  | 8.667  | 3.05                         | 11.75           | 2.0  |
| 33 3.05  | 5.667  | 10.16  | 8.750  | 3.05                         | 11.83           | 1.0  |
| 3.05     | 5.750  | 10.16  | 8.833  | 3.05                         | 11.92           | 1.0  |
| 3.05     | 5.833  | 73.15  | 8.917  | 3.05                         | 12.00           | 1.0  |
| 33 4.06  | 5.917  | 73.15  | 9.000  | 3.05                         | 12.08           | 2.0  |
| 17 4.06  | 6.000  | 73.15  | 9.083  | 3.05                         | 12.17           | 2.0  |
| 90 4.06  | 6.083  | 74.17  | 9.167  | 3.05                         | 12.25           | 2.0  |
| 3.05     | 6.167  | 74.17  | 9.250  | 3.05                         | ĺ               |      |
| (mm/hr)= | 74.17  |  | 53.29  |                              |                 |      |
|          |  |  |  |                              |                 |      |
| (min)=   | 5.11   | (ii)   | 9.13 (ii)  |                              |                 |      |
|          |  |  |  |                              |                 |      |
|          | 0.21   |  | 0.12   |                              |                 |      |
| ,        |  |  |  | *T0                          | TALS*           |      |
| (cms)=   | 0.09   |  | 0.03   | 0                            | .117 (iii       | .)   |
| (hrs)=   | 6.25   |  | 6.25   |                              | 5.25            | •    |
| (mm)=    | 80.04  |  | 45.99  | 68                           | 3.46            |      |
| (mm)=    | 82.04  |  | 82.04  | 83                           | 2.04            |      |
| EENT =   | 0.98   |  | 0.56   |                              | 3.83            |      |
|          |  |  |  |                              |                 |      |
|          | 17 1.02 00 1.02 00 1.02 03 2.03 35 2.03 35 0 2.03 35 0 2.03 35 0 3.05 30 3.05 37 3.05 37 3.05 37 3.05 37 3.05 37 3.05 37 3.05 38 4.06 00 4.06 00 4.06 00 4.06 00 (min) = ((cms) = ((hrs) = (hrs) = (mm) = (tmr | 17 1.02 5.006   102 1.02 5.083   33 2.03 5.165   50 2.03 5.250   50 2.03 5.250   50 2.03 5.500   50 3.05 5.500   50 3.05 5.500   50 3.05 5.667   50 3.05 5.833   3.3 3.05 5.583   33 3.05 5.667   50 3.05 5.833   33 3.05 6.677   50 3.05 5.833   33 3.05 6.676   57 3.05 6.060   57 3.05 6.060   50 3.05 5.833   33 3.05 6.167   74 4.06 6.080   60 3.05 5.833   3.05 6.167   75 (min) = 74.17   76 (min) = 5.10   76 (min) = 5.10   77 (min) = 5.10   77 (min) = 5.10   77 (min) = 6.25   77 (min) = 6.25   78 (min) = 80.04   78 (min) = 80 | 17 1.02   5.000   6.10  20 1.02   5.083   5.08 | 1.02   S.0.00   C.10   R.083 | 17 1.02   5.000 | 08   |

| ADD HYD ( 0470) <br>  1 + 2 = 3 | 0.58 | QPEAK<br>(cms)<br>0.111<br>0.117 | TPEAK<br>(hrs)<br>6.25<br>6.25 |       |
|---------------------------------|------|----------------------------------|--------------------------------|-------|
| ID = 3 ( 0470):                 | 1.23 | 0.228                            | 6.25                           | 70.87 |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| RESERVOIR( 0535)                 | OVERFLOW         | IS OFF          |                  |                 |
|----------------------------------|------------------|-----------------|------------------|-----------------|
| IN= 2> OUT= 1  <br>  DT= 5.0 min | OUTFLOW<br>(cms) | STORAGE (ha.m.) | OUTFLOW<br>(cms) | STORAGE (ha.m.) |

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|                   | Langs | taffRd_E | A_Propo | sed_WestDor | Waters | hd    |      |
|-------------------|-------|----------|---------|-------------|--------|-------|------|
| 1.750             | 2.03  | 4.833    | 6.10    | 7.917       | 5.08   | 11.00 | 2.03 |
| 1.833             | 1.02  | 4.917    | 6.10    | 8.000       | 5.08   | 11.08 | 2.03 |
| 1.917             | 1.02  | 5.000    | 6.10    | 8.083       | 4.06   | 11.17 | 2.03 |
| 2.000             | 1.02  | 5.083    | 5.08    | 8.167       | 4.06   | 11.25 | 2.03 |
| 2.083             | 2.03  | 5.167    | 5.08    | 8.250       | 4.06   | 11.33 | 1.02 |
| 2.167             | 2.03  | 5.250    | 5.08    | 8.333       | 4.06   | 11.42 | 1.02 |
| 2.250             | 2.03  | 5.333    | 10.16   | 8.417       | 4.06   | 11.50 | 1.02 |
| 2.333             | 3.05  | 5.417    | 10.16   | 8.500       | 4.06   | 11.58 | 2.03 |
| 2.417             | 3.05  | 5.500    | 10.16   | 8.583       | 3.05   | 11.67 | 2.03 |
| 2.500             | 3.05  | 5.583    | 10.16   | 8.667       | 3.05   | 11.75 | 2.03 |
| 2.583             | 3.05  | 5.667    | 10.16   | 8.750       | 3.05   | 11.83 | 1.02 |
| 2.667             | 3.05  | 5.750    | 10.16   | 8.833       | 3.05   | 11.92 | 1.02 |
| 2.750             | 3.05  | 5.833    | 73.15   | 8.917       | 3.05   | 12.00 | 1.02 |
| 2.833             | 4.06  | 5.917    | 73.15   | 9.000       | 3.05   | 12.08 | 2.03 |
| 2.917             | 4.06  | 6.000    | 73.15   | 9.083       | 3.05   | 12.17 | 2.03 |
| 3.000             | 4.06  | 6.083    | 74.17   | 9.167       | 3.05   | 12.25 | 2.03 |
| 3.083             | 3.05  | 6.167    | 74.17   | 9.250       | 3.05   |       |      |
|                   |       |          |         |             |        |       |      |
| ax.Eff.Inten.(mm/ |       | 74.17    |         | 53.29       |        |       |      |
| over (m           |       | 5.00     |         | 10.00       |        |       |      |
|                   | in)=  |          | (ii)    | 7.62 (ii)   |        |       |      |
| nit Hyd. Tpeak (m |       | 5.00     |         | 10.00       |        |       |      |
|                   |       |          |         |             |        |       |      |

Ma Sto \*TOTALS\* 0.116 (iii) PEAK FLOW TIME TO PEAK 0.10 6.25 0.01 6.25 TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 6.25 74.25 80.04 45.99 82.04 82.04

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 83.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB | | STANDHYD ( 0230) | |ID= 1 DT= 5.0 min | Area (ha)= 0.70 Total Imp(%)= 66.00 Dir. Conn.(%)= 66.00 IMPERVIOUS PERVIOUS (i) Surface Area Dep. Storage Average Slope (ha)= (mm)= (%)= (m)= 0.46 2.00 1.00 320.00 0.24 5.00 2.00 Length Mannings n 0.013 0.300

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

## LangstaffRd\_EA\_Proposed\_WestDonWatershd

|                   |        | TR/   | ANSFORME | D HYETOGRA | APH   | -      |      |
|-------------------|--------|-------|----------|------------|-------|--------|------|
| TIME              | RAIN   | TIME  | RAIN     | TIME       | RAIN  | TIME   | RAI  |
| hrs               | mm/hr  | hrs   | mm/hr    |            | mm/hr | hrs    | mm/h |
| 0.083             | 0.00   | 3.167 | 3.05     | 6.250      | 74.17 | 9.33   | 3.05 |
| 0.167             | 0.00   | 3.250 | 3.05     | 6.333      | 15.24 | 9.42   | 3.05 |
| 0.250             | 0.00   | 3.333 | 3.05     | 6.417      | 15.24 | 9.50   | 3.05 |
| 0.333             | 2.03   | 3.417 | 3.05     | 6.500      | 15.24 | 9.58   | 2.03 |
| 0.417             | 2.03   | 3.500 | 3.05     | 6.583      | 14.22 | 9.67   | 2.03 |
| 0.500             | 2.03   | 3.583 |          | 6.667      | 14.22 | 9.75   | 2.03 |
| 0.583             |        | 3.667 |          |            | 14.22 |        | 3.05 |
| 0.667             |        | 3.750 |          | 6.833      | 7.11  |        | 3.05 |
| 0.750             |        | 3.833 |          | 6.917      | 7.11  | 10.00  | 3.05 |
| 0.833             |        | 3.917 |          | 7.000      | 7.11  |        | 2.03 |
| 0.917             | 2.03   | 4.000 |          | 7.083      | 6.10  | 10.17  | 2.03 |
| 1.000             |        | 4.083 |          | 7.167      | 6.10  |        | 2.03 |
| 1.083             |        | 4.167 |          | 7.250      | 6.10  |        | 2.03 |
| 1.167             |        | 4.250 |          | 7.333      | 5.08  |        | 2.03 |
| 1.250             |        | 4.333 |          | 7.417      | 5.08  |        | 2.03 |
| 1.333             | 2.03   | 4.417 |          | 7.500      | 5.08  | 10.58  | 1.02 |
| 1.417             |        | 4.500 | 5.08     |            | 5.08  |        | 1.02 |
| 1.500             |        | 4.583 |          | 7.667      | 5.08  |        | 1.02 |
| 1.583             |        | 4.667 |          | 7.750      | 5.08  |        | 2.03 |
| 1.667             |        | 4.750 |          | 7.833      | 5.08  |        | 2.03 |
| 1.750             |        | 4.833 |          | 7.917      | 5.08  |        | 2.03 |
| 1.833             |        | 4.917 |          | 8.000      | 5.08  |        | 2.03 |
| 1.917             |        | 5.000 |          | 8.083      | 4.06  |        | 2.03 |
| 2.000             |        | 5.083 |          | 8.167      | 4.06  |        | 2.03 |
| 2.083             |        | 5.167 | 5.08     |            | 4.06  |        | 1.02 |
| 2.167             |        | 5.250 |          | 8.333      | 4.06  |        | 1.02 |
| 2.250             |        | 5.333 |          | 8.417      | 4.06  |        | 1.02 |
| 2.333             |        | 5.417 |          | 8.500      | 4.06  |        | 2.03 |
| 2.417             |        | 5.500 |          | 8.583      | 3.05  |        | 2.03 |
| 2.500             | 3.05   |       |          | 8.667      | 3.05  |        | 2.03 |
| 2.583             |        | 5.667 |          | 8.750      | 3.05  |        | 1.02 |
| 2.667             |        | 5.750 |          | 8.833      | 3.05  |        | 1.02 |
| 2.750             |        | 5.833 |          | 8.917      | 3.05  |        | 1.02 |
| 2.833             |        | 5.917 |          | 9.000      | 3.05  |        | 2.03 |
| 2.917             |        | 6.000 |          | 9.083      | 3.05  |        | 2.03 |
| 3.000             |        | 6.083 |          | 9.167      | 3.05  |        | 2.03 |
| 3.083             | 3.05   | 6.167 | 74.17    | 9.250      | 3.05  |        |      |
| Max.Eff.Inten.(mm | n/hr)= | 74.17 |          | 50.57      |       |        |      |
| over (            |        | 5.00  |          | 15.00      |       |        |      |
| Storage Coeff. (  | min)=  | 5.79  | (ii)     | 13.59 (ii) | )     |        |      |
| Unit Hyd. Tpeak ( |        | 5.00  |          | 15.00      |       |        |      |
| Unit Hyd. peak (  | cms)=  | 0.20  |          | 0.08       |       |        |      |
|                   |        |       |          |            | *T0T  | ΓΔI S* |      |

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0.02 6.33 43.44 82.04 0.53

0.09 6.25 80.04 82.04 0.98

\*TOTALS\*
0.119 (iii)
6.25
67.59
82.04
0.82

## ${\tt LangstaffRd\_EA\_Proposed\_WestDonWatershd}$

|   | CALIB<br>  STANDHYD ( 0155) <br> ID= 1 DT= 5.0 min | Area<br>Total | (ha)=<br>Imp(%)= | 0.56<br>93.00 | Dir. Conn.(%)= | 93.00 |
|---|--|---------------|------------------|---------------|----------------|-------|
| - |  |               |                  |               |                |       |
|   |  |               | IMPERVIO         | US            | PERVIOUS (i)   |       |
|   | Surface Area                                       | (ha)=         | 0.52             | <u>!</u>      | 0.04           |       |
|   | Dep. Storage                                       | (mm)=         | 2.00             | )             | 5.00           |       |
|   | Average Slope                                      | (%)=          | 1.00             | )             | 2.00           |       |
|   | Length   | (m)=          | 260.00           | )             | 25.00          |       |
|   | Mannings n   | =             | 0.013            | 3             | 0.290          |       |
|   |  |               |                  |               |                |       |

PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       |       |       | D HYETOGR |       |       |       |
|-------|-------|-------|-------|-----------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN  | ' TIME    | RAIN  |       | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr | ' hrs     | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05  | 6.250     | 74.17 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05  | 6.333     | 15.24 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 3.05  | 6.417     | 15.24 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 3.05  | 6.500     | 15.24 | 9.58  | 2.03  |
| 0.417 | 2.03  | 3.500 | 3.05  | 6.583     | 14.22 | 9.67  | 2.03  |
| 0.500 | 2.03  | 3.583 | 3.05  | 6.667     | 14.22 | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 3.05  | 6.750     | 14.22 | 9.83  | 3.05  |
| 0.667 |       | 3.750 | 3.05  | 6.833     | 7.11  | 9.92  | 3.05  |
| 0.750 | 1.02  |       | 4.06  |           | 7.11  | 10.00 | 3.05  |
| 0.833 | 2.03  |       | 4.06  |           | 7.11  | 10.08 | 2.03  |
| 0.917 | 2.03  | 4.000 | 4.06  | 7.083     | 6.10  |       | 2.03  |
| 1.000 | 2.03  | 4.083 | 3.05  | 7.167     | 6.10  | 10.25 | 2.03  |
| 1.083 | 1.02  | 4.167 | 3.05  | 7.250     | 6.10  | 10.33 | 2.03  |
| 1.167 |       | 4.250 | 3.05  | 7.333     | 5.08  | 10.42 | 2.03  |
| 1.250 | 1.02  |       | 5.08  | 7.417     | 5.08  | 10.50 | 2.03  |
| 1.333 | 2.03  |       | 5.08  | 7.500     | 5.08  |       | 1.02  |
| 1.417 | 2.03  |       | 5.08  | 7.583     | 5.08  |       | 1.02  |
| 1.500 | 2.03  | 4.583 | 6.10  | 7.667     | 5.08  |       | 1.02  |
| 1.583 |       | 4.667 | 6.10  | 7.750     | 5.08  |       | 2.03  |
| 1.667 | 2.03  |       | 6.10  | 7.833     | 5.08  |       | 2.03  |
| 1.750 | 2.03  |       | 6.10  |           |       | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 6.10  | 8.000     | 5.08  | 11.08 | 2.03  |
| 1.917 | 1.02  | 5.000 | 6.10  | 8.083     | 4.06  | 11.17 | 2.03  |
| 2.000 | 1.02  | 5.083 | 5.08  | 8.167     | 4.06  | 11.25 | 2.03  |
| 2.083 |       | 5.167 | 5.08  | 8.250     | 4.06  | 11.33 | 1.02  |
| 2.167 | 2.03  | 5.250 | 5.08  |           | 4.06  | 11.42 | 1.02  |
| 2.250 | 2.03  | 5.333 | 10.16 |           | 4.06  |       | 1.02  |
| 2.333 | 3.05  | 5.417 | 10.16 | 8.500     | 4.06  |       | 2.03  |
| 2.417 | 3.05  | 5.500 | 10.16 | 8.583     | 3.05  | 11.67 | 2.03  |
| 2.500 | 3.05  | 5.583 | 10.16 | 8.667     | 3.05  | 11.75 | 2.03  |
| 2.583 | 3.05  | 5.667 | 10.16 | 8.750     | 3.05  | 11.83 | 1.02  |
| 2.667 | 3.05  | 5.750 | 10.16 | 8.833     | 3.05  | 11.92 | 1.02  |
| 2.750 | 3.05  | 5.833 | 73.15 | 8.917     | 3.05  | 12.00 | 1.02  |
| 2.833 | 4.06  | 5.917 | 73.15 | 9.000     | 3.05  | 12.08 | 2.03  |
| 2.917 | 4.06  | 6.000 | 73.15 | 9.083     | 3.05  | 12.17 | 2.03  |
| 3.000 | 4.06  | 6.083 | 74.17 | 9.167     | 3.05  | 12.25 | 2.03  |

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### LangstaffRd\_EA\_Proposed\_WestDonWatershd

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 81.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0475)   | AREA | QPEAK | TPEAK | R.V.  |
|-------------------|------|-------|-------|-------|
| 1 + 2 = 3         | (ha) | (cms) | (hrs) | (mm)  |
| ID1= 1 ( 0225):   | 0.60 | 0.116 | 6.25  | 74.25 |
| + ID2= 2 ( 0230): | 0.70 | 0.119 | 6.25  | 67.59 |
| ID = 3 ( 0475):   | 1.30 | 0.234 | 6.25  | 70.66 |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ESERVOIR( 0540)                | OVERFLOW | IS OFF |       |         |         |
|--------------------------------|----------|--------|-------|---------|---------|
| IN= 2> OUT= 1  <br>DT= 5.0 min | OUTFLOW  | STORAG | Εĺ    | OUTFLOW | STORAGE |
|                                | (cms)    | (ha.m. | ) İ   | (cms)   | (ha.m.) |
|                                | 0.0000   |        |       | 0.0271  | 0.0367  |
|                                | 0.0118   | 0.004  | 8 j   | 0.0306  | 0.0474  |
|                                | 0.0184   | 0.015  | 4 j   | 0.0415  | 0.0639  |
|                                | 0.0232   | 0.026  | 1     | 0.0000  | 0.0000  |
|                                | Al       | REA C  | PEAK  | TPEAK   | R.V.    |
|                                | (1       | ha) (  | cms)  | (hrs)   | (mm)    |
| INFLOW : ID= 2 ( 0             | 475) 1   | .300   | 0.234 | 6.25    | 70.66   |
| OUTFLOW: ID= 1 ( 0             | 540) 1   | .300   | 0.032 | 6.92    | 70.59   |

MAXIMUM STORAGE USED (min)= 40.00 (ha.m.)= 0.0494

| ADD HYD ( 0480)                         |      |       |       |       |
|---|------|-------|-------|-------|
| 1 + 2 = 3                               | AREA | QPEAK | TPEAK | R.V.  |
|   | (ha) | (cms) | (hrs) | (mm)  |
| ID1= 1 ( 0535):                         | 1.23 | 0.017 | 7.42  | 70.69 |
| + ID2= 2 ( 0540):                       | 1.30 | 0.032 | 6.92  | 70.59 |
| ======================================= |      |       |       |       |
| ID = 3 ( 0480):                         | 2.53 | 0.049 | 7.00  | 70.63 |

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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# 

| Max.Eff.Inten.(n | nm/hr)= | 74.17     | 59.01     |             |
|------------------|---------|-----------|-----------|-------------|
| over             | (min)   | 5.00      | 10.00     |             |
| Storage Coeff.   | (min)=  | 5.11 (ii) | 7.44 (ii) |             |
| Unit Hyd. Tpeak  | (min)=  | 5.00      | 10.00     |             |
| Unit Hyd. peak   | (cms)=  | 0.21      | 0.13      |             |
|                  |         |           |           | *TOTALS*    |
| PEAK FLOW        | (cms)=  | 0.11      | 0.01      | 0.113 (iii) |
| TIME TO PEAK     | (hrs)=  | 6.25      | 6.25      | 6.25        |
| RUNOFF VOLUME    | (mm)=   | 80.04     | 51.61     | 78.04       |
| TOTAL RAINFALL   | (mm)=   | 82.04     | 82.04     | 82.04       |
| RUNOFF COEFFICIE | NT =    | 0.98      | 0.63      | 0.95        |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 87.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| (,                |       |         |       |      |           |       |  |
|-------------------|-------|---------|-------|------|-----------|-------|--|
|                   |       |         |       |      |           |       |  |
|                   |       |         |       |      |           |       |  |
| CALIB             |       |         |       |      |           |       |  |
| STANDHYD ( 0160)  | Area  | (ha)=   | 0.43  |      |           |       |  |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 95.00 | Dir. | Conn.(%)= | 95.00 |  |
|                   |       |         |       |      |           |       |  |

|               |       | IMPERVIOUS | PERVIOUS (i) |
|---------------|-------|------------|--------------|
| Surface Area  | (ha)= | 0.41       | 0.02         |
| Dep. Storage  | (mm)= | 2.00       | 5.00         |
| Average Slope | (%)=  | 1.00       | 2.00         |
| Length        | (m)=  | 260.00     | 20.00        |
| Mannings n    | =     | 0.013      | 0.250        |
|               |       |            |              |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

# ---- TRANSFORMED HYETOGRAPH ---TIME RAIN | TIME RAIN | TIME RAIN |

| TIME  | RAIN  | TIME  | RAIN  | ' TIME | RAIN  | TIME  | RAIN  |
|-------|-------|-------|-------|--------|-------|-------|-------|
| hrs   | mm/hr | hrs   | mm/hr | ' hrs  | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05  | 6.250  | 74.17 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05  | 6.333  | 15.24 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 3.05  | 6.417  | 15.24 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 3.05  | 6.500  | 15.24 | 9.58  | 2.03  |
| 0.417 | 2.03  | 3.500 | 3.05  | 6.583  | 14.22 | 9.67  | 2.03  |
| 0.500 | 2.03  | 3.583 | 3.05  | 6.667  | 14.22 | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 3.05  | 6.750  | 14.22 | 9.83  | 3.05  |
| 0.667 | 1.02  | 3.750 | 3.05  | 6.833  | 7.11  | 9.92  | 3.05  |
| 0.750 | 1.02  | 3.833 | 4.06  | 6.917  | 7.11  | 10.00 | 3.05  |
| 0.833 | 2.03  | 3.917 | 4.06  | 7.000  | 7.11  | 10.08 | 2.03  |
| 0.917 | 2.03  | 4.000 | 4.06  | 7.083  | 6.10  | 10.17 | 2.03  |
| 1.000 | 2.03  | 4.083 | 3.05  | 7.167  | 6.10  | 10.25 | 2.03  |
| 1.083 | 1.02  | 4.167 | 3.05  | 7.250  | 6.10  | 10.33 | 2.03  |
|       |       |       |       |        |       |       |       |

```
LangstaffRd EA_Proposed_MestDonWatershd
1.02 | 4.250 | 3.05 | 7.333 | 5.08 | 14
1.02 | 4.333 | 5.08 | 7.417 | 5.08 | 14
2.03 | 4.417 | 5.08 | 7.590 | 5.08 | 14
2.03 | 4.500 | 5.08 | 7.583 | 5.08 | 14
2.03 | 4.500 | 5.08 | 7.583 | 5.08 | 14
2.03 | 4.583 | 6.10 | 7.667 | 5.08 | 14
2.03 | 4.667 | 6.10 | 7.750 | 5.08 | 14
2.03 | 4.4667 | 6.10 | 7.750 | 5.08 | 14
2.03 | 4.433 | 6.10 | 7.750 | 5.08 | 14
2.03 | 4.433 | 6.10 | 7.917 | 5.08 | 12
2.03 | 4.750 | 6.10 | 8.000 | 5.08 | 12
1.02 | 4.917 | 6.10 | 8.000 | 5.08 | 6.10 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  5.88 | 10.42

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6.96 | 11.75

6.96 | 11.75

6.
                                                                                                                                                                               1.167
                                                                                                                                                                                   1.250
                                                                                                                                                                               1.250
1.333
1.417
1.500
1.583
1.667
1.750
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              1.02
1.02
1.02
2.03
2.03
                                                                                                                                                                                   1.833
                                                                                                                                                                                   1.917
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              2.03
1.02
1.02
1.02
2.03
2.03
                                                                                                                                                                               2.000
2.083
2.167
2.250
2.333
                                                                                                                                                                                   2.417
                                                                                                                                                                                   2.500
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  2.03
                                                                                                                                                                               2.667
2.750
2.833
2.917
Max.Eff.Inten.(mm/hr)=

over (min)

Storage Coeff. (min)=

Unit Hyd. Tpeak (min)=

Unit Hyd. peak (cms)=
                                                                                                                                                                                                                                                                                                                                                                                                                                           74.17
5.00
5.11 (ii)
5.00
0.21
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    61.96
10.00
6.72 (ii)
10.00
0.14
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 *TOTALS*
0.087 (iii)
6.25
78.77
82.04
0.96
        PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                                                                                                                                                                                                                                                                                                                                                                                                               0.08
6.25
80.04
82.04
0.98
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        0.00
6.25
54.74
82.04
0.67
                                  (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
        CN* = 89.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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TPEAK (hrs) 6.25 6.25

QPEAK

AREA

|    |                  | Langs       | taffRd E  | A Propo | sed WestDon | Watersh | ıd        |      |
|----|------------------|-------------|-----------|---------|-------------|---------|-----------|------|
|    | 2.66             |             |           |         |             | 3.05 l  |           | 1.02 |
|    | 2.75             | 0 3.05      | 5.833     | 73.15   | 8.917       | 3.05 I  | 12.00     | 1.02 |
|    | 2.83             | 3 4.06      | 5.917     | 73.15   | 9.000       | 3.05 I  | 12.08     | 2.03 |
|    | 2.91             | 7 4.06      | 6.000     | 73.15   | 9.083       | 3.05    | 12.17     | 2.03 |
|    | 3.00             | 0 4.06      | 6.083     | 74.17   | 9.167       | 3.05    | 12.25     | 2.03 |
|    | 3.08             | 3 3.05      | 6.167     | 74.17   | 9.250       | 3.05    |           |      |
|    |                  |             |           |         |             |         |           |      |
|    | Max.Eff.Inten.(  | mm/hr)=     | 74.17     |         | 60.48       |         |           |      |
|    | over             | (min)       | 5.00      |         | 10.00       |         |           |      |
|    | Storage Coeff.   | (min)=      | 3.67      | (ii)    | 6.12 (ii)   |         |           |      |
|    | Unit Hyd. Tpeak  | (min)=      | 5.00      |         | 10.00       |         |           |      |
|    | Unit Hyd. peak   | (cms)=      | 0.25      |         | 0.15        |         |           |      |
|    |                  |             |           |         |             | *TOT    | ALS*      |      |
|    | PEAK FLOW        | (cms)=      | 0.75      |         | 0.03        | 0.      | 776 (iii) |      |
|    | TIME TO PEAK     | (hrs)=      | 6.25      |         | 6.25        | 6       | .25       |      |
|    | RUNOFF VOLUME    | (mm)=       | 80.04     |         | 53.15       | 78      | .70       |      |
|    | TOTAL RAINFALL   | (mm)=       | 82.04     |         | 82.04       | 82      | .04       |      |
|    | RUNOFF COEFFICI  | ENT =       | 0.98      |         | 0.65        | 0       | .96       |      |
|    |                  |             |           |         |             |         |           |      |
| ** | * WARNING: STORA | GE COEFF. 1 | IS SMALLE | R THAN  | TIME STEP!  |         |           |      |
|    |                  |             |           |         |             |         |           |      |

ADD HYD ( 0430) | 1 + 2 = 3 |

| (iii) PEAK FLOW                      | DOES NOT IN  | CLUDE BASE | FLOW I | F ANY.    |         |  |
|--------------------------------------|--------------|------------|--------|-----------|---------|--|
|                                      |              |            |        |           |         |  |
| RESERVOIR( 0515) <br>  IN= 2> OUT= 1 | OVERFLO      | W IS OFF   |        |           |         |  |
| DT= 5.0 min                          | OUTFLOW      | STORAG     | iE     | OUTFLOW   | STORAGE |  |
|                                      | (cms)        | (ha.m.     | ) İ    | (cms)     | (ha.m.) |  |
|                                      | 0.0000       | 0.000      | é j    | 0.0091    | 0.1797  |  |
|                                      | 0.0013       | 0.015      | 7      | 0.0095    | 0.2004  |  |
|                                      | 0.0033       | 0.032      | 0      | 0.0100    | 0.2216  |  |
|                                      | 0.0044       | 0.048      | 7      | 0.0104    | 0.2433  |  |
|                                      | 0.0053       | 0.065      | 9      | 0.0109    | 0.2655  |  |
|                                      | 0.0061       | 0.083      | 7      | 0.0113    | 0.2882  |  |
|                                      | 0.0068       | 0.101      | .9     | 0.0116    | 0.3114  |  |
|                                      | 0.0074       | 0.120      | 6      | 0.1520    | 0.3592  |  |
|                                      | 0.0080       | 0.139      | 8      | 0.5654    | 0.4336  |  |
|                                      | 0.0086       | 0.159      | 15 j   | 1.1316    | 0.5100  |  |
|                                      |              |            |        |           |         |  |
|                                      |              |            |        | TPEAK     |         |  |
|                                      |              |            |        | (hrs)     |         |  |
| INFLOW : ID= 2 (                     | 0150)        | 3.810      | 0.776  | 6.25      | 78.70   |  |
| OUTFLOW: ID= 1 (                     | 0515)        | 3.810      | 0.011  | 12.33     | 77.51   |  |
|                                      |              |            |        |           |         |  |
|                                      |              |            |        | /Qin](%)= |         |  |
|                                      | IME SHIFT OF |            |        |           |         |  |
| M                                    | AXIMUM STOR  | AGE USED   | )      | (ha.m.)=  | 0.2720  |  |

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# $\label{eq:loss_loss} LangstaffRd\_EA\_Proposed\_WestDonWatershd \\ ID = 3 ( 0430): 0.99 0.200 6.25 78.36$

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALTR             |       |         |       |         |           |       |
|-------------------|-------|---------|-------|---------|-----------|-------|
| CALIB             |       |         |       |         |           |       |
| STANDHYD ( 0150)  | Area  | (ha)=   | 3.81  |         |           |       |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 95.00 | Dir.    | Conn.(%)= | 95.00 |
|                   |       |         |       |         |           |       |
|                   |       | IMPERVI | OUS   | PERVIOL | IS (i)    |       |
| Surface Area      | (ha)= | 3.6     | 2     | 0.19    | )         |       |
| Dep. Storage      | (mm)= | 2.0     | 0     | 5.00    | )         |       |
| Average Slope     | (%)=  | 1.0     | 0     | 2.00    | )         |       |
| Length            | (m)=  | 150.0   | 0     | 40.00   | )         |       |
| Mannings n        | ` '=  | 0.01    | 3     | 0.250   | )         |       |

NOTE: RATNEAU WAS TRANSFORMED TO 5.0 MTN. TIME STEP.

|       |       | TRA   | ANSFORME | ) HYETOGR | APH   | -     |       |
|-------|-------|-------|----------|-----------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME    | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs     | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05     | 6.250     | 74.17 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05     | 6.333     | 15.24 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417     | 15.24 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 3.05     | 6.500     | 15.24 | 9.58  | 2.03  |
| 0.417 | 2.03  | 3.500 | 3.05     | 6.583     | 14.22 | 9.67  | 2.03  |
| 0.500 | 2.03  | 3.583 | 3.05     | 6.667     | 14.22 | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 3.05     | 6.750     | 14.22 | 9.83  | 3.05  |
| 0.667 | 1.02  | 3.750 | 3.05     | 6.833     | 7.11  | 9.92  | 3.05  |
| 0.750 | 1.02  | 3.833 | 4.06     | 6.917     | 7.11  | 10.00 | 3.05  |
| 0.833 | 2.03  | 3.917 | 4.06     | 7.000     | 7.11  | 10.08 | 2.03  |
| 0.917 | 2.03  | 4.000 | 4.06     | 7.083     | 6.10  | 10.17 | 2.03  |
| 1.000 | 2.03  | 4.083 | 3.05     | 7.167     | 6.10  | 10.25 | 2.03  |
| 1.083 | 1.02  | 4.167 | 3.05     | 7.250     | 6.10  | 10.33 | 2.03  |
| 1.167 | 1.02  | 4.250 | 3.05     | 7.333     | 5.08  | 10.42 | 2.03  |
| 1.250 | 1.02  | 4.333 | 5.08     | 7.417     | 5.08  | 10.50 | 2.03  |
| 1.333 | 2.03  | 4.417 | 5.08     | 7.500     | 5.08  | 10.58 | 1.02  |
| 1.417 | 2.03  | 4.500 | 5.08     | 7.583     | 5.08  | 10.67 | 1.02  |
| 1.500 | 2.03  | 4.583 | 6.10     | 7.667     | 5.08  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 6.10     | 7.750     | 5.08  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 6.10     | 7.833     | 5.08  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 6.10     | 7.917     | 5.08  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 6.10     | 8.000     | 5.08  | 11.08 | 2.03  |
| 1.917 | 1.02  | 5.000 | 6.10     | 8.083     | 4.06  | 11.17 | 2.03  |
| 2.000 | 1.02  | 5.083 | 5.08     | 8.167     | 4.06  | 11.25 | 2.03  |
| 2.083 | 2.03  | 5.167 | 5.08     | 8.250     | 4.06  | 11.33 | 1.02  |
| 2.167 | 2.03  | 5.250 | 5.08     | 8.333     | 4.06  | 11.42 | 1.02  |
| 2.250 | 2.03  | 5.333 | 10.16    | 8.417     | 4.06  | 11.50 | 1.02  |
| 2.333 | 3.05  | 5.417 | 10.16    | 8.500     | 4.06  | 11.58 | 2.03  |
| 2.417 | 3.05  | 5.500 | 10.16    | 8.583     | 3.05  | 11.67 | 2.03  |
| 2.500 | 3.05  | 5.583 | 10.16    | 8.667     | 3.05  | 11.75 | 2.03  |
| 2.583 | 3.05  | 5.667 | 10.16    | 8.750     | 3.05  | 11.83 | 1.02  |

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| Langstattko_EA_Proposed_WestDonwatersno |      |       |       |       |  |  |  |  |  |  |
|---|------|-------|-------|-------|--|--|--|--|--|--|
|   |      |       |       |       |  |  |  |  |  |  |
|   |      |       |       |       |  |  |  |  |  |  |
| ADD HYD ( 0440)                         |      |       |       |       |  |  |  |  |  |  |
| 1 + 2 = 3                               | AREA | QPEAK | TPEAK | R.V.  |  |  |  |  |  |  |
|   | (ha) | (cms) | (hrs) | (mm)  |  |  |  |  |  |  |
| ID1= 1 ( 0430):                         | 0.99 | 0.200 | 6.25  | 78.36 |  |  |  |  |  |  |
| + ID2= 2 ( 0515):                       | 3.81 | 0.011 | 12.33 | 77.51 |  |  |  |  |  |  |
| ==============                          |      |       |       |       |  |  |  |  |  |  |
| ID = 3 ( 0440):                         | 4.80 | 0.209 | 6.25  | 77.69 |  |  |  |  |  |  |

| NOTE: PEAK FLOW                         | S DO NOT              | INCLUDE                | BASEFI        | LOWS IF               | ANY.      |       |  |
|---|-----------------------|------------------------|---------------|-----------------------|-----------|-------|--|
| CALIB                                   | Area<br>Total         |                        | 0.96<br>78.00 | Dir.                  | Conn.(%)= | 78.00 |  |
| Surface Area                            | (ha)=                 | IMPERVIO               | 5             | PERVIOL<br>0.21       | L ` ′     |       |  |
| Dep. Storage<br>Average Slope<br>Length | (mm)=<br>(%)=<br>(m)= | 2.00<br>1.00<br>470.00 | 0             | 5.00<br>2.00<br>20.00 | )         |       |  |
| Mannings n                              | =                     | 0.01                   | 3             | 0.256                 | )         |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANS FORME | HYETOGR | ΔРН   |       |       |
|-------|-------|-------|-----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN      | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr     | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05      | 6.250   | 74.17 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05      | 6.333   | 15.24 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 3.05      | 6.417   | 15.24 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 3.05      | 6.500   | 15.24 | 9.58  | 2.03  |
| 0.417 | 2.03  | 3.500 | 3.05      | 6.583   | 14.22 | 9.67  | 2.03  |
| 0.500 | 2.03  | 3.583 | 3.05      | 6.667   | 14.22 | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 3.05      | 6.750   | 14.22 | 9.83  | 3.05  |
| 0.667 | 1.02  | 3.750 | 3.05      | 6.833   | 7.11  | 9.92  | 3.05  |
| 0.750 | 1.02  | 3.833 | 4.06      | 6.917   | 7.11  | 10.00 | 3.05  |
| 0.833 | 2.03  | 3.917 | 4.06      | 7.000   | 7.11  | 10.08 | 2.03  |
| 0.917 | 2.03  | 4.000 | 4.06      | 7.083   | 6.10  | 10.17 | 2.03  |
| 1.000 | 2.03  | 4.083 | 3.05      | 7.167   | 6.10  | 10.25 | 2.03  |
| 1.083 | 1.02  | 4.167 | 3.05      | 7.250   | 6.10  | 10.33 | 2.03  |
| 1.167 | 1.02  | 4.250 | 3.05      | 7.333   | 5.08  | 10.42 | 2.03  |
| 1.250 | 1.02  | 4.333 | 5.08      | 7.417   | 5.08  | 10.50 | 2.03  |
| 1.333 | 2.03  | 4.417 | 5.08      | 7.500   | 5.08  | 10.58 | 1.02  |
| 1.417 | 2.03  | 4.500 | 5.08      | 7.583   | 5.08  | 10.67 | 1.02  |
| 1.500 | 2.03  | 4.583 | 6.10      | 7.667   | 5.08  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 6.10      | 7.750   | 5.08  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 6.10      | 7.833   | 5.08  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 6.10      | 7.917   | 5.08  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 6.10      | 8.000   | 5.08  | 11.08 | 2.03  |
|       |       |       |           |         |       |       |       |

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LangstaffRd_EA_Proposed_WestDonWatershd
1.02 | 5.000 | 6.10 | 8.083 | 4.06 | 12
1.02 | 5.083 | 5.08 | 8.167 | 4.06 | 12
2.03 | 5.167 | 5.08 | 8.250 | 4.06 | 12
2.03 | 5.250 | 5.08 | 8.333 | 4.06 | 12
2.03 | 5.250 | 5.08 | 8.333 | 4.06 | 12
2.03 | 5.333 | 10.16 | 8.474 | 4.06 | 12
3.05 | 5.417 | 10.16 | 8.500 | 4.06 | 12
3.05 | 5.583 | 10.16 | 8.560 | 4.06 | 12
3.05 | 5.583 | 10.16 | 8.567 | 3.05 | 12
3.05 | 5.583 | 10.16 | 8.867 | 3.05 | 12
3.05 | 5.583 | 73.15 | 8.917 | 3.05 | 12
4.06 | 5.917 | 73.15 | 9.000 | 3.05 | 14
4.06 | 6.000 | 73.15 | 9.083 | 3.05 | 14
4.06 | 6.080 | 74.17 | 9.167 | 3.05 | 14
3.05 | 6.167 | 74.17 | 9.157 | 3.05 | 14
3.05 | 6.167 | 74.17 | 9.157 | 3.05 | 14
3.05 | 6.167 | 74.17 | 9.157 | 3.05 | 14
3.05 | 6.167 | 74.17 | 9.157 | 3.05 | 14
3.05 | 6.167 | 74.17 | 9.157 | 3.05 | 14
3.05 | 6.167 | 74.17 | 9.157 | 3.05 | 14
3.05 | 6.167 | 74.17 | 9.157 | 3.05 | 14
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             nNatershd
4.06 | 11.17
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                                                                                                                                                                                                 2.667
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 1.02
                                                                                                                                                                                       2.750
2.833
2.917
3.000
3.083
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        1.02
2.03
2.03
2.03
Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                                                                                                                                                                                                                                                                                                                                                                                                                                           74.17
5.00
7.29 (ii)
5.00
0.17
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            53.29
15.00
10.45 (ii)
15.00
0.09
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           *TOTALS*
0.177 (iii)
6.25
72.54
82.04
         PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                0.15
6.25
80.04
82.04
0.98
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      0.02
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   6.33
45.99
82.04
0.56
```

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB             |       |         |       |        |           |       |  |
|-------------------|-------|---------|-------|--------|-----------|-------|--|
| STANDHYD ( 0205)  | Area  | (ha)=   | 1.11  |        |           |       |  |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 77.00 | Dir.   | Conn.(%)= | 77.00 |  |
|                   |       |         |       |        |           |       |  |
|                   |       | IMPERVI | OUS   | PERVIO | JS (i)    |       |  |
| Surface Area      | (ha)= | 0.8     | 5     | 0.26   | 5         |       |  |
| Dep. Storage      | (mm)= | 2.0     | 0     | 5.00   | 9         |       |  |
| Average Slope     | (%)=  | 1.0     | 0     | 2.00   | •         |       |  |
| Length            | (m)=  | 470.0   | 0     | 20.00  | •         |       |  |
| Mannings n        | =     | 0.01    | 3     | 0.256  | 9         |       |  |
|                   |       |         |       |        |           |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ---TIME RAIN | TIME RAIN | TIME RAIN | TIME

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LangstaffRd\_EA\_Proposed\_WestDonWatershd

CN\* = 83.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0460)                         |      |       |       |       |
|---|------|-------|-------|-------|
| 1 + 2 = 3                               | AREA | QPEAK | TPEAK | R.V.  |
|   | (ha) | (cms) | (hrs) | (mm)  |
| ID1= 1 ( 0205):                         | 1.11 | 0.203 | 6.25  | 72.20 |
| + ID2= 2 ( 0210):                       | 0.96 | 0.177 | 6.25  | 72.54 |
| ======================================= |      |       |       |       |
| ID = 3 ( 0460):                         | 2.07 | 0.380 | 6.25  | 72.36 |

| ID = 3 ( 0460)                       | : 2.07       | 0.380        | 5.25 /2.36    | •       |  |
|--------------------------------------|--------------|--------------|---------------|---------|--|
| NOTE: PEAK FLOWS                     | DO NOT INCLU | DE BASEFLOWS | IF ANY.       |         |  |
| RESERVOIR( 0525) <br>  IN= 2> OUT= 1 | OVERFLOW IS  | 5 OFF        |               |         |  |
| DT= 5.0 min                          | OUTFLOW      | STORAGE      | OUTFLOW       | STORAGE |  |
|                                      | (cms)        | (ha.m.)      | (cms)         | (ha.m.) |  |
|                                      |              |              | 0.0733        |         |  |
|                                      |              |              | 0.0831        |         |  |
|                                      |              |              | 0.1449        |         |  |
|                                      |              | 0.0149       |               | 0.0000  |  |
|                                      | AREA         | A QPEAK      | TPEAK         | R.V.    |  |
|                                      | (ha)         | ) (cms)      | (hrs)         | (mm)    |  |
| INFLOW : ID= 2 ( 04                  |              |              |               |         |  |
| OUTFLOW: ID= 1 ( 05                  |              |              |               |         |  |
| PEAK                                 | FLOW RED     | OUCTION [Qou | ut/Qin](%)= 5 | 52.88   |  |
|                                      | SHIFT OF PEA |              |               |         |  |
|                                      | MUM STORAGE  |              |               |         |  |

|  |                             | <br>           |
|--|-----------------------------|----------------|
| CALIB<br>  STANDHYD ( 0190) <br> ID= 1 DT= 5.0 min | Area (ha)=<br>Total Imp(%)= | onn.(%)= 57.00 |

|               |       |            | ,            |
|---------------|-------|------------|--------------|
| <br>          | -     | IMPERVIOUS | PERVIOUS (i) |
| Surface Area  | (ha)= | 0.49       | 0.37         |
| Dep. Storage  | (mm)= | 2.00       | 5.00         |
| Average Slope | (%)=  | 1.00       | 2.00         |
| Length        | (m)=  | 340.00     | 50.00        |
| Mannings n    | -     | 0.013      | 0.250        |
|               |       |            |              |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|                                     | Langs  | taffRd E      | A Propos | sed WestDo    | nWaters | hd           |      |
|-------------------------------------|--------|---------------|----------|---------------|---------|--------------|------|
| hrs                                 | mm/hr  | hrs           | mm/hr    | ' hrs         | mm/hr   | hrs          | mm/h |
| 0.083                               | 0.00   | 3.167         | 3.05     | 6.250         | 74.17   | 9.33         | 3.05 |
| 0.167                               | 0.00   | 3.250         |          | 6.333         | 15.24   |              | 3.05 |
| 0.250                               |        | 3.333         |          | 6.417         | 15.24   |              | 3.05 |
| 0.333                               |        | 3.417         |          | 6.500         | 15.24   |              | 2.03 |
| 0.417                               |        | 3.500         |          | 6.583         | 14.22   |              | 2.03 |
| 0.500                               | 2.03   | 3.583         |          | 6.667         | 14.22   |              | 2.03 |
| 0.583                               |        | 3.667         |          | 6.750         | 14.22   |              | 3.05 |
| 0.667                               |        | 3.750         |          | 6.833         | 7.11    |              | 3.05 |
| 0.750                               |        | 3.833         |          | 6.917         |         | 10.00        | 3.05 |
| 0.833                               |        | 3.917         |          | 7.000         |         | 10.08        | 2.03 |
| 0.917                               |        | 4.000         |          | 7.083         |         | 10.17        | 2.03 |
| 1.000                               |        | 4.083         |          | 7.167         |         | 10.25        | 2.03 |
| 1.083                               |        | 4.167         |          | 7.250         |         | 10.33        | 2.03 |
| 1.167                               |        | 4.250         |          | 7.333         |         | 10.42        | 2.03 |
| 1.250                               |        | 4.333         |          | 7.417         |         | 10.50        | 2.03 |
| 1.333                               |        | 4.417         |          | 7.500         |         | 10.58        | 1.02 |
| 1.417                               |        | 4.500         |          | 7.583         |         | 10.67        | 1.02 |
| 1.500                               | 2 02   | i 4 E00       | c 10     | 7.667         |         | 10.75        | 1.02 |
| 1.583                               | 2.03   | 1 4.565       | 6 10     | 7.750         |         | 10.73        | 2.03 |
| 1.667                               | 2.03   | 4.667         | 6 10     | 7.833         |         | 10.03        | 2.03 |
| 1.750                               |        | 4.833         |          | 7.917         |         | 11.00        | 2.03 |
| 1.833                               |        | 4.833         |          | 8.000         |         | 11.08        | 2.03 |
| 1.917                               |        | 5.000         |          | 8.083         |         | 11.00        | 2.03 |
| 2.000                               |        | 5.083         |          | 8.167         |         | 11.17        | 2.03 |
| 2.083                               |        | 5.167         |          | 8.250         |         | 11.33        | 1.02 |
| 2.167                               |        | 5.250         |          | 8.333         |         | 11.42        | 1.02 |
| 2.250                               |        | 5.333         |          | 8.417         |         | 11.50        | 1.02 |
| 2.230                               |        | 5.417         |          | 8.500         |         | 11.58        | 2.03 |
| 2.333                               |        | 5.500         |          | 8.583         |         | 11.56        | 2.03 |
| 2.417                               |        | 5.583         |          | 8.667         |         | 11.07        | 2.03 |
|                                     |        |               |          |               |         |              |      |
| 2.583                               |        | 5.667         |          | 8.750         |         | 11.83        | 1.02 |
| 2.667                               |        | 5.750         |          | 8.833         |         | 11.92        | 1.02 |
| 2.750<br>2.833                      |        | 5.833         |          | 8.917         |         | 12.00        | 1.02 |
|                                     |        | 5.917         |          | 9.000         |         | 12.08        | 2.03 |
| 2.917                               |        | 6.000         |          | 9.083         |         | 12.17        | 2.03 |
| 3.000<br>3.083                      |        | 6.083         |          | 9.167         | 3.05    |              | 2.03 |
| 3.003                               | 3.03   | 0.107         | /4.1/    | 1 3.230       | 3.03    |              |      |
| Max.Eff.Inten.(mm                   |        | 74.17         |          | 53.29         |         |              |      |
| over (                              |        | 5.00          |          | 15.00         |         |              |      |
|                                     | (min)= | 7.29          |          | 10.52 (ii     | )       |              |      |
| Unit Hyd. Tpeak (                   |        | 5.00          |          | 15.00         |         |              |      |
| Unit Hyd. peak (                    | (cms)= | 0.17          |          | 0.09          | ****    | ΓALS*        |      |
| PEAK FLOW (                         | (cms)= | 0.17          |          | 0.03          |         | .203 (iii    | )    |
|                                     | (hrs)= | 6.25          |          | 6.33          |         | 5.25         | ,    |
| RUNOFF VOLUME                       | (mm)=  | 80.04         |          | 45.99         |         | 2.20         |      |
|                                     |        |               |          |               |         |              |      |
|                                     |        |               |          |               |         |              |      |
| TOTAL RAINFALL<br>RUNOFF COEFFICIEN | (mm)=  | 82.04<br>0.98 |          | 82.04<br>0.56 | 82      | 2.04<br>9.88 |      |

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

|                                     | Langs        |               |       | ed_WestDo     |       |              |       |  |
|-------------------------------------|--------------|---------------|-------|---------------|-------|--------------|-------|--|
|                                     |              | TRA           |       | D HYETOGR     |       |              |       |  |
| TIME                                | RAIN         | TIME          | RAIN  | ' TIME        | RAIN  | TIME         | RAIN  |  |
| hrs                                 | mm/hr        | hrs           | mm/hr | ' hrs         | mm/hr | hrs          | mm/hr |  |
| 0.083                               | 0.00         | 3.167         | 3.05  | 6.250         | 74.17 | 9.33         | 3.05  |  |
| 0.167                               | 0.00         | 3.250         | 3.05  | 6.333         | 15.24 | 9.42         | 3.05  |  |
| 0.250                               | 0.00         | 3.333         | 3.05  | 6.417         | 15.24 | 9.50         | 3.05  |  |
| 0.333                               | 2.03         | 3.417         | 3.05  | 6.500         | 15.24 | 9.58         | 2.03  |  |
| 0.417                               | 2.03         | 3.500         | 3.05  | 6.583         | 14.22 | 9.67         | 2.03  |  |
| 0.500                               | 2.03         | 3.583         | 3.05  | 6.667         | 14.22 | 9.75         | 2.03  |  |
| 0.583                               | 1.02         | 3.667         | 3.05  | 6.750         | 14.22 | 9.83         | 3.05  |  |
| 0.667                               | 1.02         | 3.750         | 3.05  | 6.833         | 7.11  | 9.92         | 3.05  |  |
| 0.750                               | 1.02         | 3.833         | 4.06  | 6.917         | 7.11  | 10.00        | 3.05  |  |
| 0.833                               | 2.03         | 3.917         | 4.06  | 7.000         | 7.11  | 10.08        | 2.03  |  |
| 0.917                               | 2.03         | 4.000         | 4.06  | 7.083         | 6.10  |              | 2.03  |  |
| 1.000                               | 2.03         | 4.083         | 3.05  | 7.167         | 6.10  |              | 2.03  |  |
| 1.083                               | 1.02         | 4.167         | 3.05  | 7.250         | 6.10  |              | 2.03  |  |
| 1.167                               | 1.02         | 4.250         | 3.05  | 7.333         | 5.08  |              | 2.03  |  |
| 1.250                               | 1.02         |               | 5.08  | 7.417         | 5.08  |              | 2.03  |  |
| 1.333                               | 2.03         | 4.417         | 5.08  | 7.500         | 5.08  |              | 1.02  |  |
| 1.417                               | 2.03         | 4.500         | 5.08  | 7.583         | 5.08  | 10.67        | 1.02  |  |
| 1.500                               |              | 4.583         | 6.10  | 7.667         | 5.08  |              | 1.02  |  |
| 1.583                               | 2.03         | 4.667         | 6.10  | 7.750         | 5.08  |              | 2.03  |  |
| 1.667                               | 2.03         | 4.750         | 6.10  | 7.833         | 5.08  | 10.92        | 2.03  |  |
| 1.750                               | 2.03         | 4.833         |       | 7.917         | 5.08  |              | 2.03  |  |
| 1.833                               | 1.02         | 4.917         | 6.10  | 8.000         | 5.08  |              | 2.03  |  |
| 1.917                               | 1.02         | 5.000         | 6.10  | 8.083         | 4.06  | 11.17        | 2.03  |  |
| 2.000                               | 1.02         | 5.083         | 5.08  | 8.167         | 4.06  |              | 2.03  |  |
| 2.083                               | 2.03         | 5.167         |       | 8.250         | 4.06  |              | 1.02  |  |
| 2.167                               | 2.03         | 5.250         | 5.08  | 8.333         | 4.06  | 11.42        | 1.02  |  |
| 2.250                               | 2.03         | 5.333         | 10.16 | 8.417         | 4.06  | 11.50        | 1.02  |  |
| 2.333                               | 3.05         | 5.417         | 10.16 | 8.500         | 4.06  | 11.58        | 2.03  |  |
| 2.417                               | 3.05         | 5.500         | 10.16 | 8.583         | 3.05  | 11.67        | 2.03  |  |
| 2.500                               | 3.05         | 5.583         | 10.16 | 8.667         | 3.05  | 11.75        | 2.03  |  |
| 2.583                               | 3.05         | 5.667         | 10.16 | 8.750         | 3.05  |              | 1.02  |  |
| 2.667                               | 3.05         | 5.750         | 10.16 | 8.833         | 3.05  | 11.92        | 1.02  |  |
| 2.750                               | 3.05         | 5.833         | 73.15 | 8.917         | 3.05  | 12.00        | 1.02  |  |
| 2.833                               | 4.06         | 5.917         | 73.15 | 9.000         | 3.05  |              | 2.03  |  |
| 2.917                               | 4.06         | 6.000         | 73.15 | 9.083         | 3.05  |              | 2.03  |  |
| 3.000                               | 4.06         | 6.083         | 74.17 | 9.167         | 3.05  |              | 2.03  |  |
| 3.083                               | 3.05         | 6.167         | 74.17 | 9.250         | 3.05  |              |       |  |
| /                                   |              |               |       |               |       |              |       |  |
| Max.Eff.Inten.(mm                   |              | 74.17         |       | 51.79         |       |              |       |  |
| over (                              |              | 5.00          |       | 20.00         | ,     |              |       |  |
|                                     | min)=        |               |       | 16.50 (ii     | .)    |              |       |  |
| Unit Hyd. Tpeak (                   |              | 5.00          |       | 20.00         |       |              |       |  |
| Unit Hyd. peak (                    | cms)=        | 0.19          |       | 0.06          | ****  |              |       |  |
| DEAK FLOW                           |              | 0.40          |       | 0.04          |       | TALS*        |       |  |
|                                     | cms)=        | 0.10          |       | 0.04          |       | .134 (iii    | ,     |  |
|                                     | hrs)=<br>()  | 6.25          |       | 6.42          |       | 5.25         |       |  |
|                                     | (mm)=        | 80.04         |       | 45.99         |       | 5.39         |       |  |
| TOTAL RAINFALL<br>RUNOFF COEFFICIEN | (mm)=<br>T = | 82.04<br>0.98 |       | 82.04<br>0.56 |       | 2.04<br>3.80 |       |  |
| NUMBER COEFFICIEN                   |              | 0.96          |       | 0.50          | ,     |              |       |  |

### LangstaffRd\_EA\_Proposed\_WestDonWatershd

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB  <br>  STANDHYD ( 0195) <br> ID= 1 DT= 5.0 min | Area<br>Total          | (ha)=<br>Imp(%)=                 | 0.79<br>75.00 | Dir. Conn.(%)=                       | 75.00 |
|--|------------------------|----------------------------------|---------------|--------------------------------------|-------|
| Surface Area<br>Dep. Storage<br>Average Slope        | (ha)=<br>(mm)=<br>(%)= | IMPERVIO<br>0.59<br>2.00<br>1.00 |               | PERVIOUS (i)<br>0.20<br>5.00<br>2.00 |       |
| Length<br>Mannings n                                 | (m)=<br>=              | 340.00<br>0.013                  |               | 20.00<br>0.250                       |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR/   | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05     | 6.250   | 74.17 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05     | 6.333   | 15.24 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 3.05     | 6.417   | 15.24 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 3.05     | 6.500   | 15.24 | 9.58  | 2.03  |
| 0.417 | 2.03  | 3.500 | 3.05     | 6.583   | 14.22 | 9.67  | 2.03  |
| 0.500 | 2.03  | 3.583 | 3.05     | 6.667   | 14.22 | 9.75  | 2.03  |
| 0.583 | 1.02  | 3.667 | 3.05     | 6.750   | 14.22 | 9.83  | 3.05  |
| 0.667 | 1.02  | 3.750 | 3.05     | 6.833   | 7.11  | 9.92  | 3.05  |
| 0.750 | 1.02  | 3.833 | 4.06     | 6.917   | 7.11  | 10.00 | 3.05  |
| 0.833 | 2.03  | 3.917 | 4.06     | 7.000   | 7.11  | 10.08 | 2.03  |
| 0.917 | 2.03  | 4.000 | 4.06     | 7.083   | 6.10  | 10.17 | 2.03  |
| 1.000 | 2.03  | 4.083 | 3.05     | 7.167   | 6.10  | 10.25 | 2.03  |
| 1.083 | 1.02  | 4.167 | 3.05     | 7.250   | 6.10  | 10.33 | 2.03  |
| 1.167 | 1.02  | 4.250 | 3.05     | 7.333   | 5.08  | 10.42 | 2.03  |
| 1.250 | 1.02  | 4.333 | 5.08     | 7.417   | 5.08  | 10.50 | 2.03  |
| 1.333 | 2.03  | 4.417 | 5.08     | 7.500   | 5.08  | 10.58 | 1.02  |
| 1.417 | 2.03  | 4.500 | 5.08     | 7.583   | 5.08  | 10.67 | 1.02  |
| 1.500 | 2.03  | 4.583 | 6.10     | 7.667   | 5.08  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 6.10     | 7.750   | 5.08  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 6.10     | 7.833   | 5.08  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 6.10     | 7.917   | 5.08  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 6.10     | 8.000   | 5.08  | 11.08 | 2.03  |
| 1.917 | 1.02  | 5.000 | 6.10     | 8.083   | 4.06  | 11.17 | 2.03  |
| 2.000 | 1.02  | 5.083 | 5.08     | 8.167   | 4.06  | 11.25 | 2.03  |
| 2.083 | 2.03  | 5.167 | 5.08     | 8.250   | 4.06  | 11.33 | 1.02  |
| 2.167 | 2.03  | 5.250 | 5.08     | 8.333   | 4.06  | 11.42 | 1.02  |
| 2.250 | 2.03  | 5.333 | 10.16    | 8.417   | 4.06  | 11.50 | 1.02  |

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LangstaffRd_EA_Proposed_WestDonWatershd

AREA QPEAK TPEAK R.

(ha) (cms) (hrs) (ms)

(5) 1.650 0.280 6.25 (6)

(6) 1.650 0.135 6.42 (6)
INFLOW: ID= 2 ( 0455)
OUTFLOW: ID= 1 ( 0555)
                                                                                                                                                68.29
                                     PEAK FLOW REDUCTION [Qout/Qin](%)= 48.14
TIME SHIFT OF PEAK FLOW (min)= 10.00
MAXIMUM STORAGE USED (ha.m.)= 0.042
                                                                                                  (min)= 10.00
(ha.m.)= 0.0428
```

ADD HYD ( 0465)| 1 + 2 = 3 | QPEAK (cms) 0.201 0.135 R.V. (mm) 72.35 68.29 ΔRFΔ TΡΕΔΚ (ha) 2.07 1.65 (hrs) 6.42 6.42 ID1= 1 ( 0525): + ID2= 2 ( 0555): ID = 3 ( 0465): 3.72 0.336 6.42 70.55

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

\*\*\*\*\*\*\*\*\*\* 

Filename: C:\Users\ray.zhao\AppD ata\Local\Temp\ e8da∂adc-3ha3-467d-984d-5ab4a7d3492c\571caf6d Comments: 100yr-12hrSCS READ STORM Ptotal= 89.92 mm TIME RAIN TIME
hrs mm/hr hrs
6.75 16.26 10.00
7.00 7.11 10.25
7.25 7.11 10.59
7.50 5.08 10.75
7.75 5.08 11.00
8.00 6.10 11.25
8.25 5.08 111.50
8.50 4.06 11.75
8.75 3.05 12.00
9.00 4.06 12.25
9.25 3.05
9.50 3.05
9.75 3.05 TIME RAIN | TIME RAIN | mm/hr 0.00 2.03 mm/hr | '
4.06 |
3.05 |
4.06 |
3.05 |
7.11 |
6.10 |
6.10 |
11.18 |
11.18 |
80.26 |
81.28 |
16.26 | hrs 3.50 3.75 4.00 4.25 4.50 4.75 5.00 5.25 5.50 6.25 6.50 mm/hr 2.03 0.25 0.50 0.75 1.00 1.25 1.50 2.25 2.50 2.75 3.00 3.25 3.05 2.03 1.02 2.03 2.03 2.03 1.02 2.03 | 1.02 | 2.03 | 2.03 | 2.03 | 1.02 | 2.03 | 4.06 | 3.05 | 4.06 | 3.05 | 2.03

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|  | 1   |   |  |                                     |   |   |      |
|--|---|---|--|-------------------------------------|---|---|------|
|  |   |   |  | sed_West                            |   |   |      |
| 2.333  | 3.05                                      | 5.417   | 10.16  | 8.500                               | 4.06  | 11.58   | 2.03 |
| 2.417  | 3.05                                      | 5.500   | 10.16  | 8.583                               | 3.05  | 11.67   | 2.03 |
| 2.500  | 3.05                                      | 5.583   | 10.16  | 8.667                               | 3.05  | 11.75   | 2.03 |
| 2.583  | 3.05 İ                                    | 5.667   | 10.16  | i 8.750                             | 3.05  | 11.83   | 1.02 |
| 2.667  | 3.05                                      | 5.750   | 10.16  | 8.833                               | 3.05  | 11.92   | 1.02 |
| 2 750  | 3 05 1                                    | 5 833   | 73 15  | 8 917                               | 3 05  | 12 00   | 1 02 |
| 2 833  | 1 96                                      | 5 917   | 73.15  | 1 9 999                             | 3 05  | 1 12 08   | 2 03 |
| 2.033  | 4.00                                      | C 000   | 73.13  | 1 0 000                             | 3.03  | 12.00   | 2.03 |
| 2.91/  | 4.00                                      | 6.000   | /3.13  | 9.003                               | 3.05  | 12.17   | 2.03 |
| 3.000  | 4.06                                      | 6.083   | 74.17  | 9.16/                               | 3.05  | 12.25   | 2.03 |
| 3.083  | 3.05                                      | 6.16/   | /4.1/  | 9.250                               | 3.05  | 11.58<br>  11.67<br>  11.75<br>  11.83<br>  11.92<br>  12.00<br>  12.08<br>  12.17<br>  12.25 |      |
|  |   |   |  |                                     |   |   |      |
| Max.Eff.Inten.(mm/h  | r)=                                       | 74.17   |  | 53.29                               |   |   |      |
| over (mi   | n)  | 5.00  |  | 10.00                               |   |   |      |
| Storage Coeff. (mi   | n)=                                       | 6.00  | (ii)   | 9.38 (                              | ii)   |   |      |
| Unit Hyd. Tpeak (mi  | n)=                                       | 5.00  |  | 10.00                               |   |   |      |
| over (mi<br>Storage Coeff. (mi<br>Unit Hyd. Tpeak (mi<br>Unit Hyd. peak (cm                      | s)=                                       | 0.19  |  | 0.12                                |   |   |      |
|  |   |   |  |                                     | *T  | OTALS*  |      |
| PEAK FLOW (cm:   | s)=                                       | 0.12  |  | 0.03                                |   | 0.147 (iii  | )    |
| TIME TO PEAK (hr   | s)=                                       | 6.25  |  | 6.25                                |   | 6.25  |      |
| RUNOFF VOLUME (m   | m)=                                       | 80.04   |  | 45.99                               |   | 71.52   |      |
| TOTAL RATNEAU (mi  | m)=                                       | 82 04   |  | 82 04                               |   | 82 04   |      |
| PEAK FLOW (cm<br>TIME TO PEAK (hr<br>RUNOFF VOLUME (m<br>TOTAL RAINFALL (m<br>RUNOFF COEFFICIENT | ,-  | 02.04   |  | 02.04                               |   | 02.07   |      |
| KONOFF COEFFICIENT   | -   | 0.50  |  | 0.50                                |   | 0.07  |      |
| (iii) PEAK FLOW DOE:   | S NOT I                                   | NCLUDE  | BASEFLO  | N IF ANY                            |   |   |      |
| ADD HYD ( 0455) <br>  1 + 2 = 3  | AG  | EA 01   | DEAV   | TDEAV                               | D V   |   |      |
| 1 + 2 = 3  | Ar<br>/F                                  | .EA (I  | cmc \  | (hnc)                               | (mm)  |   |      |
| ID1= 1 ( 0190):<br>+ ID2= 2 ( 0195):   | (1  | 06 C  | 124  | (111.5)                             | (IIIII)   |   |      |
| IDT= 1 ( 0190);  | ٥.  | 70 0.   | 1.47   | 0.25                                | 00.39   |   |      |
| + 102= 2 ( 0195):  | 0.  | /9 0.   | 14/  | 6.25                                | /1.52   |   |      |
| ============   |   | ======  |  |                                     |   |   |      |
| ID = 3 ( 0455):  | 1.  |   |  |                                     |   |   |      |
| NOTE: PEAK FLOWS D   | O NOT I                                   | NCLUDE  | 280<br>BASEFLOI  | 6.25<br>NS IF AN                    | 68.32<br>Y.                                       |   |      |
| , ,  | O NOT I                                   | NCLUDE  | 280<br>BASEFLOI  | 6.25<br>NS IF AN                    | 68.32<br>Y.                                       |   |      |
| NOTE: PEAK FLOWS DO  | O NOT I                                   | NCLUDE  | 280<br>BASEFLOI  | 6.25                                | 68.32<br>Y.                                       |   |      |
| NOTE: PEAK FLOWS DO  | O NOT I                                   | NCLUDE  | 280<br>BASEFLOI  | 6.25                                | 68.32<br>Y.                                       |   |      |
| NOTE: PEAK FLOWS DO  | O NOT I                                   | NCLUDE  | 280<br>BASEFLOI  | 6.25                                | 68.32<br>Y.                                       |   |      |
| NOTE: PEAK FLOWS DO  | O NOT I                                   | NCLUDE  | 280<br>BASEFLOI  | 6.25                                | 68.32<br>Y.                                       |   |      |
| NOTE: PEAK FLOWS DO  | O NOT I                                   | NCLUDE  | 280<br>BASEFLOI  | 6.25                                | 68.32<br>Y.                                       |   |      |
| NOTE: PEAK FLOWS D   | O NOT I                                   | NCLUDE  | 280<br>BASEFLOI  | 6.25                                | 68.32<br>Y.                                       |   |      |
| NOTE: PEAK FLOWS DO  | O NOT 1  OVERFL  OUTFLO (cms) 0.000 0.010 | 00 IS | 280<br>BASEFLOI<br>FF<br>DRAGE<br>a.m.)<br>.0000<br>.0024<br>.0079 | 6.25  WS IF AN  OUTF  (cm  0.0  0.0 | 68.32<br>Y.<br>LOW S<br>s) (<br>238<br>268<br>825 | TORAGE<br>ha.m.)<br>0.0199<br>0.0259<br>0.0346  |      |
| NOTE: PEAK FLOWS DO  | O NOT 1  OVERFL  OUTFLO (cms) 0.000 0.010 | 00 IS | 280<br>BASEFLOI<br>FF<br>DRAGE<br>a.m.)<br>.0000<br>.0024<br>.0079 | 6.25  WS IF AN  OUTF  (cm  0.0  0.0 | 68.32<br>Y.                                       | TORAGE<br>ha.m.)<br>0.0199<br>0.0259<br>0.0346  |      |

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|                   | Lar   | gstaffRd_EA_Pro | oposed_WestDonWater | shd   |
|-------------------|-------|-----------------|---------------------|-------|
| ID= 1 DT= 5.0 min | Total | Imp(%) = 72.00  | Dir. Conn.(%)=      | 72.00 |
|                   |       |                 |                     |       |
|                   |       | IMPERVIOUS      | PERVIOUS (i)        |       |
| Surface Area      | (ha)= | 0.43            | 0.17                |       |
| Dep. Storage      | (mm)= | 2.00            | 5.00                |       |
| Average Slope     | (%)=  | 1.00            | 2.00                |       |
| Length            | (m)=  | 250.00          | 20.00               |       |
| Mannings n        | =     | 0.013           | 0.250               |       |
|                   |       |                 |                     |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

| TIME  | RAIN  | TIME  | RAIN  | I' TIME | RAIN    | I TIME | RAIN  |
|-------|-------|-------|-------|---------|---------|--------|-------|
| hrs   | mm/hr | hrs   | mm/hr | i' hrs  | mm/hr   | i hrs  | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05  | 6.250   | 81.28 l | 9.33   | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05  | 6.333   | 16.26   | 9.42   | 3.05  |
| 0.250 | 0.00  | 3.333 | 4.06  | 6.417   | 16.26   | 9.50   | 3.05  |
| 0.333 | 2.03  | 3.417 | 4.06  | 6.500   | 16.26   | 9.58   | 3.05  |
| 0.417 | 2.03  | 3.500 | 4.06  | 6.583   | 16.26   | 9.67   | 3.05  |
| 0.500 | 2.03  | 3.583 | 3.05  | 6.667   | 16.26   | 9.75   | 3.05  |
| 0.583 | 2.03  | 3.667 | 3.05  | 6.750   | 16.26   | 9.83   | 2.03  |
| 0.667 | 2.03  | 3.750 | 3.05  | 6.833   | 7.11    | 9.92   | 2.03  |
| 0.750 | 2.03  | 3.833 | 4.06  | 6.917   | 7.11    | 10.00  | 2.03  |
| 0.833 | 1.02  | 3.917 | 4.06  | 7.000   | 7.11    | 10.08  | 3.05  |
| 0.917 | 1.02  | 4.000 | 4.06  | 7.083   | 7.11    | 10.17  | 3.05  |
| 1.000 | 1.02  | 4.083 | 3.05  | 7.167   | 7.11    | 10.25  | 3.05  |
| 1.083 | 2.03  | 4.167 | 3.05  | 7.250   | 7.11    | 10.33  | 2.03  |
| 1.167 | 2.03  | 4.250 | 3.05  | 7.333   | 5.08    | 10.42  | 2.03  |
| 1.250 | 2.03  | 4.333 | 7.11  | 7.417   | 5.08    |        | 2.03  |
| 1.333 | 2.03  | 4.417 | 7.11  | 7.500   | 5.08    | 10.58  | 1.02  |
| 1.417 | 2.03  | 4.500 | 7.11  | 7.583   | 5.08    | 10.67  | 1.02  |
| 1.500 | 2.03  | 4.583 | 6.10  | 7.667   | 5.08    | 10.75  | 1.02  |
| 1.583 | 2.03  | 4.667 | 6.10  | 7.750   | 5.08    |        | 2.03  |
| 1.667 | 2.03  |       | 6.10  | 7.833   | 6.10    | 10.92  | 2.03  |
| 1.750 | 2.03  | 4.833 | 6.10  | 7.917   | 6.10    | 11.00  | 2.03  |
| 1.833 | 1.02  | 4.917 | 6.10  | 8.000   | 6.10    |        | 2.03  |
| 1.917 | 1.02  | 5.000 | 6.10  | 8.083   | 5.08    |        | 2.03  |
| 2.000 | 1.02  | 5.083 | 6.10  | 8.167   | 5.08    | 11.25  | 2.03  |
| 2.083 | 2.03  | 5.167 | 6.10  | 8.250   | 5.08    | 11.33  | 2.03  |
| 2.167 | 2.03  | 5.250 | 6.10  | 8.333   | 4.06    | 11.42  | 2.03  |
| 2.250 | 2.03  | 5.333 | 11.18 | 8.417   | 4.06    | 11.50  | 2.03  |
| 2.333 | 4.06  | 5.417 | 11.18 | 8.500   | 4.06    | 11.58  | 1.02  |
| 2.417 | 4.06  | 5.500 | 11.18 | 8.583   | 3.05    | 11.67  | 1.02  |
| 2.500 | 4.06  | 5.583 | 11.18 | 8.667   | 3.05    | 11.75  | 1.02  |
| 2.583 | 3.05  | 5.667 | 11.18 | 8.750   | 3.05    | 11.83  | 2.03  |
| 2.667 | 3.05  | 5.750 | 11.18 | 8.833   | 4.06    | 11.92  | 2.03  |
| 2.750 | 3.05  | 5.833 | 80.26 | 8.917   | 4.06    | 12.00  | 2.03  |
| 2.833 | 4.06  | 5.917 | 80.26 | 9.000   | 4.06    | 12.08  | 2.03  |
| 2.917 | 4.06  | 6.000 | 80.26 | 9.083   | 3.05    | 12.17  | 2.03  |
| 3.000 | 4.06  | 6.083 | 81.28 | 9.167   | 3.05    | 12.25  | 2.03  |
| 3.083 | 3.05  | 6.167 | 81.28 | 9.250   | 3.05    |        |       |

```
LangstaffRd_EA_Proposed_WestDonWatershd
)= 81.28 60.55
) 5.00 10.00
Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                     4.81 (ii)
                                                                             8.28 (ii)
                                                     0.22
                                                                                                    *TOTALS*
0.123 (iii)
PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                     0.10
                                                                             0.03
                                                    6.25
87.92
                                                                             6.25
                                                                                                         6.25
                                                                           52.66
                                                                                                        78.04
                                                    89.92
                                                                           89.92
```

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
- CN\* = 83.0 Ia = Dep. Storage (Above)
  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
  THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB | CALTB | STANDHYD ( 0170) | Area (ha)= 0.43 |ID=1 DT= 5.0 min | Total Imp(%)= 98.00 Dir. Conn.(%)= 98.00 PFRVIOUS (i) TMDERVIOUS Surface Area Dep. Storage Average Slope (ha)= (mm)= (%)= (m)= 0.42 2.00 1.00 0.01 5.00 2.00 Length 250.00 20.00 Mannings n 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

RAIN | TIME mm/hr | hrs 3.05 | 6.250 3.05 | 6.333 TIME mm/hr hrs. 3.65 6.250 3.05 6.250 4.06 6.417 4.06 6.583 3.05 6.667 3.05 6.667 3.05 6.67 7.000 4.06 7.083 3.05 7.250 3.05 7.250 3.05 7.333 hrs 0.083 mm/hr hrs 3.167 mm/hr 3.05 0.00 81.28 | 9.33 0.167 3.250 16.26 İ 3.05 0.250 0.333 0.417 0.500 0.583 0.00 2.03 2.03 2.03 2.03 2.03 3.250 3.333 3.417 3.500 3.583 3.667 3.750 16.26 16.26 16.26 16.26 16.26 7.11 7.11 3.05 3.05 3.05 3.05 2.03 0.667 2.03 0.750 2.03 3.833 2.03 0.833 1.02 3.917 7.11 3.05 7.11 | 7.11 | 7.11 | 7.11 | 5.08 | 1.02 | 1.02 | 2.03 | 2.03 | 4.000 4.083 4.167 4.250 10.17 10.25 10.33 10.42 0.917 1.000 3.05

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LangstaffRd\_EA\_Proposed\_WestDonWatershd 6)= 1.00 2.00 1)= 65.83 40.00 = 0.013 0.250 (%)= (m)= =

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

Average Slope Mannings n

> TRANSFORMED HYETOGRAPH RAIN | mm/hr | 0.00 | 0.00 | RAIN | TIME mm/hr | hrs 81.28 | 9.33 RAIN mm/hr TIME hrs 0.083 hrs 3.167 6.259 6.333 6.417 6.500 6.583 6.667 6.750 6.833 6.917 7.000 7.083 7.167 7.250 7.333 7.417 7.500 7.583 3.05 3.05 9.42 0.167 3.250 16.26 0.00 2.03 2.03 2.03 2.03 2.03 4.06 4.06 4.06 3.05 3.05 3.05 16.26 16.26 16.26 16.26 16.26 7.11 7.11 3.05 3.05 3.05 3.05 3.05 2.03 0.250 0.333 3.333 9.50 9.58 0.333 0.417 0.500 0.583 4.06 0.750 2.03 3.833 0.833 1.02 3.917 4.06 7.11 7.11 3.05 1.02 1.02 2.03 2.03 2.03 2.03 4.06 4.06 3.05 3.05 3.05 7.11 7.11 3.05 3.05 2.03 2.03 2.03 0.917 1.000 4.000 10.17 7.11 7.11 5.08 5.08 5.08 5.08 5.08 4.083 4.083 4.167 4.250 4.333 4.417 1.083 1.167 1.250 1.333 1.417 2.03 4.500 4.583 7.11 10.67 1.02 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 7.667 7.750 7.833 7.917 8.000 8.083 8.167 8.250 8.333 8.417 8.500 8.583 8.667 1.02 4.583 4.667 4.750 4.833 4.917 5.000 5.083 5.08 5.08 6.10 6.10 5.08 5.08 2.03 2.03 2.03 2.03 1.02 2.03 2.03 2.03 2.03 1.583 10.83 10.92 11.00 11.08 11.17 1.917 1.02 11.25 2.083 2.03 5.167 6.10 5.08 11.33 2.167 2.03 5,250 6.10 4.06 4.06 4.06 3.05 3.05 3.05 4.06 2.03 4.06 4.06 4.06 11.18 11.18 11.18 11.18 11.18 2.250 5.333 11.50 2.03 5.417 5.500 5.583 5.667 5.750 11.58 11.67 11.75 11.83 2.333 2.417 2.500 2.583 8.750 8.833 8.917 9.000 9.083 9.167 2.03 3.05 2.667 3.05 11.18 2.03 2.750 3.05 5.833 80.26 4.06 12.00 2.03 2.833 4.06 | 4.06 | 4.06 | 5.917 80.26 4.06 12.08 2.03 80.26 | 9.083 81.28 | 9.167 81.28 | 9.250 3.05 3.05 3.05 2.917 6.000 3.05 | 6.167

Max.Eff.Inten.(mm/hr)= 81.28 60.55 over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 5.00 15.00 2.16 (ii) 10.79 (ii) 5.00 15.00 0.31

```
LangstaffRd_EA_Proposed_WestDot
2.03  | 4.333  | 7.11  | 7.417
2.03  | 4.417  | 7.11  | 7.590
2.03  | 4.590  | 7.11  | 7.693
2.03  | 4.583  | 6.10  | 7.657
2.03  | 4.667  | 6.10  | 7.659
2.03  | 4.667  | 6.10  | 7.833
2.03  | 4.833  | 6.10  | 7.917
2.03  | 4.833  | 6.10  | 7.917
2.04  | 6.10  | 8.000
                                          1.250
                                                                                                                                                       5.08 | 10.50
5.08 | 10.58
                                           1.333
                                          1.333
1.417
1.500
1.583
1.667
1.750
                                                                                                                                                       5.08
5.08
5.08
6.10
6.10
                                                                                                                                                                        10.67
10.75
10.83
10.92
                                                                                                                                                                                                 1.02
1.02
2.03
2.03
                                                                                                        6.10 | 7.917
6.10 | 8.083
6.10 | 8.083
6.10 | 8.167
6.10 | 8.250
6.10 | 8.331
11.18 | 8.431
11.18 | 8.583
11.18 | 8.675
11.18 | 8.833
80.26 | 8.93
80.26 | 9.083
80.26 | 9.083
81.28 | 9.167
81.28 | 9.250
                                                                                                                                                                         11.00
                                                                                                                                                                                                  2.03
                                                                                    4.917
5.000
5.083
5.167
5.250
5.333
5.417
5.500
                                           1.833
                                                                  1.02
                                                                                                                                                       6.10
                                           1.917
                                                                  1.02
                                                                                                                                                       5.08
                                                                                                                                                                        11.17
                                                                                                                                                                                                  2.03
                                           2.000
                                                                  1.02
                                                                                                                                                       5.08
                                                                                                                                                                         11.25
                                          2.083
2.167
2.250
2.333
2.417
                                                                  2.03
2.03
2.03
4.06
4.06
                                                                                                                                                                        11.33
                                                                                                                                                       3.05
                                                                                                                                                                         11.67
                                                                                                                                                                                                  1.02
                                           2.500
                                                                  4.06
                                                                                                                                                       3.05
                                                                                                                                                                                                  1.02
                                                                                    5.583
5.667
5.750
5.833
5.917
6.000
6.083
6.167
                                           2.583
                                                                  3.05
                                                                                                                                                       3.05
                                                                                                                                                                        11.83
                                                                                                                                                                                                  2.03
                                           2.667
                                                                  3.05
                                                                                                                                                                         11.92
                                           2.750
2.833
2.917
                                                                 3.05 |
4.06 |
4.06 |
4.06 |
3.05 |
                                                                                                                                                       4.06 |
4.06 |
3.05 |
3.05 |
3.05 |
                                                                                                                                                                        12.00
12.08
12.17
12.25
                                                                                                                                                                                                 2.03
2.03
2.03
2.03
2.03
                                           3.083
              Max.Eff.Inten.(mm/hr)=
                                                                                       81.28
                                                                                                                          69.46
             over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                                                         5.00
4.81 (ii)
5.00
0.22
                                                                                                                          10.00
5.88 (ii)
10.00
0.15
                                                                                                                                                             *TOTALS*
0.097 (iii)
                                                                                          0.09
                                                        (cms)=
                                                                                                                             0.00
              TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                                                          6.25
                                                                                                                             6.25
                                                                                                                                                                    6.25
                                                                                        87.92
89.92
                                                                                                                          62.00
89.92
                                                                                          0.98
***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
                  (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
              (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

| CALIB | | STANDHYD ( 0180)| |ID= 1 DT= 5.0 min | Area (ha)= 0.65 Total Imp(%)= 52.00 Dir. Conn.(%)= 52.00 IMPERVIOUS PERVIOUS (i) Surface Area Dep. Storage (ha)= (mm)=

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LangstaffRd\_EA\_Proposed\_WestDonWatershd

|                 |        |       |       | *TOTALS*    |
|-----------------|--------|-------|-------|-------------|
| PEAK FLOW       | (cms)= | 0.08  | 0.04  | 0.118 (iii) |
| TIME TO PEAK    | (hrs)= | 6.25  | 6.33  | 6.25        |
| RUNOFF VOLUME   | (mm)=  | 87.92 | 52.66 | 70.98       |
| TOTAL RAINFALL  | (mm)=  | 89.92 | 89.92 | 89.92       |
| RUNOFF COEFFICI | ENT =  | 0.98  | 0.59  | 0.79        |

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB | | STANDHYD ( 0185)| |ID= 1 DT= 5.0 min | Area (ha)= 0.47 Total Imp(%)= 72.00 Dir. Conn.(%)= 72.00 TMPERVIOUS PERVIOUS (i) (ha)= (mm)= (%)= (m)= 0.34 2.00 1.00 0.13 5.00 2.00 Dep. Storage Average Slope Length Mannings n 0.013 0.350

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05     | 6.250   | 81.28 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05     | 6.333   | 16.26 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 4.06     | 6.417   | 16.26 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 4.06     | 6.500   | 16.26 | 9.58  | 3.05  |
| 0.417 | 2.03  | 3.500 | 4.06     | 6.583   | 16.26 | 9.67  | 3.05  |
| 0.500 | 2.03  | 3.583 | 3.05     | 6.667   | 16.26 | 9.75  | 3.05  |
| 0.583 | 2.03  | 3.667 | 3.05     | 6.750   | 16.26 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 3.05     | 6.833   | 7.11  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 4.06     | 6.917   | 7.11  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 4.06     | 7.000   | 7.11  | 10.08 | 3.05  |
| 0.917 | 1.02  | 4.000 | 4.06     | 7.083   | 7.11  | 10.17 | 3.05  |
| 1.000 | 1.02  | 4.083 | 3.05     | 7.167   | 7.11  | 10.25 | 3.05  |
| 1.083 | 2.03  | 4.167 | 3.05     | 7.250   | 7.11  | 10.33 | 2.03  |
| 1.167 | 2.03  | 4.250 | 3.05     | 7.333   | 5.08  | 10.42 | 2.03  |
| 1.250 | 2.03  | 4.333 | 7.11     | 7.417   | 5.08  | 10.50 | 2.03  |
| 1.333 | 2.03  | 4.417 | 7.11     | 7.500   | 5.08  | 10.58 | 1.02  |
| 1.417 | 2.03  | 4.500 | 7.11     | 7.583   | 5.08  | 10.67 | 1.02  |
| 1.500 | 2.03  | 4.583 | 6.10     | 7.667   | 5.08  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 6.10     | 7.750   | 5.08  | 10.83 | 2.03  |

```
LangstaffRd_EA_Proposed_WestDonWatershd
2.03 | 4.750 | 6.10 | 7.833 | 6.10 | 1
2.03 | 4.833 | 6.10 | 7.917 | 6.10 | 1
1.02 | 4.917 | 6.10 | 8.000 | 6.10 | 1
1.02 | 5.000 | 6.10 | 8.000 | 6.10 | 1
1.02 | 5.000 | 6.10 | 8.003 | 5.08 | 1
1.02 | 5.083 | 6.10 | 8.167 | 5.08 | 1
2.03 | 5.167 | 6.10 | 8.250 | 5.08 | 1
2.03 | 5.250 | 6.10 | 8.250 | 5.08 | 1
2.03 | 5.333 | 11.18 | 8.417 | 4.06 | 1
4.06 | 5.500 | 11.18 | 8.583 | 3.05 | 1
4.06 | 5.500 | 11.18 | 8.583 | 3.05 | 1
4.06 | 5.533 | 81.26 | 8.750 | 3.05 | 1
3.05 | 5.667 | 11.18 | 8.833 | 4.06 | 1
3.05 | 5.667 | 11.18 | 8.833 | 4.06 | 1
4.06 | 5.933 | 80.26 | 8.917 | 4.06 | 1
4.06 | 5.917 | 80.26 | 9.000 | 4.06 | 1
4.06 | 6.000 | 80.26 | 9.000 | 4.06 | 1
4.06 | 6.000 | 80.26 | 9.003 | 3.05 | 1
4.06 | 6.000 | 80.26 | 9.003 | 3.05 | 1
4.06 | 6.000 | 80.26 | 9.083 | 3.05 | 1
4.06 | 6.000 | 80.26 | 9.083 | 3.05 | 1
4.06 | 6.083 | 81.28 | 9.157 | 3.05 | 1
4.06 | 6.083 | 81.28 | 9.157 | 3.05 | 1
                                                                                                                                                                                                                         Natershd
6.10 | 10.92
6.10 | 11.00
6.10 | 11.08
5.08 | 11.17
5.08 | 11.25
5.08 | 11.24
4.06 | 11.50
4.06 | 11.50
4.06 | 11.50
                                                            1.667
                                                             1.750
                                                                                                                                                                                                                                                                                         2.03
                                                            1.833
1.917
2.000
2.083
                                                                                                                                                                                                                                                                                        2.03
2.03
2.03
2.03
2.03
                                                             2.167
                                                                                                                                                                                                                                                                                         2.03
                                                             2.250
                                                             2.333
                                                                                                                                                                                                                                                                                         1.02
                                                             2.417
                                                                                                                                                                                                                                                      11.67
                                                                                                                                                                                                                                                                                         1.02
                                                                                                                                                                                                                                                                                        1.02
2.03
2.03
2.03
                                                             2.500
2.583
                                                                                                                                                                                                                                                      11.75
                                                                                                                                                                                                                                                    11.75
11.83
11.92
12.00
12.08
                                                            2.667
2.750
2.833
                                                                                                                                                                                                                                                                                         2.03
                                                             2.917
                                                                                                                                                                                                                                                     12.17
                                                                                                                                                                                                                                                                                         2.03
                                                                                                                                                                                                                                                    12.25
                                                                                                                                                                                                                                                                                        2.03
                                                             3.083
                Max.Eff.Inten.(mm/hr)=

over (min)

Storage Coeff. (min)=

Unit Hyd. Tpeak (min)=

Unit Hyd. peak (cms)=
                                                                                                                            81.28 54.91
5.00 10.00
4.69 (ii) 8.94 (ii)
5.00 10.00
0.22 0.12
                                                                                                                                                                                                                                    *TOTALS*
                 PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                                                                                              0.08
6.25
87.92
89.92
0.98
                                                                                                                                                                                                                                         0.094 (iii)
6.25
76.54
89.92
                                                                                                                                                                                    a a2
                                                                                                                                                                               6.25
47.30
89.92
0.53
***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
                (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN* = 79.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COFFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
   ADD HYD ( 0445)|
1 + 2 = 3 |
ID1= 1 ( 0180):
+ ID2= 2 ( 0185):
                                                                                                                                         QPEAK
(cms)
0.118
0.094
                                                                                                                                                                               TPEAK
(hrs)
6.25
6.25
                                                                                                                                                                                                               R.V.
(mm)
70.98
76.54
                                                                                                              AREA
                                                                                                              (ha)
0.65
0.47
                     ID = 3 ( 0445):
                                                                                                         1.12
                                                                                                                                     0.212
                                                                                                                                                                             6.25
                                                                                                                                                                                                              73.31
                 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

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LangstaffRd\_EA\_Proposed\_WestDonWatershd = 0.013 0.250 Mannings n

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```
TRANSFORMED HYETOGRAPH -
                                         RAIN |
mm/hr |
0.00 |
0.00 |
                                                          TIME
hrs
3.167
3.250
3.333
                                                                                                               RAIN | TIME
mm/hr | hrs
81.28 | 9.33
16.26 | 9.42
                                                                                          RATN
                       hrs
0.083
0.167
                                                                                                                                                    mm/hr
3.05
3.05
3.05
3.05
                                           0.00
                                                                                                               16.26
                        0.250
                                                                                                                                  9.50
9.58
                        0.333
                                                          3,417
                                                                                                               16.26
                                          2.03
2.03
2.03
2.03
2.03
1.02
                                                                                                                                9.58
9.67
9.75
9.83
9.92
10.00
10.08
                        0.417
                                                          3.500
                                                                                                               16.26
16.26
7.11
7.11
7.11
7.11
7.11
5.08
5.08
5.08
5.08
5.08
6.10
6.10
6.10
5.08
4.06
4.06
                                                                                                                                                    3.05
3.05
2.03
2.03
2.03
3.05
3.05
                        0.417
0.500
0.583
0.667
0.750
0.833
                                                          3.667
3.750
3.833
3.917
                        0.917
                                           1.02
                                                         4.000
4.083
4.167
4.250
4.333
4.417
4.500
4.583
4.667
4.750
4.833
4.917
5.000
5.083
                                                                                                                                10.17
                        1.000
                                           1.02
                                                                                                                                10.25
                                                                                                                                                     3.05
                                          2.03
2.03
2.03
2.03
2.03
2.03
2.03
                                                                                                                                10.25
10.33
10.42
10.50
10.58
10.67
10.75
                                                                                                                                                    2.03
2.03
2.03
1.02
1.02
                        1.083
                        1.083
1.167
1.250
1.333
1.417
1.500
                                                                             6.10 |
6.10 |
6.10 |
6.10 |
6.10 |
6.10 |
6.10 |
                        1.583
                                           2.03
                                                                                                                                10.83
                                                                                                                                                    2.03
                        1.667
                                                                                                                                10.92
                                                                                                                                                    2.03
                                          2.03
1.02
1.02
1.02
2.03
2.03
                                                                                                                                11.00
11.08
11.17
11.25
11.33
                                                                                                                                                   2.03
2.03
2.03
2.03
2.03
                        1.750
                        1.833
1.917
2.000
2.083
                                                          5.167
                        2.167
                                                          5.250
                                                                                                                                11.42
                        2.250
                                           2.03
4.06
                                                          5.333
                                                                            11.18
                                                                                                                                11.50
                                                                                                                                                    2.03
                        2.333
                                                          5.417
                                                                            11.18
                                                                                                                                11.58
                                                                                                                                                    1.02
                                                         5.417
5.500
5.583
5.667
5.750
5.833
5.917
                                                                                                                3.05
3.05
3.05
4.06
4.06
4.06
                                          4.06
4.06
3.05
3.05
                                                                           11.18
11.18
11.18
11.18
                                                                                                                                11.67
11.75
11.83
11.92
12.00
                                                                                                                                                   1.02
1.02
2.03
2.03
                        2.417
                                          3.05 |
4.06 |
4.06 |
                        2.750
                                                                                                                                                    2.03
                                                                            80.26
                        2.833
                                                                            80.26
                                                                                                                                12.08
                                                                                                                                                    2.03
                        2.917
                                                          6.000
                                                                            80.26 |
81.28 |
                                                                                                                 3.05
                                                                                                                                12.17
                                                                                                                                                   2.03
                                                          6.083
                                                                                                                                12.25
                        3.083
                                          3.05 | 6.167
                                                                            81.28 | 9.250
                                                                                                                 3.05
Max.Eff.Inten.(mm/hr)=
                                                                                         64.97
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                            10.00 15.00
7.56 (ii) 12.39 (ii)
10.00 15.00
                                                              0.13
                                                                                           0.08
                                                                                                                      *TOTALS*
                                                              0.51
PEAK FLOW
                                 (cms)=
                                                                                           0.10
                                                                                                                          0.611 (iii)
```

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| ADD HYD ( 0450) <br>  1 + 2 = 3  <br>                                  | AREA<br>(ha)                        | QPEAK<br>(cms) | TPEAK<br>(hrs)        | R.V.<br>(mm)           |                    |
|--|-------------------------------------|----------------|-----------------------|------------------------|--------------------|
| ID1= 1 ( 0165):<br>+ ID2= 2 ( 0170):                                   | 0.43                                | 0.097          | 6.25                  | 87.39                  |                    |
| ID = 3 ( 0450):  |                                     |                |                       |                        | •                  |
| NOTE: PEAK FLOWS DO  | NOT INCLU                           | JDE BASEFL     | OWS IF AM             | NY.                    |                    |
|  |                                     |                |                       |                        |                    |
| ADD HYD ( 0450)<br>3 + 2 = 1   | AREA                                | QPEAK          | TPEAK                 | R.V.                   |                    |
| 3 + 2 = 1  <br>  3 + 2 = 1  <br>  ID1= 3 ( 0450):<br>+ ID2= 2 ( 0445): | (ha)<br>1.03<br>1.12                | 0.219<br>0.212 | (hrs)<br>6.25<br>6.25 | (mm)<br>81.94<br>73.31 | 1                  |
| ID = 1 ( 0450):  |                                     |                |                       |                        | :                  |
| NOTE: PEAK FLOWS DO  | OVERFLOW 1                          | S OFF          |                       |                        |                    |
| DT= 5.0 min  | OUTFLOW<br>(cms)                    | STORAGE        | OUTE                  | LOW<br>ns )            | STORAGE<br>(ha m ) |
|  | (cms)<br>0.0000<br>0.0081<br>0.0123 | 0.0000         | 0.6                   | 9181                   | 0.0552             |
|  | 0.0081                              | 0.0048         | 0.6                   | 9203                   | 0.0732             |
|  | 0.0123                              | 0.0192         | 0.6                   | 9000                   | 0.0000             |
|  | ARE                                 | A QPE          | AK TE                 | PEAK                   | R.V.               |
|  |                                     |                | 5) (1                 | 11.2)                  | 77.45              |
|  | (ha<br>9) 2.1<br>9) 2.1             | 150 0<br>150 0 | .431<br>.022          | 8.50                   | 77.38              |
| INFLOW : ID= 2 ( 0456<br>OUTFLOW: ID= 1 ( 0526<br>PEAK                 | FLOW RE                             | DUCTION [      | Qout/Qin              | ](%)= 5                | .19                |
| INFLOW : ID= 2 ( 0456<br>OUTFLOW: ID= 1 ( 0526<br>PEAK<br>TIME 5       |                                     | DUCTION [      | Qout/Qin<br>(r        | ](%)= 5<br>nin)=135    | i.19<br>i.00       |

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PERVIOUS (i)

0.73 5.00 2.00

40.00

|                 | Lang   | staffRd_EA_Pi | roposed_WestDor | Watershd |
|-----------------|--------|---------------|-----------------|----------|
| TIME TO PEAK    | (hrs)= | 6.25          | 6.33            | 6.25     |
| RUNOFF VOLUME   | (mm)=  | 87.92         | 57.11           | 80.52    |
| TOTAL RAINFALL  | (mm)=  | 89.92         | 89.92           | 89.92    |
| RUNOFF COEFFICI | ENT =  | 0.98          | 0.64            | 0.96     |

IMPERVIOUS

2.32 2.00 1.00 531.00

(ha)= (mm)= (%)= (m)=

Surface Area Dep. Storage Average Slope Length

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 86.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COEFFICIENT.

  (iii) PEAK FLOW DOES NOT TNYLIUDE BASFFLOW IT ANYL

|     | (111)  | PEAK   | FLOW | DOES | NOI | INCLUDE | BASEFI | LOW IF | ANY. |        |    |     |      |
|-----|--------|--------|------|------|-----|---------|--------|--------|------|--------|----|-----|------|
|     |        |        |      |      |     |         |        |        |      |        |    |     | <br> |
|     |        |        |      |      |     |         |        |        |      |        |    |     |      |
| CA  | LIB    |        |      |      |     |         |        |        |      |        |    |     |      |
| ST  | ANDHYD | ( 0:   | 135) | Are  | ea  | (ha)=   | 1.43   |        |      |        |    |     |      |
| ID= | 1 DT=  | 5.0 r  | min  | Tot  | tal | Imp(%)= | 99.00  | Dir.   | Con  | n.(%)= | 99 | .00 |      |
|     |        |        |      |      |     |         |        |        |      |        |    |     |      |
|     |        |        |      |      |     | IMPERVI | OUS    | PERVIO | US ( | i)     |    |     |      |
|     | Surfa  | ce Are | ea   | (ha) | )=  | 1.4     | 2      | 0.0    | 1    |        |    |     |      |
|     | Dep.   | Stora  | ge   | (mm) | )=  | 2.0     | 0      | 5.0    | 0    |        |    |     |      |
|     | Avera  | ge Slo | ope  | (%)  | )=  | 1.0     | 0      | 2.0    | 0    |        |    |     |      |
|     | Lengt  | h      |      | (m)  | )=  | 503.0   | 0      | 30.0   | 0    |        |    |     |      |
|     | Manni  | ngs n  |      |      | =   | 0.01    | 3      | 0.25   | 0    |        |    |     |      |
|     |        |        |      |      |     |         |        |        |      |        |    |     |      |
|     |        |        |      |      |     |         |        |        |      |        |    |     |      |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | ) HYETOGR | APH   |       |       |
|-------|-------|-------|----------|-----------|-------|-------|-------|
| TIME  | RAIN  | TIME  |          | ' TIME    | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs     | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05     | 6.250     | 81.28 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05     | 6.333     | 16.26 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 4.06     | 6.417     | 16.26 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 4.06     | 6.500     | 16.26 | 9.58  | 3.05  |
| 0.417 | 2.03  | 3.500 | 4.06     | 6.583     | 16.26 | 9.67  | 3.05  |
| 0.500 | 2.03  | 3.583 | 3.05     | 6.667     | 16.26 | 9.75  | 3.05  |
| 0.583 | 2.03  | 3.667 | 3.05     | 6.750     | 16.26 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 3.05     | 6.833     | 7.11  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 4.06     | 6.917     | 7.11  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 4.06     | 7.000     | 7.11  | 10.08 | 3.05  |
| 0.917 | 1.02  | 4.000 | 4.06     | 7.083     | 7.11  | 10.17 | 3.05  |
| 1.000 | 1.02  | 4.083 | 3.05     | 7.167     | 7.11  | 10.25 | 3.05  |
| 1.083 | 2.03  | 4.167 | 3.05     | 7.250     | 7.11  | 10.33 | 2.03  |
| 1.167 | 2.03  | 4.250 | 3.05     | 7.333     | 5.08  | 10.42 | 2.03  |
| 1.250 | 2.03  | 4.333 | 7.11     | 7.417     | 5.08  | 10.50 | 2.03  |
| 1.333 | 2.03  | 4.417 | 7.11     | 7.500     | 5.08  | 10.58 | 1.02  |
| 1.417 | 2.03  | 4.500 | 7.11     | 7.583     | 5.08  | 10.67 | 1.02  |
| 1.500 | 2.03  | 4.583 | 6.10     | 7.667     | 5.08  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 6.10     | 7.750     | 5.08  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 6.10     | 7.833     | 6.10  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 6.10     | 7.917     | 6.10  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 6.10     | 8.000     | 6.10  | 11.08 | 2.03  |
|       |       |       |          |           |       |       |       |

```
1.917
                                                                              5.08 | 11.17
5.08 | 11.25
                      2.000
                                                                                                     2.03
                                                                                                     2.03
2.03
2.03
1.02
                      2.083
2.167
                                                                                         11.33
                      2.417
                                                                                         11.67
                                                                                                     1.02
                                                                                         11.75
                                                                                                     1.02
                      2.583
                                                                                        11.83
                                                                                                     2.03
                      2.667
                                                                                         11.92
                                                                                                     2.03
                                 3.05
4.06
4.06
4.06
                                                                                                     2.03
2.03
2.03
2.03
2.03
                      2.750
                                                                                         12.00
                      2.833
2.917
3.000
                                 3.05
                      3.083
      Max.Eff.Inten.(mm/hr)=
                                             81.28
                                                               62.01
      over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                              5.00
7.32 (ii)
5.00
0.17
                                                               10.00
                                                               8.34 (ii)
10.00
                                                                 0.13
       PEAK FLOW
                            (cms)=
                                              0.31
                                                                 0.00
                                                                                    0.317 (iii)
      PEAK FLOW (Cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                             6.25
87.92
                                                                 6.25
                                                                                     6.25
87.57
                                                               54.10
                                             89 92
                                                               89 92
         (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
       CN* = 84.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
PERVIOUS (i)
                                         TMPERVTOUS
                             (ha)=
(mm)=
(%)=
(m)=
                                                              0.11
5.00
2.00
25.00
                                            1.16
2.00
1.00
503.00
      Dep. Storage
Average Slope
       Length
      Mannings n
                                             0.013
                                                               0.250
           NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.
                       ---- TRANSFORMED HYETOGRAPH ----
TIME RAIN | TIME RAIN | TIME RAIN | TIME
                                                        Page 173
      LangstaffRd_EA_Proposed_WestDonWatershd
CN* = 83.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COFFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
                                        (ha)
                                                   (cms)
                                                               (hrs)
                                                                          (mm)
87.57
       ID1= 1 ( 0135):
+ ID2= 2 ( 0140):
                                       1.43
                                                 0.317
                                                               6.25
                                       1.27
                                                  0.274
                                                               6.25
                                                                           84.74
       ID = 3 ( 0420):
                                      2.70
                                               0.590
                                                              6.25
                                                                          86.24
      NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
 RESERVOIR( 0530)|
                                 OVERFLOW IS OFF
 IN= 2---> OUT= 1
DT= 5.0 min
                                  OUTFLOW
                                                 STORAGE
                                                                   OUTFLOW
                                                                                   STORAGE
                                   (cms)
0.0000
0.0056
                                                  (ha.m.)
0.0000
0.0072
                                                                     (cms)
0.0122
                                                                     0.0382
                                                                                      0.1093
                                    0.0084
                                                   0.0283
                                                                     0.0516
                                   0.0105
                                                  0.0553
                                                                     0.0000
                                                                                      0.0000
                                           AREA
                                                        QPEAK
                                                                       TPFAK
                                                                                       R.V.
                                           (ha)
2.700
2.700
                                                       (cms)
0.590
0.052
                                                                      (hrs)
6.25
7.25
   INFLOW : ID= 2 ( 0420)
OUTFLOW: ID= 1 ( 0530)
                         PEAK FLOW REDUCTION [Qout/Qin](%)= 8.73
TIME SHIFT OF PEAK FLOW (min)= 60.00
MAXIMUM STORAGE USED (ha.m.)= 0.1597
 ADD HYD ( 0425)|
1 + 2 = 3 |
                                       AREA
                                                               TPEAK
                                                  QPEAK
                                       (ha)
3.05
                                                (cms)
0.611
                                                               (hrs)
                                                                          (mm)
80.52
       ID1= 1 ( 0145):
+ ID2= 2 ( 0530):
                                       2.70
                                                 0.052
                                                               7.25
                                                                           86.12
        ID = 3 ( 0425):
                                       5.75 0.653
      NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
| RESERVOIR( 0512)|
| IN= 2---> OUT= 1 |
                                 OVERFLOW IS OFF
```

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LangstaffRd\_EA\_Proposed\_WestDonWatershd mm/hr hrs 3.167 mm/hr hrs mm/hr | 81.28 | 6.250 0.083 0.00 3.05 9.33 3.05 3.05 4.06 4.06 4.06 6.333 6.417 6.500 6.583 16.26 16.26 16.26 16.26 9.42 9.50 9.58 9.67 3.05 3.05 3.05 3.05 0.167 0.250 0.00 3.250 3.333 3.333 3.417 3.500 3.583 0.500 2.03 3.05 6.667 16.26 9.75 3.05 0.583 2.03 3.667 3.05 6.750 16.26 9.83 2.03 0.667 2.03 3.750 3.05 6.833 7.11 9.92 2.03 6.917 7.000 7.083 7.167 7.250 7.333 0.750 2.03 3.833 4.06 7.11 10.00 2.03 3.833 3.917 4.000 4.083 4.167 4.250 0.833 0.917 1.000 1.083 4.06 4.06 3.05 3.05 7.11 7.11 7.11 7.11 7.11 10.08 10.17 10.25 10.33 3.05 3.05 3.05 2.03 1.02 1.02 1.02 1.02 2.03 1.167 5.08 2.03 3.05 7.11 10.42 2.03 4.250 4.333 4.417 4.500 4.583 4.667 4.750 4.833 4.917 1.250 2.03 7.417 5.08 10.50 2.03 1.333 2.03 7.11 7.500 5.08 10.58 1.02 7.500 7.583 7.667 7.750 7.833 7.917 8.000 1.417 2.03 7.11 5.08 10.67 1.02 1.500 1.583 1.667 1.750 1.833 2.03 2.03 2.03 2.03 2.03 6.10 6.10 6.10 6.10 5.08 5.08 6.10 6.10 10.75 10.83 10.92 11.00 1.02 2.03 2.03 2.03 6.10 1.02 6.10 11.08 2.03 4.917 5.000 5.083 5.167 5.250 5.333 5.417 5.500 5.583 8.083 8.167 8.250 8.333 8.417 8.500 8.583 1.917 1.02 6.10 5.08 11.17 2.03 2.000 1.02 6.10 5.08 11.25 2.03 6.10 6.10 11.18 11.18 2 03 11 33 2.167 2.250 2.333 2.417 2.03 2.03 2.03 4.06 4.06 4.06 4.06 4.06 3.05 11.42 11.50 11.58 2.03 2.03 2.03 1.02 11.67 2.500 4.06 11.18 8.667 8.750 3.05 11.75 1.02 2.583 3.05 5.667 11.18 3.05 11.83 2.03 5.667 5.750 5.833 5.917 6.000 6.083 6.167 8.750 8.833 8.917 9.000 9.083 9.167 9.250 11.92 12.00 12.08 12.17 12.25 2.03 2.03 2.03 2.03 2.03 2.667 2.750 3.05 11.18 4.06 3 05 80.26 | 80.26 | 80.26 | 81.28 | 81.28 | 2.750 2.833 2.917 3.000 3.083 4.06 4.06 4.06 3.05 4.06 | 4.06 | 3.05 | 3.05 | 3.05 | 81.28 Max.Eff.Inten.(mm/hr)= 60.55 over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 5.00 7.32 (ii) 5.00 0.17 10.00 9.61 (ii) \*TOTALS\* 0.274 (iii) TIME TO PEAK (hrs)= (mm)= (mm)= 6.25 6.25 6.25 84.74 RUNOFF VOLUME 87.92 52.66 TOTAL RAINFALL 89.92 89.92 89.92 RUNOFF COEFFICIENT 0.98 0.59

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

STORAGE (ha.m.) 0.0000 OUTFLOW (cms) 0.0471 STORAGE (ha.m.) 0.1003 | DT= 5.0 min (cms) 0.0000 0.0071 0.0165 0.0636 0.1284 0.0098 0.0331 0.0763 0.1594 0 0119 0 0526 0 0870 0 1934 0.2308 AREA (ha) 5.750 5.750 (cms) 0.653 0.086 (hrs) (mm) 83.15 INFLOW : ID= 2 ( 0425) OUTFLOW: ID= 1 ( 0512) 6.25 8.50 83.05 PEAK FLOW REDUCTION [Qout/Qin](%)= 13.16 TIME SHIFT OF PEAK FLOW (min)=135.00 MAXIMUM STORAGE USED (ha.m.)= 0.1898 CALIB | CALIB | | STANDHYD ( 0215) | | ID= 1 DT= 5.0 min | Area (ha)= 0.58 Total Imp(%)= 81.00 Dir. Conn.(%)= 81.00 PERVIOUS (i) 0.47 2.00 0.11 5.00 (mm) = (%) = (m) = Dep. Storage Average Slope 1.00 2.00 Length Mannings n 260.00 30.00 0.013 0.250 NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP. TRANSFORMED HYETOGRAPH RAIN | TIME TIME RAIN TIME RAIN | TIME RAIN 3.167 3.250 3.333 3.417 3.500 mm/hr 0.00 0.00 0.00 2.03 hrs 9.33 9.42 9.50 9.58 mm/hr mm/hr İ 6.250 6.333 6.417 6.500 6.583 6.667 6.750 6.833 0.083 3.05 3.05 4.06 4.06 81.28 | 16.26 | 16.26 | 16.26 | 3.05 3.05 3.05 3.05 3.05 0.167 0.250 0.333 0.417 2.03 4.06 16.26 9.67 3.05 3.583 0.500 2.03 3.05 16.26 9.75 3.05 0.583 2.03 3.667 3.05 16.26 9.83 2.03 0.667 2.03 3.750 3.05 7.11 2.03 4.06 4.06 4.06 3.05 6.833 6.917 7.000 7.083 7.167 7.250 7.333 7.417 0.750 0.833 0.917 1.000 1.083 2.03 1.02 1.02 1.02 2.03 3.833 3.917 4.000 4.083 4.167 7.11 7.11 7.11 7.11 7.11 10.00 10.08 10.17 10.25 2.03 3.05 3.05 2.03 3.05 7.11 10.33 2.03 | 4.250 2.03 | 4.333 2.03 | 4.417 2.03 | 4.500 1.167 3.05 5.08 10.42 2.03 1.250 7.11 5.08 10.50 2.03 1 333 7.11 | 7.500 7.11 | 7.583 5 08 10 58 1 02

10.67

1.417

```
5.08 | 10.75
5.08 | 10.83
1.583
                                                          2.03
                                                          2.03
2.03
2.03
2.03
1.667
1.750
                                                 10.92
                                                 11.25
                                                          2.03
2.083
                                                 11.33
                                                          2.03
2.167
                                                 11.42
                                                          2.03
2.250
                                                 11.50
                                                          2.03
2.333
                                                 11.58
                                                          1.02
2.667
                                                 11.92
                                                          2.03
2.750
                                                 12.00
                                                          2.03
2.833
                                                12.08
                                                          2.03
2.917
                                                 12.17
                                                          2.03
                                                 12.25
```

Max.Eff.Inten.(mm/hr)= over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 5.00 4.92 (ii) 10.00 8.54 (ii) 5.00 10.00 0.22 0.12 \*\*\*\*\*\* PEAK FLOW TIME TO PEAK RUNOFF VOLUME 0.11 6.25 87.92 0.02 6.25 52.66 89.92 0.122 (iii) 6.25 81.21 (cms)= (hrs)= (mm)= (mm)= TOTAL RAINFALL 89.92 89.92 RUNOFF COEFFICIENT 0.98 0.59 0.90

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN\* = 83.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COFFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| STANDHYD ( 0220)| |ID= 1 DT= 5.0 min | Area (ha)= 0.65 Total Imp(%)= 66.00 Dir. Conn.(%)= 66.00 IMPERVIOUS PERVIOUS (i) 0.43 2.00 1.00 260.00 0.013 0.22 5.00 2.00 Surface Area (ha)= Dep. Storage Average Slope Length Mannings n (mm)= (%)= (m)= 20.00

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LangstaffRd\_EA\_Proposed\_WestDonWatershd 1)= 87.92 52.66 75.9 1)= 89.92 89.92 89.9 RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =

0.59

0.84

\*\*\*\* WARNING: STORAGE COFFE. IS SMALLER THAN TIME STEP!

0.98

ADD HYD ( 0470)| 1 + 2 = 3 | (ha) 0.58 (cms) 0.122 (hrs) 6.25 (mm) 81.21 ID1= 1 ( 0215): + ID2= 2 ( 0220): 0.65 0.130 6.25 75.92 ID = 3 ( 0470): 1.23 0.252 6.25 78.42

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR( 0535) OVERFLOW IS OFF IN= 2---> OUT= 1 DT= 5.0 min OUTFLOW STORAGE OUTFLOW STORAGE (cms) 0.0000 0.0053 (ha.m.) 0.0000 0.0048 0.0154 (cms) 0.0116 0.0131 0.0202 0.0100 0.0261 0.0000 0.0000 R.V. AREA OPEAK TPEAK

(ha) 1.230 1.230 INFLOW: ID= 2 ( 0470) OUTFLOW: ID= 1 ( 0535)

> PEAK FLOW REDUCTION [Qout/Qin](%)= 7.89
> TIME SHIFT OF PEAK FLOW (min)= 65.00 TIME SHIFT OF PEAK FLOW (min)= 65.00 MAXIMUM STORAGE USED (ha.m.)= 0.0632

| CALIB | STANDHYD ( 0225)| |ID= 1 DT= 5.0 min | Area (ha)= 0.60 Total Imp(%)= 83.00 Dir. Conn.(%)= 83.00

IMPERVIOUS PERVIOUS (i) Surface Area 0.50 2.00 0.10 5.00 Dep. Storage

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#### LangstaffRd\_EA\_Proposed\_WestDonWatershd

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

TIME RAIN | TIME RAIN | TIME hrs mm/hr | hrs mm/hr | hrs 3.167 3.05 | 6.250 81.28 | 9.33 mm/hr mm/hr 0.083 0.00 3.05 0.167 0.00 3.250 3.05 6.333 16.26 9.42 3.05 0.250 0.00 3.333 4.06 16.26 3.05 16.26 16.26 16.26 16.26 7.11 0.333 0.417 0.500 0.583 2.03 2.03 2.03 2.03 3.417 3.500 3.583 3.667 3.750 4.06 4.06 3.05 3.05 6.500 6.583 6.667 6.750 6.833 9.58 9.67 9.75 9.83 3.05 3.05 3.05 2.03 2.03 9.92 0.667 3.05 2.03 0.750 2.03 3.833 4.06 6.917 7.000 7.11 10.00 2.03 0.833 1.02 3.917 4.06 7.11 10.08 3.05 4.000 4.083 4.167 4.250 4.333 4.417 7.000 7.083 7.167 7.250 7.333 7.417 7.500 0.917 1.02 4.06 10.17 3.05 3.05 3.05 3.05 7.11 1.000 1.083 1.167 1.250 1.02 2.03 2.03 2.03 7.11 7.11 7.11 5.08 5.08 10.25 10.33 10.42 10.50 3.05 2.03 2.03 1.333 2.03 7.11 5.08 10.58 1.02 4.500 4.583 4.667 4.750 4.833 4.917 5.000 7.583 1.417 2.03 7.11 5.08 10.67 1.02 1.417 1.500 1.583 1.667 1.750 1.833 1.917 2.03 6.10 5.08 10.75 1.02 6.10 6.10 6.10 6.10 6.10 2 03 7.750 7.833 7.917 8.000 8.083 8.167 8.250 8.333 8.417 8.500 8.583 8.667 8.750 8.833 10 83 2.03 2.03 2.03 1.02 1.02 6.10 6.10 6.10 5.08 10.83 10.92 11.00 11.08 11.17 2.03 2.03 2.03 2.03 2.03 5.083 2.000 2.083 1.02 6.10 5.08 11.25 2.03 2.03 5.167 6.10 5.08 11.33 2.03 6.10 6.10 11.18 11.18 11.18 11.18 11.33 11.42 11.50 11.58 11.67 11.75 11.83 2.167 2.03 5.250 5.333 4.06 2.03 4.06 4.06 4.06 3.05 3.05 3.05 4.06 2.03 2.250 2.333 2.417 2.500 2.583 5.333 5.417 5.500 5.583 5.667 5.750 4.06 4.06 4.06 3.05 3.05 1.02 1.02 1.02 1.02 2.03 2.667 11.18 11.92 2.03 5.833 5.917 6.000 6.083 8.917 9.000 9.083 9.167 9.250 2.750 3.05 80.26 4.06 12.00 2.03 2.833 4.06 80.26 4.06 12.08 2.03 4.06 4.06 3.05 80.26 | 81.28 | 81.28 | 3.05 3.05 3.05 2.917 12.17 2.03 81.28 60.55 Max.Eff.Inten.(mm/hr)= over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 5.00 4.92 (ii) 10.00 8.80 (ii) 10.00

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0.12

6.25

\*TOTALS\*

0.130 (iii) 6.25

0.22

LangstaffRd\_EA\_Proposed\_WestDonWatershd () = 1.00 2.00 () = 320.00 10.00

(%)= (m)= = Average Slope Length Mannings n 0.013 0.250

PEAK FLOW TIME TO PEAK

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

mm/hr 0.00 0.00 mm/hr | 81.28 | hrs 3.167 mm/hr hrs 6.250 mm/h 9.33 0.083 3.05 3.05 3.05 0.167 3.250 6.333 16.26 İ 3.05 6.333 6.417 6.500 6.583 6.667 6.750 6.833 16.26 16.26 16.26 16.26 16.26 7.11 7.11 9.42 9.50 9.58 9.67 9.75 9.83 9.92 0.250 0.00 3.333 3.05 0 333 2 03 0.333 0.417 0.500 0.583 2.03 2.03 2.03 2.03 2.03 3.500 3.583 3.667 3.750 3.05 3.05 3.05 2.03 0.667 0.750 2.03 3.833 4.06 6.917 7.000 10.00 2.03 3.917 4.000 4.083 4.167 4.250 4.333 4.417 0.833 1.02 4.06 10.08 3.05 0.833 0.917 1.000 1.083 1.167 1.250 1.333 7.000 7.083 7.167 7.250 7.333 7.417 7.500 7.583 7.11 7.11 7.11 7.11 5.08 5.08 5.08 3.05 3.05 2.03 2.03 2.03 1.02 4.06 10.17 10.17 10.25 10.33 10.42 10.50 10.58 1.02 2.03 2.03 2.03 2.03 3.05 3.05 3.05 7.11 7.11 1.02 7.11 1.417 2.03 4.500 5.08 10.67 1.02 7.667 7.750 7.833 7.917 8.000 8.083 8.167 1.500 2.03 4.583 6.10 5.08 10.75 1.02 4.583 4.667 4.750 4.833 4.917 5.000 1.583 1.667 1.750 1.833 1.917 2.03 2.03 2.03 2.03 1.02 6.10 6.10 6.10 6.10 5.08 6.10 6.10 6.10 5.08 10.83 10.92 11.00 11.08 2.03 2.03 2.03 2.03 1.02 6.10 11.17 2.03 2.000 1.02 5.083 6.10 5.08 11.25 2.03 2.083 2.03 5.167 6.10 8.250 5.08 11.33 2.03 2.167 2.03 5.250 6.10 | 8.333 11.18 | 8.417 11.18 | 8.500 11.18 | 8.583 11.18 | 8.667 11.18 | 8.8750 11.18 | 8.833 80.26 | 8.917 80.26 | 9.000 80.26 | 9.083 81.28 | 9.167 81.28 | 9.250 6.10 4.06 11.42 2.03 2.03 4.06 4.06 4.06 3.05 3.05 5.333 5.417 5.500 5.583 4.06 4.06 3.05 3.05 2.250 11.50 2.03 2.333 2.417 2.500 2.583 5.667 5.750 3.05 11.83 2.03 2.667 4.06 11.92 2.03 2.750 3.05 5.833 4.06 12.00 2.03 2.833 4.06 5.917 6.000 6.083 4.06 12.08 2.03 4.06 | 4.06 | 3.05 | 3.05 3.05 3.05 2.917 12.17 6.167

Max.Eff.Inten.(mm/hr)= 81.28 60.55 over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 5.00 5.58 (ii) 10.00 7.35 (ii) 5 00 10 00 0.13

#### LangstaffRd\_EA\_Proposed\_WestDonWatershd

| PEAK FLOW       | (cms)= | 0.11  | 0.02  | 0.128 (iii) |
|-----------------|--------|-------|-------|-------------|
| TIME TO PEAK    | (hrs)= | 6.25  | 6.25  | 6.25        |
| RUNOFF VOLUME   | (mm)=  | 87.92 | 52.66 | 81.92       |
| TOTAL RAINFALL  | (mm)=  | 89.92 | 89.92 | 89.92       |
| RUNOFF COEFFICE | ENT =  | 0.98  | 0.59  | 0.91        |

| CALIB             |               | (ha)= 0.70     |              |       |
|-------------------|---------------|----------------|--------------|-------|
| ID= 1 DT= 5.0 min | Area<br>Total | Imp(%) = 66.00 |              | 66.00 |
|                   |               |                |              |       |
|                   |               | IMPERVIOUS     | PERVIOUS (i) |       |
| Surface Area      | (ha)=         | 0.46           | 0.24         |       |
| Dep. Storage      | (mm)=         | 2.00           | 5.00         |       |
| Average Slope     | (%)=          | 1.00           | 2.00         |       |
| Length            | (m)=          | 320.00         | 25.00        |       |
| Mannings n        | ` ′=          | 0.013          | 0.300        |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR/   | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05     | 6.250   | 81.28 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05     | 6.333   | 16.26 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 4.06     | 6.417   | 16.26 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 4.06     | 6.500   | 16.26 | 9.58  | 3.05  |
| 0.417 | 2.03  | 3.500 | 4.06     | 6.583   | 16.26 | 9.67  | 3.05  |
| 0.500 | 2.03  | 3.583 | 3.05     | 6.667   | 16.26 | 9.75  | 3.05  |
| 0.583 | 2.03  | 3.667 | 3.05     | 6.750   | 16.26 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 3.05     | 6.833   | 7.11  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 4.06     | 6.917   | 7.11  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 4.06     | 7.000   | 7.11  | 10.08 | 3.05  |
| 0.917 | 1.02  | 4.000 | 4.06     | 7.083   | 7.11  | 10.17 | 3.05  |
| 1.000 | 1.02  | 4.083 | 3.05     | 7.167   | 7.11  | 10.25 | 3.05  |
| 1.083 | 2.03  | 4.167 | 3.05     | 7.250   | 7.11  | 10.33 | 2.03  |
| 1.167 | 2.03  | 4.250 | 3.05     | 7.333   | 5.08  | 10.42 | 2.03  |
| 1.250 | 2.03  | 4.333 | 7.11     | 7.417   | 5.08  | 10.50 | 2.03  |
| 1.333 | 2.03  | 4.417 | 7.11     | 7.500   | 5.08  | 10.58 | 1.02  |
| 1.417 | 2.03  | 4.500 | 7.11     | 7.583   | 5.08  | 10.67 | 1.02  |
| 1.500 | 2.03  | 4.583 | 6.10     | 7.667   | 5.08  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 6.10     | 7.750   | 5.08  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 6.10     | 7.833   | 6.10  | 10.92 | 2.03  |

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|  | LangstaffRd        |             |                  |         |
|--|--------------------|-------------|------------------|---------|
| DT= 5.0 min  | OUTFLOW S          |             |                  |         |
|  | (cms) (            | ha.m.)      | (cms)            | (ha.m.) |
|  | 0.0000             | 0.0000      | 0.0271<br>0.0306 | 0.0367  |
|  | 0.0118             | 0.0048      | 0.0306           | 0.0474  |
|  |                    |             | 0.0415           |         |
|  | 0.0232             | 0.0261      | 0.0000           | 0.0000  |
|  |                    |             |                  |         |
|  | AREA               | QPEAK       | TPEAK            | R.V.    |
|  | (ha)               | (cms)       | (hrs)            | (mm)    |
| INFLOW : ID= 2 ( 047                                     | 5) 1.300           | 0.262       | 2 6.25           | 78.18   |
| INFLOW : ID= 2 ( 0479<br>OUTFLOW: ID= 1 ( 0540           | 1.300              | 0.036       | 6.92             | 78.11   |
|  |                    |             |                  |         |
| PEAK   | FLOW REDU          | CTION [Qout | t/Qin](%)= 1     | 3.69    |
| TIME :   | SHIFT OF PEAK      | FLOW        | (min)= 4         | 0.00    |
| MAXIM  | JM STORAGE         | USED        | (hà.m.)=         | 0.0553  |
|  |                    |             |                  |         |
|  |                    |             |                  |         |
|  |                    |             |                  |         |
|  |                    |             |                  |         |
| ADD HYD ( 0480)  |                    |             |                  |         |
| ID1= 1 ( 0535):  | AREA               | OPEAK TE    | PEAK R.V         |         |
|  | (ha)               | (cms) (h    | nrs) (mm         | )       |
| ID1= 1 ( 0535):  | 1.23 6             | .020 7.     | .33 78.24        | ,       |
| + ID2= 2 ( 0540):  | 1.30 6             | .036 6.     | .92 78.11        |         |
| ===========  |                    |             |                  |         |
| ID = 3 ( 0480):  | 2.53 6             | .055 7.     | .00 78.17        |         |
|  |                    |             |                  |         |
| NOTE: PEAK FLOWS DO                                      | NOT THE LUDE       | BASEFI OWS  | TF ANY.          |         |
|  |                    |             |                  |         |
|  |                    |             |                  |         |
| CALIB  |                    |             |                  |         |
| STANDHYD ( 0155) A                                       | rea (ha)=          | 0.56        |                  |         |
| ID= 1 DT= 5.0 min   To                                   |                    |             | ir Conn (%)      | = 93.00 |
| 110-1 01- 3.0 1111   11                                  | Jear Imp(%)-       | JJ.00 D.    | Li . Colili.(%)  | - 55.00 |
|  | IMPERVI            | OUS DERV    | TOUS (i)         |         |
| Surface Area (h  | 2)- 25             | 2 12.00     | 2 04             |         |
| Don Stonago (m   | ")- 0.5            | 0 0         | - 00             |         |
| Surface Area (ha<br>Dep. Storage (ma<br>Average Slope (S | ")- 2.6<br>V\- 1.6 | 0           | 2.00             |         |
| Average Stope (  | ")- 1.6            | n 2         | 2.00             |         |
| Length (I  | 11)= 200.0         | 2 2         | 200              |         |
| mannings n   | = 0.01             | . ه         | . 290            |         |
| NOTE: RAINFALL   | HAC TRANSFOR       | MED TO 5    | O MIN TIME       | CTED    |
| NOTE: KAINFALL   | WAS IRANSFUR       | וובט וט 5.  | . MIN. IIME      | SIEF.   |
|  |                    |             |                  |         |

RAIN | TIME mm/hr | hrs 0.00 | 3.167 0.00 | 3.250 0.00 | 3.333 2.03 | 3.417 2.03 | 3.500 2.03 | 3.583

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TIME hrs 0.083 0.167 0.250 0.333 0.417 0.500

```
RAIN |
mm/hr |
81.28 |
16.26 |
16.26 |
16.26 |
16.26 |
16.26 |
TRANSFORMED HYETOGRAPH --
                 NSFORMED HYETOGR
RAIN | TIME
mm/hr | hrs
3.05 | 6.250
3.05 | 6.333
4.06 | 6.433
4.06 | 6.500
4.06 | 6.583
3.05 | 6.667
                                                                                                                         TIME
hrs
9.33
9.42
9.50
9.58
9.67
9.75
                                                                                                                                                                RAIN
mm/hr
3.05
3.05
3.05
3.05
3.05
3.05
```

```
Natershd
6.10 | 11.00
6.10 | 11.08
6.10 | 11.08
5.08 | 11.17
5.08 | 11.25
5.08 | 11.33
4.06 | 11.42
4.06 | 11.50
3.05 | 11.75
3.05 | 11.83
4.06 | 11.92
4.06 | 12.00
4.06 | 12.00
4.06 | 12.00
3.05 | 12.37
                                         1.750
1.833
                                         1.833
1.917
2.000
2.083
2.167
2.250
2.333
                                                                                                                                                                                                   2.03
2.03
2.03
2.03
2.03
2.03
                                                                                                                                                                                                     1.02
                                         2.417
                                                                                                                                                                                                    1.02
                                         2.417
2.500
2.583
2.667
2.750
2.833
2.917
                                                                                                                                                                                                     1.02
                                                                 4.06 |
3.05 |
3.05 |
4.06 |
4.06 |
4.06 |
3.05 |
                                                                                                                                                                                                   2.03
2.03
2.03
2.03
2.03
2.03
2.03
                                         3.083
                                                                                                                                                        3.05
           Max.Eff.Inten.(mm/hr)=

over (min)

Storage Coeff. (min)=

Unit Hyd. Tpeak (min)=

Unit Hyd. peak (cms)=
                                                                                      81.28
5.00
5.58 (ii)
5.00
0.20
                                                                                                                          57.69
15.00
10.53 (ii)
15.00
0.09
                                                                                                                                                               *TOTALS*
           PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                                                                                                                                  0.134 (iii)
6.25
74.98
89.92
0.83
                                                                                          0.10
                                                                                                                              0.03
                                                                                        6.25
87.92
89.92
0.98
                                                                                                                           6.33
49.90
89.92
0.55
           (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN* = 81.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COFFFICENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
| ADD HYD ( 0475)|
| 1 + 2 = 3 |
                                                                                              QPEAK
(cms)
0.128
0.134
                                                                                                                                               R.V.
(mm)
81.92
74.98
                                                                            ARFA
                                                                                                                           TPFAK
               ID = 3 ( 0475):
                                                                            1.30 0.262
                                                                                                                          6.25
                                                                                                                                                78.18
            NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
| RESERVOIR( 0540)|
| IN= 2---> OUT= 1 |
                                                                  OVERFLOW IS OFF
                                                                                                              Page 182
```

| Langs 0.583  | taffRd E | A Propos | sed WestDo                  | nWaters | hd       |      |
|--|----------|----------|-----------------------------|---------|----------|------|
| a 583 2 a3 l   | 3 667    | 3 05     | 6 750                       | 16 26   | 0.83     | 2 03 |
| 0.565 2.65   | 3 750    | 3.05     | 6 833                       | 7 11    | 9 92     | 2.03 |
| 0.507 2.03   | 3 833    | 4 06     | 6 917                       | 7 11    | 10 00    | 2.03 |
| 0.730 2.03   | 3 917    | 4.00     | 7 999                       | 7 11    | 10.00    | 3 05 |
| 0.033 1.02   | 1 000    | 4.00     | 7.000                       | 7 11    | 10.00    | 3.05 |
| 1 000 1 02   | 4 083    | 3 05     | 7 167                       | 7 11    | 10.25    | 3.05 |
| 1 083 2 03   | 4 167    | 3 05     | 7 250                       | 7 11    | 10.23    | 2 03 |
| 1.167 2.03   | 4.250    | 3.05     | 7.333                       | 5.08    | 10.42    | 2.03 |
| 1.250 2.03   | 4.333    | 7.11     | 7.417                       | 5.08    | 10.50    | 2.03 |
| 1.333 2.03   | 4.417    | 7.11     | 7.500                       | 5.08    | 10.58    | 1.02 |
| 1.417 2.03   | 4.500    | 7.11     | 7.583                       | 5.08    | 10.67    | 1.02 |
| 1.500 2.03   | 4.583    | 6.10     | 7.667                       | 5.08    | 10.75    | 1.02 |
| 1.583 2.03   | 4.667    | 6.10     | 7.750                       | 5.08    | 10.83    | 2.03 |
| 1.667 2.03   | 4.750    | 6.10     | 7.833                       | 6.10    | 10.92    | 2.03 |
| 1.750 2.03   | 4.833    | 6.10     | 7.917                       | 6.10    | 11.00    | 2.03 |
| 1.833 1.02   | 4.917    | 6.10     | 8.000                       | 6.10    | 11.08    | 2.03 |
| 1.917 1.02   | 5.000    | 6.10     | 8.083                       | 5.08    | 11.17    | 2.03 |
| 2.000 1.02   | 5.083    | 6.10     | 8.167                       | 5.08    | 11.25    | 2.03 |
| 2.083 2.03   | 5.167    | 6.10     | 8.250                       | 5.08    | 11.33    | 2.03 |
| 2.167 2.03   | 5.250    | 6.10     | 8.333                       | 4.06    | 11.42    | 2.03 |
| 2.250 2.03   | 5.333    | 11.18    | 8.417                       | 4.06    | 11.50    | 2.03 |
| 2.333 4.06   | 5.417    | 11.18    | 8.500                       | 4.06    | 11.58    | 1.02 |
| 2.417 4.06   | 5.500    | 11.18    | 8.583                       | 3.05    | 11.67    | 1.02 |
| 2.500 4.06   | 5.583    | 11.18    | 8.667                       | 3.05    | 11.75    | 1.02 |
| 2.583 3.05   | 5.667    | 11.18    | 8.750                       | 3.05    | 11.83    | 2.03 |
| 2.667 3.05   | 5.750    | 11.18    | 8.833                       | 4.06    | 11.92    | 2.03 |
| 2.750 3.05   | 5.833    | 80.26    | 8.917                       | 4.06    | 12.00    | 2.03 |
| 2.833 4.06   | 5.917    | 80.26    | 9.000                       | 4.06    | 12.08    | 2.03 |
| 2.917 4.06   | 6.000    | 80.26    | 9.083                       | 3.05    | 12.17    | 2.03 |
| 3.000 4.06   | 6.083    | 81.28    | 9.167                       | 3.05    | 12.25    | 2.03 |
| 2.256 2.03<br>2.333 4.06<br>2.417 4.06<br>2.500 4.06<br>2.583 3.05<br>2.667 3.05<br>2.750 3.05<br>2.833 4.06<br>2.917 4.06<br>3.080 3.083 3.05 | 6.167    | 81.28    | 9.250                       | 3.05    |          |      |
| Max.Eff.Inten.(mm/hr)=   | 01 70    |          | CC 17                       |         |          |      |
| over (min)   | 5.00     |          | 10.00<br>7.17 (ii)<br>10.00 |         |          |      |
| Storage Coeff. (min)=<br>Unit Hyd. Tpeak (min)=<br>Unit Hyd. peak (cms)=   | 4.92     | (ii)     | 7.17 (ii)                   |         |          |      |
| Unit Hyd. Tpeak (min)=   | 5.00     |          | 10.00                       |         |          |      |
| Unit Hyd. peak (cms)=  | 0.22     |          | 0.14                        |         |          |      |
|  |          |          |                             | *T01    | ALS*     |      |
| PEAK FLOW (cms)= TIME TO PEAK (hrs)= RUNOFF VOLUME (mm)=   | 0.12     |          | 0.01                        | 0.      | 124 (iii | )    |
| TIME TO PEAK (hrs)=  | 6.25     |          | 6.25                        | 6       | .25      |      |
| RUNOFF VOLUME (mm)=  | 87.92    |          | 58.69                       | 85      | .86      |      |
| TOTAL RAINFALL (mm)=   | 89.92    |          | 6.25<br>58.69<br>89.92      | 89      | .92      |      |
| TOTAL RAINFALL (mm)=<br>RUNOFF COEFFICIENT =   | 0.98     |          | 0.65                        | 6       | .95      |      |
| ***** WARNING: STORAGE COEFF. I  | S SMALLE | R THAN   | TIME STEP!                  |         |          |      |
| (i) CN PROCEDURE SELECTE   |          |          |                             |         |          |      |
| CN* = 87.0 Ia<br>(ii) TIME STEP (DT) SHOUL   |          |          |                             |         |          |      |
| THAN THE STORAGE COE   |          |          | EQUAL                       |         |          |      |
| (iii) PEAK FLOW DOES NOT I   |          |          | IF ANY.                     |         |          |      |
|  |          |          |                             |         |          |      |
|  |          |          |                             |         |          |      |

#### LangstaffRd\_EA\_Proposed\_WestDonWatershd

| CALIB<br>  STANDHYD ( 0160) <br> ID= 1 DT= 5.0 min | Area<br>Total | (ha)=<br>Imp(%)= | 0.43<br>95.00 | Dir. Conn.(%)= | 95.00 |
|--|---------------|------------------|---------------|----------------|-------|
|  |               | IMPERVI          | oue.          | PERVIOUS (i)   |       |
|  |               | TIMPERATI        | JUS           | PEKA1002 (1)   |       |
| Surface Area                                       | (ha)=         | 0.4              | 1             | 0.02           |       |
| Dep. Storage                                       | (mm)=         | 2.0              | 3             | 5.00           |       |
| Average Slope                                      | (%)=          | 1.0              | 9             | 2.00           |       |
| Length   | (m)=          | 260.0            | 9             | 20.00          |       |
| Mannings n   | ` =           | 0.01             | 3             | 0.250          |       |
|  |               |                  |               |                |       |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |              | TR    | ANSFORME       | D HYETOGR      | APH          |                |       |
|-------|--------------|-------|----------------|----------------|--------------|----------------|-------|
| TIME  | RAIN         | TIME  | RAIN           | ' TIME         | RAIN         | TIME           | RAIN  |
| hrs   | mm/hr        | hrs   | mm/hr          | ' hrs          | mm/hr        | hrs            | mm/hr |
| 0.083 | 0.00         | 3.167 | 3.05           | 6.250          | 81.28        | 9.33           | 3.05  |
| 0.167 | 0.00         | 3.250 | 3.05           | 6.333          | 16.26        | 9.42           | 3.05  |
| 0.250 | 0.00         | 3.333 | 4.06           | 6.417          | 16.26        | 9.50           | 3.05  |
| 0.333 | 2.03         | 3.417 | 4.06           | 6.500          | 16.26        | 9.58           | 3.05  |
| 0.417 | 2.03         | 3.500 | 4.06           | 6.583          | 16.26        | 9.67           | 3.05  |
| 0.500 | 2.03         | 3.583 | 3.05           | 6.667          | 16.26        | 9.75           | 3.05  |
| 0.583 | 2.03         | 3.667 | 3.05           | 6.750          | 16.26        | 9.83           | 2.03  |
| 0.667 | 2.03         | 3.750 | 3.05           | 6.833          | 7.11         | 9.92           | 2.03  |
| 0.750 | 2.03         | 3.833 | 4.06           | 6.917          | 7.11         | 10.00          | 2.03  |
| 0.833 | 1.02         | 3.917 | 4.06           | 7.000          | 7.11         | 10.08          | 3.05  |
| 0.917 | 1.02         | 4.000 | 4.06           | 7.083          | 7.11         | 10.17          | 3.05  |
| 1.000 | 1.02         | 4.083 | 3.05           | 7.167          | 7.11         | 10.25          | 3.05  |
| 1.083 | 2.03         | 4.167 | 3.05           | 7.250          | 7.11         | 10.33          | 2.03  |
| 1.167 | 2.03         | 4.250 | 3.05           | 7.333          | 5.08         | 10.42          | 2.03  |
| 1.250 | 2.03         | 4.333 | 7.11           | 7.417          | 5.08         | 10.50          | 2.03  |
| 1.333 | 2.03         | 4.417 | 7.11           | 7.500          | 5.08         | 10.58          | 1.02  |
| 1.417 | 2.03         | 4.500 | 7.11           | 7.583          | 5.08         | 10.67          | 1.02  |
| 1.500 | 2.03         | 4.583 | 6.10           | 7.667          | 5.08         | 10.75          | 1.02  |
| 1.583 | 2.03         | 4.667 | 6.10           | 7.750          | 5.08         | 10.83          | 2.03  |
| 1.667 | 2.03         | 4.750 | 6.10           | 7.833          | 6.10         | 10.92          | 2.03  |
| 1.750 | 2.03         | 4.833 | 6.10           | 7.917          | 6.10         | 11.00          | 2.03  |
| 1.833 | 1.02         | 4.917 | 6.10           | 8.000          | 6.10         | 11.08          | 2.03  |
| 1.917 | 1.02         | 5.000 | 6.10           | 8.083          | 5.08         | 11.17          | 2.03  |
| 2.000 | 1.02         | 5.083 | 6.10           | 8.167          | 5.08         | 11.25          | 2.03  |
| 2.083 | 2.03         | 5.167 | 6.10           | 8.250          | 5.08         | 11.33          | 2.03  |
| 2.167 | 2.03         | 5.250 | 6.10           | 8.333          | 4.06         | 11.42          | 2.03  |
| 2.250 | 2.03         | 5.333 | 11.18          | 8.417          | 4.06         | 11.50          | 2.03  |
| 2.333 | 4.06         | 5.417 | 11.18          | 8.500          | 4.06         | 11.58          | 1.02  |
| 2.417 | 4.06         | 5.500 | 11.18          | 8.583          | 3.05         | 11.67          | 1.02  |
| 2.500 | 4.06         | 5.583 | 11.18          | 8.667          | 3.05         | 11.75          | 1.02  |
| 2.583 | 3.05         | 5.667 | 11.18          | 8.750          | 3.05         | 11.83<br>11.92 | 2.03  |
| 2.667 | 3.05<br>3.05 | 5.750 | 11.18<br>80.26 | 8.833<br>8.917 | 4.06<br>4.06 | 12.00          | 2.03  |
| 2.750 | 4.06         | 5.833 | 80.26          | 9.000          | 4.06         | 12.00          | 2.03  |
|       |              | 6.000 |                |                |              |                |       |
| 2.917 | 4.06         | 0.000 | 80.26          | 9.083          | 3.05         | 12.17          | 2.03  |

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|  | Lange | taffRd F | A Propos | ed WestD | nnWatens | hd         |       |
|--|-------|----------|----------|----------|----------|------------|-------|
| hrs                                    | mm/hr |          | mm/hr    |          | mm/hr    |            | mm/hr |
| 0.083                                  | 0.00  |          |          | 6.250    |          |            | 3.05  |
| 0.167                                  | 0.00  |          | 3.05     |          | 16.26    |            | 3.05  |
| 0.250                                  | 0.00  |          | 4.06     |          | 16.26    |            | 3.05  |
| 0.333                                  | 2.03  |          | 4.06     |          |          |            | 3.05  |
| 0.417                                  | 2.03  |          | 4.06     |          | 16.26    |            | 3.05  |
| 0.500                                  | 2.03  |          | 3.05     |          | 16.26    |            | 3.05  |
| 0.583                                  | 2.03  |          | 3.05     |          | 16.26    |            | 2.03  |
| 0.667                                  |       | 3.750    | 3.05     |          | 7.11     |            | 2.03  |
| 0.750                                  | 2.03  |          | 4.06     |          | 7.11     |            | 2.03  |
| 0.833                                  | 1.02  |          | 4.06     |          | 7.11     |            | 3.05  |
| 0.917                                  |       | 4.000    | 4.06     |          | 7.11     |            | 3.05  |
| 1.000                                  |       | 4.083    | 3.05     |          | 7.11     |            | 3.05  |
| 1.083                                  |       | 4.167    | 3.05     |          | 7.11     |            | 2.03  |
| 1.167                                  | 2.03  |          | 3.05     |          | 5.08     |            | 2.03  |
| 1.250                                  |       | 4.333    | 7.11     |          | 5.08     |            | 2.03  |
| 1.333                                  |       | 4.417    | 7.11     | 7.500    | 5.08     |            | 1.02  |
| 1.417                                  |       | 4.500    | 7.11     |          |          | 10.67      | 1.02  |
| 1.500                                  |       | 4.583    | 6.10     |          |          | 10.75      | 1.02  |
| 1.583                                  | 2.03  |          | 6.10     |          | 5.08     |            | 2.03  |
| 1.667                                  |       | 4.750    | 6.10     |          | 6.10     |            | 2.03  |
| 1.750                                  |       | 4.833    | 6.10     | 7.917    | 6.10     |            | 2.03  |
| 1.833                                  |       | 4.917    | 6.10     |          | 6.10     |            | 2.03  |
| 1.917                                  | 1.02  | 5.000    | 6.10     | 8.083    | 5.08     | 11.17      | 2.03  |
| 2.000                                  | 1.02  | 5.083    | 6.10     | 8.167    | 5.08     | 11.25      | 2.03  |
| 2.083                                  | 2.03  | 5.167    | 6.10     | 8.250    | 5.08     | 11.33      | 2.03  |
| 2.167                                  | 2.03  | 5.250    | 6.10     | 8.333    | 4.06     | 11.42      | 2.03  |
| 2.250                                  | 2.03  | 5.333    | 11.18    | 8.417    | 4.06     | 11.50      | 2.03  |
| 2.333                                  | 4.06  | 5.417    | 11.18    | 8.500    | 4.06     | 11.58      | 1.02  |
| 2.417                                  | 4.06  | 5.500    | 11.18    | 8.583    | 3.05     | 11.67      | 1.02  |
| 2.500                                  | 4.06  | 5.583    | 11.18    | 8.667    | 3.05     | 11.75      | 1.02  |
| 2.583                                  | 3.05  | 5.667    | 11.18    | 8.750    | 3.05     | 11.83      | 2.03  |
| 2.667                                  | 3.05  | 5.750    | 11.18    | 8.833    | 4.06     | 11.92      | 2.03  |
| 2.750                                  | 3.05  | 5.833    | 80.26    | 8.917    | 4.06     | 12.00      | 2.03  |
| 2.833                                  | 4.06  | 5.917    | 80.26    | 9.000    | 4.06     | 12.08      | 2.03  |
| 2.917                                  | 4.06  | 6.000    | 80.26    | 9.083    | 3.05     | 12.17      | 2.03  |
| 3.000                                  | 4.06  | 6.083    | 81.28    |          | 3.05     | 12.25      | 2.03  |
| 3.083                                  | 3.05  | 6.167    | 81.28    | 9.250    | 3.05     | l          |       |
| Max.Eff.Inten.(mm/                     |       | 81.28    |          | 67.97    |          |            |       |
| over (m                                |       | 5.00     |          | 10.00    |          |            |       |
|  | in)=  | 3.54     |          | 5.90 (ii | .)       |            |       |
| Unit Hyd. Tpeak (m                     |       | 5.00     |          | 10.00    |          |            |       |
| Unit Hyd. peak (c                      | ms)=  | 0.26     |          | 0.15     |          |            |       |
|  |       |          |          |          |          | TALS*      |       |
|  | ms)=  | 0.82     |          | 0.03     |          | .851 (iii) | )     |
|  | rs)=  | 6.25     |          | 6.25     |          | 5.25       |       |
|  | mm)=  | 87.92    |          | 60.31    |          | 5.54       |       |
| TOTAL RAINFALL (<br>RUNOFF COEFFICIENT | mm)=  | 89.92    |          | 89.92    |          | 9.92       |       |
| KONOFF COEFFICIENT                     | =     | 0.98     |          | 0.67     |          | 9.96       |       |

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

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LangstaffRd\_EA\_Proposed\_WestDonWatershd 4.06 | 6.083 | 81.28 | 9.167 | 3.05 | 12.25 | 2.03 3.05 | 6.167 | 81.28 | 9.250 | 3.05 | 3.083 81.28 5.00 4.92 (ii) 5.00 0.22 69.46 10.00 6.48 (ii) 10.00 0.14 Max.Eff.Inten.(mm/hr)= over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= \*TOTALS\* 0.096 (iii) 6.25 86.61 89.92 0.96 PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 0.09 0.00 6.25 87.92 89.92 0.98 6.25 62.00 89.92 0.69 \*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP! (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: (1) CN\* PROCEDURE SELECTED FOR FEXTURES GASSONS
(11) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(111) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY. AREA (ha) 0.56 QPEAK (cms) 0.124 0.096 TPEAK (hrs) 6.25 6.25 R.V. (mm) 85.86 86.61 0.43 ID = 3 ( 0430): 0.99 0.220 6.25 86.19 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY. Area (ha)= 3.81 Total Imp(%)= 95.00 Dir. Conn.(%)= 95.00 IMPERVIOUS PERVIOUS (i) 3.62 2.00 1.00 150.00 0.013 9.19 5.00 2.00 40.00 0.250 Surface Area Dep. Storage Average Slope Length (ha)= (mm)= (%)= (m)= Mannings n NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP. ---- TRANSFORMED HYETOGRAPH ---TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN

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(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN\* = 88.0 I a= Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| RESERVOIR( 0515)  | OVERFLOW   | TC 0FF  |  |   |
|---|--|---|--|---|
| IN= 2> OUT= 1   |  | 15 UFF  |  |   |
| DT= 5.0 min   |  | STORAGE   | OUTFLOW  | STORAGE                                     |
|   | (cms)  | STORAGE<br>(ha.m.)  | OUTFLOW (cms)  | (ha.m.)                                     |
|   | 0.0000   | 0.0000  | 0.0091   | 0.1797                                      |
|   | 0.0013   | 0.0000<br>0.0157  | 0.0095   | 0.2004                                      |
|   | 0.0033   | 0.0320  | 0.0100   | 0.2216                                      |
|   | 0.0044   | 0.0487  | 0.0104   | 0.2433                                      |
|   | 0.0053   | 0.0659  | 0.0109   | 0.2655                                      |
|   | 0.0061   | 0.0837<br>0.1019  | 0.0113   | 0.2882                                      |
|   | 0.0068   | 0.1019  | 0.0116   | 0.3114                                      |
|   | 0.0074   | 0.1206<br>0.1398  | 0.1520   | 0.3592                                      |
|   | 0.0080   | 0.1398  | 0.5654   | 0.4336                                      |
|   | 0.0086   | 0.1595  | 1.1316   | 0.5100                                      |
| INFLOW : ID= 2 (  | AR   | EA OPEAK  | TPEAK  | R.V.  |
|   | (h   | a) (cms)  | (hrs)  | (mm)  |
| INFLOW : ID= 2 (  | 0150) 3.   | 810 0.85  | 51 6.25  | 86.54                                       |
| OUTFLOW: ID= 1 (  | 0515) 3.   | 810 0.03  | 11 12.33   | 85.08                                       |
| 1   | PEAK FLOW R<br>TIME SHIFT OF P<br>MAXIMUM STORAG   | EAK FLOW  | (min)=36   | 55.00                                       |
| 1   | TIME SHIFT OF P  | EAK FLOW  | (min)=36   | 55.00                                       |
| 1   | TIME SHIFT OF P  | EAK FLOW  | (min)=36   | 55.00                                       |
| ADD HYD ( 0440)   | TIME SHIFT OF P  | EAK FLOW<br>E USED  | (min)=36<br>(ha.m.)=   | 55.00<br>0.3004                             |
| ADD HYD ( 0440)   | IME SHIFT OF P   | EAK FLOW<br>E USED  | (min)=36<br>(ha.m.)=   | 55.00<br>0.3004                             |
| ADD HYD ( 0440)   | IME SHIFT OF P   | EAK FLOW<br>E USED  | (min)=36<br>(ha.m.)=   | 55.00<br>0.3004                             |
| ADD HYD ( 0440)<br>1 + 2 = 3<br>ID1= 1 ( 04   | TIME SHIFT OF P HAXIMUM STORAG  AREA (ha) H30): 0.99   | QPEAK 1 (cms) (0.220 (cms)  | (min)=36<br>(ha.m.)=<br>   | 55.00<br>0.3004<br>                         |
| ADD HYD ( 0440)<br>1 + 2 = 3<br>ID1= 1 ( 04<br>+ ID2= 2 ( 05                                    | AREA (ha) (h2) (h2) (h2) (h2) (h2) (h2) (h2) (h2   | QPEAK 1 (cms) (0.220 (0.011 12  | (min)=36<br>(ha.m.)=<br>TPEAK R.V<br>(hrs) (mm<br>5.25 86.19   | 55.00<br>0.3004<br>                         |
| ADD HYD ( 0440)<br>1 + 2 = 3  <br>ID1= 1 ( 04<br>+ ID2= 2 ( 05                                  | TIME SHIFT OF P HAXIMUM STORAG  AREA (ha) H30): 0.99   | QPEAK (cms) (0.220 (0.011 12  | (min)=36<br>(ha.m.)=<br>TPEAK R.V<br>(hrs) (mr<br>5.25 86.15<br>2.33 85.08                             | 75.00<br>0.3004<br><br>7.<br>1)<br>0.<br>3. |
| ADD HYD ( 0449)<br>1 + 2 = 3<br>ID1= 1 ( 04<br>+ ID2= 2 ( 05)<br>ID = 3 ( 04                    | AREA (ha): 4.80  | QPEAK (Cms) (.cms) 0.229 (0.229 (   | (min)=36<br>(ha.m.)=<br>TPEAK R.V<br>(hrs) (mms)<br>6.25 86.25<br>2.33 85.08                           | 75.00<br>0.3004<br><br>7.<br>1)<br>0.<br>3. |
| ADD HYD ( 0440)<br>1 + 2 = 3  <br>ID1= 1 ( 04<br>+ ID2= 2 ( 05                                  | AREA (ha)  130): 0.99  1515): 3.81  140): 4.80   | QPEAK (Cms) (.cms) 0.229 (0.229 (   | (min)=36<br>(ha.m.)=<br>TPEAK R.V<br>(hrs) (mms)<br>6.25 86.25<br>2.33 85.08                           | 75.00<br>0.3004<br><br>7.<br>1)<br>0.<br>3. |
| ADD HYD ( 0440)<br>1 + 2 = 3  <br>ID1= 1 ( 04<br>+ ID2= 2 ( 05<br>ID = 3 ( 04<br>NOTE: PEAK FLC | AREA (ha)  130): 0.99  1515): 3.81  140): 4.80   | QPEAK (Cms) (.cms) 0.229 (0.229 (   | (min)=36<br>(ha.m.)=<br>TPEAK R.V<br>(hrs) (mms)<br>6.25 86.25<br>2.33 85.08                           | 75.00<br>0.3004<br><br>7.<br>1)<br>0.<br>3. |
| ADD HYD ( 0440) 1 + 2 = 3  ID1= 1 ( 0440) 1 + 102= 2 ( 06 00) 1                                 | AREA (ha) 4.80 NOT INCL  Area (ha) 4.80 NOT INCL  Area (ha)  | QPEAK ((cms) ((cms) 0.220 (0.011 1.200) (UDE BASEFLOWS)) = 0.96   | (min)=36<br>(ha.m.)=<br>TPEAK R.V.<br>(hrs) (mm<br>5.25 86.15<br>2.33 85.06<br>                        | 55.00<br>0.3004                             |
| ADD HYD ( 0440) 1 + 2 = 3  ID1= 1 ( 04 + ID2= 2 ( 05  | AREA (ha): 4.80  Area (ha)  Area (ha)  Area (ha)  Area (ha)  Area (ha)   | QPEAK (cms) (cms) (0.220 (0.011 12.229 (0.0129 (0.229 (0.0129 | (min)=36<br>(ha.m.)=<br>IPEAK R.N.<br>(hrs) (mm<br>6.25 86.19<br>2.33 85.06<br>5.25 85.31<br>S.IF ANY. | 55.00<br>0.3004                             |
| ADD HYD ( 0440)<br>1 + 2 = 3<br>ID1= 1 ( 04<br>+ ID2= 2 ( 05<br>                                | AREA   (ha)   330): 0.99   315): 3.31   3.31   3.32   3. | QPEAK (cms) (cms) (0.220 (0.011 1:  | (min)=36 (ha.m.)=  TPEAK R.V. (hrs) (mr) 5.25 86.15 2.33 85.61 5.25 85.31 S IF ANY.                    | 55.00<br>0.3004                             |
| ADD HYD ( 0440) 1 + 2 = 3  ID1= 1 ( 0440) 1 + 102= 2 ( 06 00) 1                                 | AREA   (ha)   Area   (ha)  | QPEAK (cms) (cms) (0.220 (0.011 1:  | (min)=36<br>(ha.m.)=<br>IPEAK R.V.<br>(hrs) (mm<br>6.25 86.15<br>2.23 85.08<br>5.25 85.31<br>5.IF ANY. | 55.00<br>0.3004                             |

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| Average Slope | (%)= | 1.00   | 2.00  |
|---------------|------|--------|-------|
| Length        | (m)= | 470.00 | 20.00 |
| Mannings n    | =    | 0.013  | 0.250 |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | D HYETOGR | APH   |       |       |
|-------|-------|-------|----------|-----------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME    | RAIN  |       | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs     | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05     | 6.250     | 81.28 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05     | 6.333     | 16.26 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 4.06     | 6.417     | 16.26 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 4.06     | 6.500     | 16.26 | 9.58  | 3.05  |
| 0.417 | 2.03  | 3.500 | 4.06     | 6.583     | 16.26 | 9.67  | 3.05  |
| 0.500 | 2.03  | 3.583 | 3.05     | 6.667     | 16.26 | 9.75  | 3.05  |
| 0.583 | 2.03  | 3.667 | 3.05     | 6.750     | 16.26 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 3.05     | 6.833     | 7.11  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 |          | 6.917     | 7.11  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 4.06     | 7.000     | 7.11  | 10.08 | 3.05  |
| 0.917 | 1.02  | 4.000 | 4.06     | 7.083     | 7.11  | 10.17 | 3.05  |
| 1.000 | 1.02  | 4.083 | 3.05     | 7.167     | 7.11  | 10.25 | 3.05  |
| 1.083 | 2.03  | 4.167 | 3.05     | 7.250     | 7.11  | 10.33 | 2.03  |
| 1.167 | 2.03  | 4.250 | 3.05     | 7.333     | 5.08  | 10.42 | 2.03  |
| 1.250 | 2.03  | 4.333 | 7.11     | 7.417     | 5.08  | 10.50 | 2.03  |
| 1.333 | 2.03  | 4.417 | 7.11     | 7.500     | 5.08  | 10.58 | 1.02  |
| 1.417 | 2.03  |       | 7.11     | 7.583     | 5.08  |       | 1.02  |
| 1.500 | 2.03  | 4.583 | 6.10     |           | 5.08  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 6.10     |           | 5.08  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 6.10     | 7.833     | 6.10  | 10.92 | 2.03  |
| 1.750 | 2.03  | 4.833 | 6.10     | 7.917     | 6.10  | 11.00 | 2.03  |
| 1.833 | 1.02  | 4.917 | 6.10     | 8.000     | 6.10  | 11.08 | 2.03  |
| 1.917 | 1.02  | 5.000 | 6.10     |           | 5.08  | 11.17 | 2.03  |
| 2.000 | 1.02  | 5.083 | 6.10     |           | 5.08  | 11.25 | 2.03  |
| 2.083 | 2.03  | 5.167 | 6.10     |           | 5.08  | 11.33 | 2.03  |
| 2.167 | 2.03  | 5.250 | 6.10     |           | 4.06  | 11.42 | 2.03  |
| 2.250 | 2.03  | 5.333 | 11.18    |           | 4.06  | 11.50 | 2.03  |
| 2.333 | 4.06  | 5.417 | 11.18    |           | 4.06  |       | 1.02  |
| 2.417 | 4.06  | 5.500 | 11.18    |           | 3.05  |       | 1.02  |
| 2.500 | 4.06  | 5.583 | 11.18    |           | 3.05  | 11.75 | 1.02  |
| 2.583 | 3.05  | 5.667 |          | 8.750     | 3.05  | 11.83 | 2.03  |
| 2.667 | 3.05  | 5.750 |          | 8.833     | 4.06  | 11.92 | 2.03  |
| 2.750 | 3.05  | 5.833 | 80.26    |           |       |       | 2.03  |
| 2.833 |       | 5.917 | 80.26    |           | 4.06  |       | 2.03  |
| 2.917 | 4.06  | 6.000 | 80.26    | 9.083     | 3.05  | 12.17 | 2.03  |
| 3.000 | 4.06  | 6.083 | 81.28    | 9.167     | 3.05  | 12.25 | 2.03  |
| 3.083 | 3.05  | 6.167 | 81.28    | 9.250     | 3.05  |       |       |

over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 5.00 15.00 7.02 (ii) 10.07 (ii) 5.00 15.00 0.17 0.10

Max.Eff.Inten.(mm/hr)=

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60.55

|     |            | Langs | taffRd E | A Propo | sed_WestDo | nWaters | hd    |      |
|-----|------------|-------|----------|---------|------------|---------|-------|------|
|     | 1.750      | 2.03  |          | 6.10    | 7.917      | 6.10    | 11.00 | 2.03 |
|     | 1.833      | 1.02  | 4.917    | 6.10    | 8.000      | 6.10    | 11.08 | 2.03 |
|     | 1.917      | 1.02  | 5.000    | 6.10    | 8.083      | 5.08    | 11.17 | 2.03 |
|     | 2.000      | 1.02  | 5.083    | 6.10    | 8.167      | 5.08    | 11.25 | 2.03 |
|     | 2.083      | 2.03  | 5.167    | 6.10    | 8.250      | 5.08    | 11.33 | 2.03 |
|     | 2.167      | 2.03  | 5.250    | 6.10    | 8.333      | 4.06    | 11.42 | 2.03 |
|     | 2.250      | 2.03  | 5.333    | 11.18   | 8.417      | 4.06    | 11.50 | 2.03 |
|     | 2.333      | 4.06  | 5.417    | 11.18   | 8.500      | 4.06    | 11.58 | 1.02 |
|     | 2.417      | 4.06  | 5.500    | 11.18   | 8.583      | 3.05    | 11.67 | 1.02 |
|     | 2.500      | 4.06  | 5.583    | 11.18   | 8.667      | 3.05    | 11.75 | 1.02 |
|     | 2.583      | 3.05  | 5.667    | 11.18   | 8.750      | 3.05    | 11.83 | 2.03 |
|     | 2.667      | 3.05  | 5.750    | 11.18   | 8.833      | 4.06    | 11.92 | 2.03 |
|     | 2.750      | 3.05  | 5.833    | 80.26   | 8.917      | 4.06    | 12.00 | 2.03 |
|     | 2.833      | 4.06  | 5.917    | 80.26   | 9.000      | 4.06    | 12.08 | 2.03 |
|     | 2.917      | 4.06  | 6.000    | 80.26   | 9.083      | 3.05    | 12.17 | 2.03 |
|     | 3.000      | 4.06  | 6.083    | 81.28   | 9.167      | 3.05    | 12.25 | 2.03 |
|     | 3.083      | 3.05  | 6.167    | 81.28   | 9.250      | 3.05    |       |      |
|     |            |       |          |         |            |         |       |      |
| .In | iten.(mm/h | r)=   | 81.28    |         | 60.55      |         |       |      |
|     | over (mi   | n)    | 5.00     |         | 15.00      |         |       |      |
|     |            |       |          |         |            |         |       |      |

| Max. Ell. Illeen. ( | , , –  | 01.20     | 00.55      |             |
|---------------------|--------|-----------|------------|-------------|
| over                | (min)  | 5.00      | 15.00      |             |
| Storage Coeff.      | (min)= | 7.02 (ii) | 10.14 (ii) |             |
| Unit Hyd. Tpeak     | (min)= | 5.00      | 15.00      |             |
| Unit Hyd. peak      | (cms)= | 0.17      | 0.10       |             |
|                     |        |           |            | *TOTALS*    |
| PEAK FLOW           | (cms)= | 0.19      | 0.03       | 0.225 (iii) |
| TIME TO PEAK        | (hrs)= | 6.25      | 6.25       | 6.25        |
| RUNOFF VOLUME       | (mm)=  | 87.92     | 52.66      | 79.80       |
| TOTAL RAINFALL      | (mm)=  | 89.92     | 89.92      | 89.92       |
| RUNOFF COEFFICIE    | NT =   | 0.98      | 0.59       | 0.89        |
|                     |        |           |            |             |

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

  CN\* = 83.0 Ia = Dep. Storage (Above)

  (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

  THAN THE STORAGE COFFFICIENT.

  (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0460)   |      |       |       |       |  |
|-------------------|------|-------|-------|-------|--|
| 1 + 2 = 3         | AREA | QPEAK | TPEAK | R.V.  |  |
|                   | (ha) | (cms) | (hrs) | (mm)  |  |
| ID1= 1 ( 0205):   | 1.11 | 0.225 | 6.25  | 79.80 |  |
| + ID2= 2 ( 0210): | 0.96 | 0.196 | 6.25  | 80.15 |  |
| ===============   |      |       |       |       |  |
| ID = 3 ( 0460):   | 2.07 | 0.421 | 6.25  | 79.96 |  |

| RESERVOIR( 0525)| | IN= 2---> OUT= 1 | OVERFLOW IS OFF

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#### LangstaffRd\_EA\_Proposed\_WestDonWatershd

|                 |        |       |       | *TOTALS*    |
|-----------------|--------|-------|-------|-------------|
| PEAK FLOW       | (cms)= | 0.17  | 0.03  | 0.196 (iii) |
| TIME TO PEAK    | (hrs)= | 6.25  | 6.25  | 6.25        |
| RUNOFF VOLUME   | (mm)=  | 87.92 | 52.66 | 80.15       |
| TOTAL RAINFALL  | (mm)=  | 89.92 | 89.92 | 89.92       |
| RUNOFF COFFETCT | FNT =  | 0.98  | 0.59  | 0.89        |

| CALIB             |       |         |       |          |          |       |  |
|-------------------|-------|---------|-------|----------|----------|-------|--|
| STANDHYD ( 0205)  | Area  | (ha)=   | 1.11  |          |          |       |  |
| ID= 1 DT= 5.0 min | Total | Imp(%)= | 77.00 | Dir. C   | onn.(%)= | 77.00 |  |
|                   |       |         |       |          |          |       |  |
|                   |       | IMPERVI | OUS   | PERVIOUS | (i)      |       |  |
| Surface Area      | (ha)= | 0.8     | 5     | 0.26     |          |       |  |
| Dep. Storage      | (mm)= | 2.0     | 0     | 5.00     |          |       |  |
| Average Slope     | (%)=  | 1.0     | 0     | 2.00     |          |       |  |
| Length            | (m)=  | 470.0   | 0     | 20.00    |          |       |  |
| Mannings n        | ` ' _ | 0 01    | 2     | 0 250    |          |       |  |

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   |       |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05     | 6.250   | 81.28 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05     | 6.333   | 16.26 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 4.06     | 6.417   | 16.26 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 4.06     | 6.500   | 16.26 | 9.58  | 3.05  |
| 0.417 | 2.03  | 3.500 | 4.06     | 6.583   | 16.26 | 9.67  | 3.05  |
| 0.500 | 2.03  | 3.583 | 3.05     | 6.667   | 16.26 | 9.75  | 3.05  |
| 0.583 | 2.03  | 3.667 | 3.05     | 6.750   | 16.26 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 3.05     | 6.833   | 7.11  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 4.06     | 6.917   | 7.11  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 4.06     | 7.000   | 7.11  | 10.08 | 3.05  |
| 0.917 | 1.02  | 4.000 | 4.06     | 7.083   | 7.11  | 10.17 | 3.05  |
| 1.000 | 1.02  | 4.083 | 3.05     | 7.167   | 7.11  | 10.25 | 3.05  |
| 1.083 | 2.03  | 4.167 | 3.05     | 7.250   | 7.11  | 10.33 | 2.03  |
| 1.167 | 2.03  | 4.250 | 3.05     | 7.333   | 5.08  | 10.42 | 2.03  |
| 1.250 | 2.03  | 4.333 | 7.11     | 7.417   | 5.08  | 10.50 | 2.03  |
| 1.333 | 2.03  | 4.417 | 7.11     | 7.500   | 5.08  | 10.58 | 1.02  |
| 1.417 | 2.03  | 4.500 | 7.11     | 7.583   | 5.08  | 10.67 | 1.02  |
| 1.500 | 2.03  | 4.583 | 6.10     | 7.667   | 5.08  | 10.75 | 1.02  |
| 1.583 | 2.03  | 4.667 | 6.10     | 7.750   | 5.08  | 10.83 | 2.03  |
| 1.667 | 2.03  | 4.750 | 6.10     | 7.833   | 6.10  | 10.92 | 2.03  |

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|                     | Langstaf | fRd EA Propos | ed WestDonWat | tershd  |
|---------------------|----------|---------------|---------------|---------|
| DT= 5.0 min         | OUTFLOW  | STORAGE       | OUTFLOW       | STORAGE |
| ii                  | (cms)    | (ha.m.)       | (cms)         | (ha.m.) |
|                     | 0.0000   | 0.0000        | 0.0733        | 0.0214  |
|                     | 0.0274   | 0.0026        | 0.0831        | 0.0278  |
|                     | 0.0478   | 0.0084        | 0.1449        | 0.0374  |
|                     | 0.0619   | 0.0149        | 0.0000        | 0.0000  |
|                     | A        | REA OPEAK     | TPEAK         | R.V.    |
|                     | (        | ha) (cms)     | (hrs)         | (mm)    |
| INFLOW : ID= 2 ( 0- | 160) 2   | .070 0.4      | 21 6.25       | 79.96   |
| OUTFLOW: ID= 1 ( 0: | 525) 2   | .070 0.2      | 28 6.42       | 79.96   |
|                     |          |               |               |         |

PEAK FLOW REDUCTION [Qout/Qin](%)= 54.27 TIME SHIFT OF PEAK FLOW (min)= 10.00 MAXIMUM STORAGE USED (ha.m.)= 0.0508

| CALIB   | Area<br>Total                  | (ha)= 0.86<br>Imp(%)= 57.00                  |   | 57.00 |
|---|--------------------------------|--|---|-------|
| Surface Area<br>Dep. Storage<br>Average Slope<br>Length | (ha)=<br>(mm)=<br>(%)=<br>(m)= | IMPERVIOUS<br>0.49<br>2.00<br>1.00<br>340.00 | PERVIOUS (i)<br>0.37<br>5.00<br>2.00<br>50.00 |       |
| Mannings n  | =                              | 0.013  | 0.250   |       |

NOTE: RAINFALL WAS TRANSFORMED TO  $\,$  5.0 MIN. TIME STEP.

|       |       | TR    | ANSFORME | HYETOGR | APH   | -     |       |
|-------|-------|-------|----------|---------|-------|-------|-------|
| TIME  | RAIN  | TIME  | RAIN     | ' TIME  | RAIN  | TIME  | RAIN  |
| hrs   | mm/hr | hrs   | mm/hr    | ' hrs   | mm/hr | hrs   | mm/hr |
| 0.083 | 0.00  | 3.167 | 3.05     | 6.250   | 81.28 | 9.33  | 3.05  |
| 0.167 | 0.00  | 3.250 | 3.05     | 6.333   | 16.26 | 9.42  | 3.05  |
| 0.250 | 0.00  | 3.333 | 4.06     | 6.417   | 16.26 | 9.50  | 3.05  |
| 0.333 | 2.03  | 3.417 | 4.06     | 6.500   | 16.26 | 9.58  | 3.05  |
| 0.417 | 2.03  | 3.500 | 4.06     | 6.583   | 16.26 | 9.67  | 3.05  |
| 0.500 | 2.03  | 3.583 | 3.05     | 6.667   | 16.26 | 9.75  | 3.05  |
| 0.583 | 2.03  | 3.667 | 3.05     | 6.750   | 16.26 | 9.83  | 2.03  |
| 0.667 | 2.03  | 3.750 | 3.05     | 6.833   | 7.11  | 9.92  | 2.03  |
| 0.750 | 2.03  | 3.833 | 4.06     | 6.917   | 7.11  | 10.00 | 2.03  |
| 0.833 | 1.02  | 3.917 | 4.06     | 7.000   | 7.11  | 10.08 | 3.05  |
| 0.917 | 1.02  | 4.000 | 4.06     | 7.083   | 7.11  | 10.17 | 3.05  |
| 1.000 | 1.02  | 4.083 | 3.05     | 7.167   | 7.11  | 10.25 | 3.05  |
| 1.083 | 2.03  | 4.167 | 3.05     | 7.250   | 7.11  | 10.33 | 2.03  |
| 1.167 | 2.03  | 4.250 | 3.05     | 7.333   | 5.08  | 10.42 | 2.03  |
| 1.250 | 2.03  | 4.333 | 7.11     | 7.417   | 5.08  | 10.50 | 2.03  |
| 1.333 | 2.03  | 4.417 | 7.11     | 7.500   | 5.08  | 10.58 | 1.02  |
| 1.417 | 2.03  | 4.500 | 7.11     | 7.583   | 5.08  | 10.67 | 1.02  |
| 1.500 | 2.03  | 4.583 | 6.10     | 7.667   | 5.08  | 10.75 | 1.02  |
|       |       |       |          |         |       |       |       |

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2.03 | 4.667 | 6.10 | 7.759 | 5.08 | 14
2.03 | 4.750 | 6.10 | 7.833 | 6.10 | 12
2.03 | 4.833 | 6.10 | 7.917 | 6.10 | 12
1.02 | 5.000 | 6.10 | 8.000 | 6.10 | 13
1.02 | 5.000 | 6.10 | 8.000 | 6.10 | 13
1.02 | 5.083 | 6.10 | 8.167 | 6.08 | 13
2.03 | 5.250 | 6.10 | 8.250 | 5.08 | 13
2.03 | 5.250 | 6.10 | 8.250 | 5.08 | 13
2.03 | 5.250 | 6.10 | 8.333 | 4.06 | 12
2.03 | 5.350 | 11.18 | 8.417 | 4.06 | 13
4.06 | 5.500 | 11.18 | 8.500 | 4.06 | 13
4.06 | 5.531 | 11.18 | 8.667 | 3.05 | 13
3.05 | 5.667 | 11.18 | 8.867 | 3.05 | 13
3.05 | 5.833 | 80.26 | 8.917 | 4.06 | 13
4.06 | 5.917 | 80.26 | 9.000 | 4.06 | 13
4.06 | 6.00 | 80.26 | 9.083 | 3.05 | 14
4.06 | 6.00 | 80.26 | 9.083 | 3.05 | 14
4.06 | 6.00 | 80.26 | 9.083 | 3.05 | 14
4.06 | 6.00 | 80.26 | 9.083 | 3.05 | 13
4.06 | 6.083 | 81.28 | 9.167 | 3.05 | 12
3.05 | 6.167 | 81.28 | 9.250 | 3.05 | 12
4.06 | 6.083 | 81.28 | 9.167 | 3.05 | 12
3.05 | 6.167 | 81.28 | 9.250 | 3.05 | 12
4.06 | 6.083 | 81.28 | 9.167 | 3.05 | 12
4.06 | 6.06 | 80.26 | 9.083 | 3.05 | 12
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4.06 | 6.06 | 80.26 | 9.083 | 3.05 | 12
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4.06 | 6.06 | 80.26 | 9.083 | 3.05 | 12
4.06 | 6.06 | 80.26 | 9.083 | 6.05 | 12
4.06 | 6.06 | 80.26 | 9.083 | 6.05 | 12
4.06 | 6.06 | 80.26 | 9.083 | 6.05 | 12
4.06 | 6.06 | 80.26 | 9.083 | 6.05 | 12
4.06 | 6.06 | 80.26 | 9.083 | 6.05 | 12
4.06 | 6.06 | 80.26 | 9.083 | 6.05 | 12
4.06 | 6.06 | 80.26 | 9.083 | 6.05 | 12
4.06 | 6.06 | 80.26 | 6.05 | 12
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4.06 | 6.06 | 80.26 | 6.05 | 12
4.06 | 6.06 | 80.26 | 6.05 | 12
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4.06 | 6.06 | 80.26 | 6.05 | 12
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1.750
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       2.167
       2.250
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       2.333
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           1.02
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       2.917
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           2.03
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  12.25
```

| Max.Eff.Inten.(r | nm/nr)= | 81.28     | 60.55      |             |
|------------------|---------|-----------|------------|-------------|
| over             | (min)   | 5.00      | 20.00      |             |
| Storage Coeff.   | (min)=  | 5.78 (ii) | 15.65 (ii) |             |
| Unit Hyd. Tpeak  | (min)=  | 5.00      | 20.00      |             |
| Unit Hyd. peak   | (cms)=  | 0.20      | 0.07       |             |
|                  |         |           |            | *TOTALS*    |
| PEAK FLOW        | (cms)=  | 0.11      | 0.04       | 0.150 (iii) |
| TIME TO PEAK     | (hrs)=  | 6.25      | 6.33       | 6.25        |
| RUNOFF VOLUME    | (mm)=   | 87.92     | 52.66      | 72.74       |
| TOTAL RAINFALL   | (mm)=   | 89.92     | 89.92      | 89.92       |
| RUNOFF COEFFICI  | ENT =   | 0.98      | 0.59       | 0.81        |

CALIB | CALIB | STANDHYD ( 0195)| |ID= 1 DT= 5.0 min | Area (ha)= 0.79 Total Imp(%)= 75.00 Dir. Conn.(%)= 75.00 IMPERVIOUS PERVIOUS (i) Surface Area 0.20 5.00 2.00 0.59 2.00 (mm)= (%)= (m)= Dep. Storage Average Slope Length Mannings n 1.00 20.00

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

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(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

(1) CN\* = 83.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD ( 0455)| 1 + 2 = 3 | QPEAK (cms) 0.150 0.162 R.V. (mm) 72.74 79.10 ΔRFΔ TΡΕΔΚ (hrs) 6.25 6.25 ID1= 1 ( 0190): + ID2= 2 ( 0195): ID = 3 ( 0455): 75.78 1.65 0.312 6.25

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR( 0555)| IN= 2---> OUT= 1 | DT= 5.0 min | OUTFLOW STORAGE (cms) 0.0000 (ha.m.) 0.0000 (cms) 0.0238 (ha.m.) 0.0199 0.0104 0.0024 0.0268 0.0825 0.0259 AREA QPEAK (cms) 0.312 0.158 (hrs) 6.25 6.42 (mm) 75.78 75.75 (ha) 1.650 INFLOW: ID= 2 ( 0455) OUTFLOW: ID= 1 ( 0555) 1.650

| ADD HYD ( 0465)| | 1 + 2 = 3 | QPEAK (cms) 0.228 TPEAK (hrs) 6.42 6.42 R.V. (mm) 79.96 75.75 AREA (ha) 2.07 1.65 ID1= 1 ( 0525): + ID2= 2 ( 0555): 0.158 ID = 3 ( 0465): 3.72 0.386 6.42 78.09

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

#### LangstaffRd\_EA\_Proposed\_WestDonWatershd

|                 |         | TRA   | NSFORME | ED HYETOGR | ΔРН   |           |      |
|-----------------|---------|-------|---------|------------|-------|-----------|------|
| TIM             | E RAIN  |       | RAIN    |            | RAIN  |           | RAI  |
| hr              |         | hrs   |         |            |       |           | mm/h |
| 0.08            |         |       | 3.05    |            |       |           | 3.05 |
| 0.16            |         | 3.250 | 3.05    |            |       |           | 3.05 |
| 0.25            |         | 3.333 |         | 6.417      |       |           | 3.05 |
| 0.33            |         | 3.417 |         | 6.500      |       |           | 3.05 |
| 0.41            | 7 2.03  | 3.500 | 4.06    | 6.583      | 16.26 | 9.67      | 3.05 |
| 0.50            | 2.03    | 3.583 | 3.05    | 6.667      | 16.26 | 9.75      | 3.05 |
| 0.58            | 3 2.03  | 3.667 | 3.05    | 6.750      | 16.26 | 9.83      | 2.03 |
| 0.66            | 7 2.03  | 3.750 | 3.05    | 6.833      | 7.11  | 9.92      | 2.03 |
| 0.75            | 2.03    | 3.833 | 4.06    | 6.917      | 7.11  | 10.00     | 2.03 |
| 0.83            | 3 1.02  | 3.917 | 4.06    | 7.000      | 7.11  | 10.08     | 3.05 |
| 0.91            | 7 1.02  | 4.000 | 4.06    | 7.083      | 7.11  | 10.17     | 3.05 |
| 1.00            | 0 1.02  | 4.083 | 3.05    | 7.167      | 7.11  | 10.25     | 3.05 |
| 1.08            | 3 2.03  | 4.167 | 3.05    | 7.250      | 7.11  | 10.33     | 2.03 |
| 1.16            | 7 2.03  | 4.250 | 3.05    | 7.333      | 5.08  | 10.42     | 2.03 |
| 1.25            | 2.03    | 4.333 | 7.11    | 7.417      | 5.08  | 10.50     | 2.03 |
| 1.33            |         | 4.417 |         |            | 5.08  | 10.58     | 1.02 |
| 1.41            |         | 4.500 | 7.11    |            | 5.08  |           | 1.02 |
| 1.50            | 2.03    | 4.583 | 6.10    | 7.667      | 5.08  | 10.75     | 1.02 |
| 1.58            | 3 2.03  | 4.667 | 6.10    | 7.750      | 5.08  | 10.83     | 2.03 |
| 1.66            | 7 2.03  | 4.750 |         | 7.833      | 6.10  | 10.92     | 2.03 |
| 1.75            | 2.03    | 4.833 | 6.10    | 7.917      | 6.10  | 11.00     | 2.03 |
| 1.83            |         | 4.917 |         |            | 6.10  |           | 2.03 |
| 1.91            | 7 1.02  | 5.000 | 6.10    | 8.083      | 5.08  | 11.17     | 2.03 |
| 2.00            | 0 1.02  | 5.083 | 6.10    | 8.167      | 5.08  | 11.25     | 2.03 |
| 2.08            | 3 2.03  | 5.167 | 6.10    | 8.250      | 5.08  | 11.33     | 2.03 |
| 2.16            | 7 2.03  | 5.250 | 6.10    | 8.333      | 4.06  | 11.42     | 2.03 |
| 2.25            |         |       |         |            | 4.06  |           | 2.03 |
| 2.33            |         | 5.417 |         | 8.500      | 4.06  |           | 1.02 |
| 2.41            |         |       |         | 8.583      | 3.05  |           | 1.02 |
| 2.50            |         | 5.583 |         | 8.667      | 3.05  |           | 1.02 |
| 2.58            |         |       |         | 8.750      | 3.05  |           | 2.03 |
| 2.66            |         |       |         | 8.833      |       | 11.92     | 2.03 |
| 2.75            |         | 5.833 |         | 8.917      |       | 12.00     | 2.03 |
| 2.83            | 3 4.06  | 5.917 | 80.26   | 9.000      |       | 12.08     | 2.03 |
| 2.91            |         |       |         | 9.083      |       | 12.17     | 2.03 |
| 3.00            |         |       |         | 9.167      |       | 12.25     | 2.03 |
| 3.08            | 3 3.05  | 6.167 | 81.28   | 9.250      | 3.05  |           |      |
| Max.Eff.Inten.( | mm/hr)= | 81.28 |         | 60.55      |       |           |      |
| over            | (min)   | 5.00  |         | 10.00      |       |           |      |
| Storage Coeff.  | (min)=  | 5.78  | (ii)    | 9.04 (ii   | )     |           |      |
| Unit Hyd. Tpeak | (min)=  | 5.00  |         | 10.00      |       |           |      |
| Unit Hyd. peak  | (cms)=  | 0.20  |         | 0.12       |       |           |      |
|                 |         |       |         |            |       | TALS*     |      |
| PEAK FLOW       | (cms)=  | 0.13  |         | 0.03       |       | 162 (iii) | )    |
| TIME TO PEAK    | (hrs)=  | 6.25  |         | 6.25       |       | 5.25      |      |
| RUNOFF VOLUME   | (mm)=   | 87.92 |         | 52.66      |       | 9.10      |      |
| TOTAL RAINFALL  | (mm)=   | 89.92 |         | 89.92      | 89    | 9.92      |      |
|                 |         |       |         |            |       |           |      |

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 ${\tt LangstaffRd\_EA\_Proposed\_WestDonWatershd}$ 

# PCSWMM Report

Langstaff\_LC1
Model LC1\_UpdatedCtchments\_Final.inp

WSP Canada Inc. July 1, 2021

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Figure 1: LC1

Table 1: Culvert LC1\_AES\_12hr\_2yr

| Name |       | Max.<br>Total<br>Inflow<br>(m³/s) | Avg.<br>Flow<br>(m³/s) | Max.<br>Flow<br>(m³/s) | Flow   | Contributing<br>Area<br>(ha) | Contributing<br>I mp.<br>Area<br>(ha) | Max.<br>Unit<br>Flow<br>(m³/s/ha) |
|------|-------|-----------------------------------|------------------------|------------------------|--------|------------------------------|---------------------------------------|-----------------------------------|
| LC1  | 1.326 | 1.326                             | 0.292                  | 1.326                  | 15.943 | 49.14                        | 46.458                                | 0.027                             |

Table 2: Catchments\_AES\_12hr\_2yr

| Name | X-Coordinate | Y-Coordinate | Rain<br>Gage | Outlet | Area<br>(ha) | Width<br>(m) | Flow<br>Length<br>(m) |     | Imperv.<br>(%) | N<br>Imperv | N<br>Perv | Dstore<br>Imperv<br>(mm) | Perv | Peak<br>Runoff<br>(m³/s) | Runoff<br>Coefficient |
|------|--------------|--------------|--------------|--------|--------------|--------------|-----------------------|-----|----------------|-------------|-----------|--------------------------|------|--------------------------|-----------------------|
| 325  | 618589.028   | 4852952.824  | AES_12hr_2yr | 300    | 26.54        | 2654         | 100                   | 4.7 | 95             | 0.013       | 0.25      | 2                        | 5    | 0.73                     | 0.785                 |
| 300  | 618906.664   | 4852860.121  | AES_12hr_2yr | LC1    | 21.7         | 1808.333     | 120                   | 7   | 95             | 0.013       | 0.25      | 2                        | 5    | 1.32                     | 0.894                 |
| 350  | 619192.465   | 4852300.707  | AES_12hr_2yr | LC1    | 0.9          | 180          | 50                    | 2   | 70             | 0.013       | 0.25      | 2                        | 5    | 0.01                     | 0.27                  |

Table 1: Culvert LC1\_AES\_12hr\_5yr

| Name | Lat.<br>Inflow | Max.<br>Total<br>Inflow<br>(m³/s) | Avg.<br>Flow<br>(m³/s) | Flow  | Flow   | Contributing<br>Area<br>(ha) | Contributing<br>I mp.<br>Area<br>(ha) | Max.<br>Unit<br>Flow<br>(m³/s/ha) |
|------|----------------|-----------------------------------|------------------------|-------|--------|------------------------------|---------------------------------------|-----------------------------------|
| LC1  | 1.782          | 1.782                             | 0.403                  | 1.782 | 22.088 | 49.14                        | 46.458                                | 0.036                             |

Table 2: Catchments\_AES\_12hr\_5yr

| Name | X-Coordinate | Y-Coordinate | Rain<br>Gage | Outlet | Area<br>(ha) | Width<br>(m) | Flow<br>Length<br>(m) |     | Imperv.<br>(%) | N<br>Imperv | N<br>Perv | Dstore<br>Imperv<br>(mm) | Perv |      | Runoff<br>Coefficient |
|------|--------------|--------------|--------------|--------|--------------|--------------|-----------------------|-----|----------------|-------------|-----------|--------------------------|------|------|-----------------------|
| 325  | 618589.028   | 4852952.824  | AES_12hr_5yr | 300    | 26.54        | 2654         | 100                   | 4.7 | 95             | 0.013       | 0.25      | 2                        | 5    | 0.97 | 0.832                 |
| 300  | 618906.664   | 4852860.121  | AES_12hr_5yr | LC1    | 21.7         | 1808.333     | 120                   | 7   | 95             | 0.013       | 0.25      | 2                        | 5    | 1.77 | 0.919                 |
| 350  | 619192.465   | 4852300.707  | AES_12hr_5yr | LC1    | 0.9          | 180          | 50                    | 2   | 70             | 0.013       | 0.25      | 2                        | 5    | 0.02 | 0.353                 |

Table 1: Culvert LC1\_AES\_12hr\_10yr

| Name | Max.<br>Lat.<br>Inflow<br>(m³/s) |       | Avg.<br>Flow<br>(m³/s) | Max.<br>Flow<br>(m³/s) | Flow   | Contributing<br>Area<br>(ha) | Contributing<br>Imp.<br>Area<br>(ha) | Max.<br>Unit<br>Flow<br>(m³/s/ha) |
|------|----------------------------------|-------|------------------------|------------------------|--------|------------------------------|--------------------------------------|-----------------------------------|
| LC1  | 2.086                            | 2.086 | 0.477                  | 2.086                  | 26.194 | 49.14                        | 46.458                               | 0.042                             |

Table 2A: Catchments\_AES\_12hr\_10yr

| Nai | me  | X-Coordinate | Y-Coordinate | Rain<br>Gage  | Outlet | Area<br>(ha) | Width<br>(m) | Flow<br>Length<br>(m) | Slope<br>(%) | Imperv.<br>(%) | N<br>Imperv |
|-----|-----|--------------|--------------|---------------|--------|--------------|--------------|-----------------------|--------------|----------------|-------------|
| 3   | 325 | 618589.028   | 4852952.824  | AES_12hr_10yr | 300    | 26.54        | 2654         | 100                   | 4.7          | 95             | 0.013       |
| 3   | 300 | 618906.664   | 4852860.121  | AES_12hr_10yr | LC1    | 21.7         | 1808.333     | 120                   | 7            | 95             | 0.013       |
| 3   | 350 | 619192.465   | 4852300.707  | AES_12hr_10yr | LC1    | 0.9          | 180          | 50                    | 2            | 70             | 0.013       |

Table 2B: Catchments\_AES\_12hr\_10yr

| Name |      | Imperv |   | Runoff | Runoff<br>Coefficient |
|------|------|--------|---|--------|-----------------------|
| 325  | 0.25 | 2      | 5 | 1.14   | 0.853                 |
| 300  | 0.25 | 2      | 5 | 2.06   | 0.93                  |
| 350  | 0.25 | 2      | 5 | 0.02   | 0.419                 |

Table 1: Culvert LC1\_AES\_12hr\_25yr

| Name | Max.<br>Lat.<br>Inflow<br>(m³/s) | Max.<br>Total<br>Inflow<br>(m³/s) | Avg.<br>Flow<br>(m³/s) | Max.<br>Flow<br>(m³/s) | Flow   | Contributing<br>Area<br>(ha) | Contributing<br>I mp.<br>Area<br>(ha) | Max.<br>Unit<br>Flow<br>(m³/s/ha) |
|------|----------------------------------|-----------------------------------|------------------------|------------------------|--------|------------------------------|---------------------------------------|-----------------------------------|
| LC1  | 2.464                            | 2.464                             | 0.568                  | 2.464                  | 31.342 | 49.14                        | 46.458                                | 0.05                              |

Table 2A: Catchments\_AES\_12hr\_25yr

| Name | X-Coordinate | Y-Coordinate | Rain<br>Gage  | Outlet | Area<br>(ha) | Width<br>(m) | Flow<br>Length<br>(m) | Slope<br>(%) | Imperv.<br>(%) | N<br>Imperv |
|------|--------------|--------------|---------------|--------|--------------|--------------|-----------------------|--------------|----------------|-------------|
| 325  | 618589.028   | 4852952.824  | AES_12hr_25yr | 300    | 26.54        | 2654         | 100                   | 4.7          | 95             | 0.013       |
| 300  | 618906.664   | 4852860.121  | AES_12hr_25yr | LC1    | 21.7         | 1808.333     | 120                   | 7            | 95             | 0.013       |
| 350  | 619192.465   | 4852300.707  | AES_12hr_25yr | LC1    | 0.9          | 180          | 50                    | 2            | 70             | 0.013       |

Table 2B: Catchments\_AES\_12hr\_25yr

| Name |      |   |   | Runoff | Runoff<br>Coefficient |
|------|------|---|---|--------|-----------------------|
| 325  | 0.25 | 2 | 5 | 1.34   | 0.873                 |
| 300  | 0.25 | 2 | 5 | 2.43   | 0.94                  |
| 350  | 0.25 | 2 | 5 | 0.03   | 0.483                 |

Table 1: Culvert LC1\_AES\_12hr\_50yr

| Name | Max.<br>Lat.<br>Inflow<br>(m³/s) |       | Avg.<br>Flow<br>(m³/s) | Max.<br>Flow<br>(m³/s) | Flow   | Contributing<br>Area<br>(ha) | Contributing<br>I mp.<br>Area<br>(ha) | Max.<br>Unit<br>Flow<br>(m³/s/ha) |
|------|----------------------------------|-------|------------------------|------------------------|--------|------------------------------|---------------------------------------|-----------------------------------|
| LC1  | 2.817                            | 2.817 | 0.654                  | 2.817                  | 36.171 | 49.14                        | 46.458                                | 0.057                             |

Table 2A: Catchments\_AES\_12hr\_50yr

| Name | X-Coordinate | Y-Coordinate | Rain<br>Gage  | Outlet | Area<br>(ha) | Width<br>(m) | Flow<br>Length<br>(m) | Slope<br>(%) | Imperv.<br>(%) | N<br>Imperv |
|------|--------------|--------------|---------------|--------|--------------|--------------|-----------------------|--------------|----------------|-------------|
| 325  | 618589.028   | 4852952.824  | AES_12hr_50yr | 300    | 26.54        | 2654         | 100                   | 4.7          | 95             | 0.013       |
| 300  | 618906.664   | 4852860.121  | AES_12hr_50yr | LC1    | 21.7         | 1808.333     | 120                   | 7            | 95             | 0.013       |
| 350  | 619192.465   | 4852300.707  | AES_12hr_50yr | LC1    | 0.9          | 180          | 50                    | 2            | 70             | 0.013       |

Table 2B: Catchments\_AES\_12hr\_50yr

| Name |      |   |   | Runoff | Runoff<br>Coefficient |
|------|------|---|---|--------|-----------------------|
| 325  | 0.25 | 2 | 5 | 1.53   | 0.887                 |
| 300  | 0.25 | 2 | 5 | 2.78   | 0.947                 |
| 350  | 0.25 | 2 | 5 | 0.04   | 0.531                 |

Table 1: Culvert LC1\_AES\_12hr\_100yr

| Name | Max.<br>Lat.<br>Inflow<br>(m³/s) | Max.<br>Total<br>Inflow<br>(m³/s) | Avg.<br>Flow<br>(m³/s) | Max.<br>Flow<br>(m³/s) | Flow   | Contributing<br>Area<br>(ha) | Contributing<br>I mp.<br>Area<br>(ha) | Max.<br>Unit<br>Flow<br>(m³/s/ha) |
|------|----------------------------------|-----------------------------------|------------------------|------------------------|--------|------------------------------|---------------------------------------|-----------------------------------|
| LC1  | 3.128                            | 3.128                             | 0.729                  | 3.128                  | 40.445 | 49.14                        | 46.458                                | 0.064                             |

Table 2A: Catchments\_AES\_12hr\_100yr

| Name | X-Coordinate | Y-Coordinate | Rain<br>Gage   | Outlet | Area<br>(ha) | Width<br>(m) | Flow<br>Length<br>(m) |     | Imperv.<br>(%) | N<br>Imperv |
|------|--------------|--------------|----------------|--------|--------------|--------------|-----------------------|-----|----------------|-------------|
| 325  | 618589.028   | 4852952.824  | AES_12hr_100yr | 300    | 26.54        | 2654         | 100                   | 4.7 | 95             | 0.013       |
| 300  | 618906.664   | 4852860.121  | AES_12hr_100yr | LC1    | 21.7         | 1808.333     | 120                   | 7   | 95             | 0.013       |
| 350  | 619192.465   | 4852300.707  | AES_12hr_100yr | LC1    | 0.9          | 180          | 50                    | 2   | 70             | 0.013       |

Table 2B: Catchments\_AES\_12hr\_100yr

| Name |      |   | Perv |      | Runoff<br>Coefficient |
|------|------|---|------|------|-----------------------|
| 325  | 0.25 | 2 | 5    | 1.7  | 0.898                 |
| 300  | 0.25 | 2 | 5    | 3.08 | 0.952                 |
| 350  | 0.25 | 2 | 5    | 0.04 | 0.567                 |

Table 1: Culvert LC1\_AES\_12hr\_Region

| Name | Max.<br>Lat.<br>Inflow<br>(m³/s) | Max.<br>Total<br>Inflow<br>(m³/s) | Avg.<br>Flow<br>(m³/s) | Max.<br>Flow<br>(m³/s) | Flow   | Contributing<br>Area<br>(ha) | Contributing<br>I mp.<br>Area<br>(ha) | Max.<br>Unit<br>Flow<br>(m³/s/ha) |
|------|----------------------------------|-----------------------------------|------------------------|------------------------|--------|------------------------------|---------------------------------------|-----------------------------------|
| LC1  | 3.128                            | 3.128                             | 0.729                  | 3.128                  | 40.445 | 49.14                        | 46.458                                | 0.064                             |

Table 2A: Catchments\_AES\_12hr\_Region

| Name | X-Coordinate | Y-Coordinate | Rain<br>Gage    | Outlet | Area<br>(ha) | Width<br>(m) | Flow<br>Length<br>(m) | Slope<br>(%) | Imperv.<br>(%) | N<br>Imperv |
|------|--------------|--------------|-----------------|--------|--------------|--------------|-----------------------|--------------|----------------|-------------|
| 325  | 618589.028   | 4852952.824  | Design_RG_15min | 300    | 26.54        | 2654         | 100                   | 4.7          | 95             | 0.013       |
| 300  | 618906.664   | 4852860.121  | Design_RG_15min | LC1    | 21.7         | 1808.333     | 120                   | 7            | 95             | 0.013       |
| 350  | 619192.465   | 4852300.707  | Design_RG_15min | LC1    | 0.9          | 180          | 50                    | 2            | 70             | 0.013       |

Table 2B: Catchments\_AES\_12hr\_Region

| Name |      |   | Perv |      | Runoff<br>Coefficient |
|------|------|---|------|------|-----------------------|
| 325  | 0.25 | 2 | 5    | 1.7  | 0.898                 |
| 300  | 0.25 | 2 | 5    | 3.08 | 0.952                 |
| 350  | 0.25 | 2 | 5    | 0.04 | 0.567                 |

# **APPENDIX**

Hydraulic Assessments

## York Region Langstaff Road EA

**West Don River** 

## **Existing Conditions Hydraulic Analysis Summary**

#### April 2020 Update

Model: "Basin5\_ExRev2\_Apr2020.prj"

Plan: Plan Ex Updated

Geometry: Basin 5-Updated at Langstaff Steady Flow: 2019 Don River Flow Update

|         |         |          |         | Min Ch    | W.S.      |           | E.G.      | Velocity | Flow   | Тор    | Froude |
|---------|---------|----------|---------|-----------|-----------|-----------|-----------|----------|--------|--------|--------|
|         | River   |          | Flow    | Elevation | Elevation | Crit W.S. | Elevation | Channel  | Area   | Width  | #      |
| Reach   | Station | Profile  | (m³/s)  | (m)       | (m)       | (m)       | (m)       | (m/s)    | (m2)   | (m)    |        |
|         | Ì       |          |         |           |           |           |           |          |        |        |        |
| Reach-1 | 5.53    | 2 Year   | 5.89    | 198.60    | 200.21    |           | 200.23    | 0.54     | 14.20  | 38.57  | 0.17   |
| Reach-1 | 5.53    | 5 Year   | 7.83    | 198.60    | 200.58    |           | 200.58    | 0.44     | 32.77  | 60.62  | 0.12   |
| Reach-1 | 5.53    | 10 Year  | 9.04    | 198.60    | 200.73    |           | 200.73    | 0.43     | 42.34  | 66.19  | 0.11   |
| Reach-1 | 5.53    | 25 Year  | 10.55   | 198.60    | 200.87    |           | 200.88    | 0.42     | 52.29  | 71.52  | 0.10   |
| Reach-1 | 5.53    | 50 Year  | 12.69   | 198.60    | 201.02    |           | 201.02    | 0.44     | 63.18  | 76.67  | 0.10   |
| Reach-1 | 5.53    | 100 Year | 15.60   | 198.60    | 201.20    |           | 201.20    | 0.45     | 76.88  | 77.70  | 0.10   |
| Reach-1 | 5.53    | Regional | 198.16  | 198.60    | 204.14    |           | 204.18    | 1.41     | 334.59 | 107.81 | 0.20   |
|         |         |          |         |           |           |           |           |          |        |        |        |
| Reach-1 | 5.52    | 2 Year   | 5.89    | 198.20    | 200.15    |           | 200.17    | 0.69     | 14.16  | 14.32  | 0.18   |
| Reach-1 | 5.52    | 5 Year   | 7.83    | 198.20    | 200.53    |           | 200.55    | 0.68     | 19.78  | 15.17  | 0.16   |
| Reach-1 | 5.52    | 10 Year  | 9.04    | 198.20    | 200.69    |           | 200.70    | 0.71     | 22.11  | 15.51  | 0.16   |
| Reach-1 | 5.52    | 25 Year  | 10.55   | 198.20    | 200.83    |           | 200.85    | 0.76     | 24.34  | 15.82  | 0.17   |
| Reach-1 | 5.52    | 50 Year  | 12.69   | 198.20    | 200.97    |           | 200.99    | 0.85     | 26.59  | 16.13  | 0.18   |
| Reach-1 | 5.52    | 100 Year | 15.60   | 198.20    | 201.14    |           | 201.17    | 0.95     | 29.44  | 18.46  | 0.19   |
| Reach-1 | 5.52    | Regional | 198.16  | 198.20    | 202.91    | 202.34    | 203.81    | 5.79     | 104.94 | 85.61  | 0.90   |
|         |         |          |         |           |           |           |           |          |        |        |        |
| Reach-1 | 5.51    | 2 Year   | 5.89    | 198.20    | 199.85    | 199.46    | 200.10    | 2.23     | 2.70   | 18.68  | 0.61   |
| Reach-1 | 5.51    | 5 Year   | 7.83    | 198.20    | 200.18    | 199.67    | 200.47    | 2.38     | 3.37   | 18.85  | 0.58   |
| Reach-1 | 5.51    | 10 Year  | 9.04    | 198.20    | 200.69    | 199.78    | 200.70    | 0.58     | 32.48  | 19.11  | 0.13   |
| Reach-1 | 5.51    | 25 Year  | 10.55   | 198.20    | 200.83    | 199.93    | 200.84    | 0.63     | 35.22  | 19.19  | 0.13   |
| Reach-1 | 5.51    | 50 Year  | 12.69   | 198.20    | 200.97    | 200.11    | 200.99    | 0.70     | 37.95  | 19.26  | 0.14   |
| Reach-1 | 5.51    | 100 Year | 15.60   | 198.20    | 201.15    | 200.36    | 201.16    | 0.80     | 41.24  | 19.35  | 0.16   |
| Reach-1 | 5.51    | Regional | 198.16  | 198.20    | 203.00    | 201.77    | 203.65    | 5.59     | 84.56  | 77.30  | 0.85   |
|         |         | -        |         |           |           |           |           |          |        |        |        |
| Reach-1 | 5.505   |          | Culvert |           |           |           |           |          |        |        |        |
|         |         |          |         |           |           |           |           |          |        |        |        |
| Reach-1 | 5.50    | 2 Year   | 5.89    | 198.00    | 199.18    | 199.00    | 199.22    | 0.98     | 10.77  | 23.58  | 0.34   |
| Reach-1 | 5.50    | 5 Year   | 7.83    | 198.00    | 199.30    | 199.00    | 199.34    | 1.06     | 13.64  | 23.88  | 0.34   |
| Reach-1 | 5.50    | 10 Year  | 9.04    | 198.00    | 199.36    | 199.03    | 199.40    | 1.12     | 15.08  | 24.03  | 0.35   |
| Reach-1 | 5.50    | 25 Year  | 10.55   | 198.00    | 199.43    | 199.08    | 199.48    | 1.18     | 16.72  | 24.19  | 0.36   |
| Reach-1 | 5.50    | 50 Year  | 12.69   | 198.00    | 199.51    | 199.13    | 199.57    | 1.28     | 18.76  | 24.40  | 0.37   |
| Reach-1 | 5.50    | 100 Year | 15.60   | 198.00    | 199.61    | 199.20    | 199.67    | 1.40     | 21.09  | 24.63  | 0.40   |
| Reach-1 | 5.50    | Regional | 198.16  | 198.00    | 201.50    | 201.16    | 202.33    | 5.54     | 72.12  | 29.18  | 0.99   |
|         |         | -        |         |           |           |           |           |          |        |        |        |
| Reach-1 | 5.49    | 2 Year   | 5.89    | 197.91    | 199.14    |           | 199.20    | 1.15     | 8.18   | 24.54  | 0.41   |
| Reach-1 | 5.49    | 5 Year   | 7.83    | 197.91    | 199.26    |           | 199.32    | 1.22     | 11.46  | 28.89  | 0.40   |
| Reach-1 | 5.49    | 10 Year  | 9.04    | 197.91    | 199.33    |           | 199.39    | 1.25     | 13.31  | 29.64  | 0.40   |
| Reach-1 | 5.49    | 25 Year  | 10.55   | 197.91    | 199.40    |           | 199.46    | 1.30     | 15.44  | 30.47  | 0.40   |
| Reach-1 | 5.49    | 50 Year  | 12.69   | 197.91    | 199.49    |           | 199.55    | 1.37     | 18.16  | 31.50  | 0.41   |
| Reach-1 | 5.49    | 100 Year | 15.60   | 197.91    | 199.58    |           | 199.66    | 1.46     | 21.33  | 32.67  | 0.42   |
| Reach-1 | 5.49    | Regional | 198.16  | 197.91    | 201.69    |           | 202.08    | 4.16     | 133.74 | 89.43  | 0.72   |
|         |         | -        |         |           |           |           |           |          |        |        |        |
| Reach-1 | 5.48    | 2 Year   | 5.89    | 197.53    | 198.81    |           | 198.86    | 0.91     | 6.63   | 11.48  | 0.35   |

## **Existing Conditions Hydraulic Analysis Summary**

#### April 2020 Update

Model: "Basin5\_ExRev2\_Apr2020.prj"

Plan: Plan Ex Updated

Geometry: Basin 5-Updated at Langstaff Steady Flow: 2019 Don River Flow Update

|         |         |          |        | Min Ch    | W.S.      |           | E.G.      | Velocity | Flow   | Тор    | Froude |
|---------|---------|----------|--------|-----------|-----------|-----------|-----------|----------|--------|--------|--------|
|         | River   |          | Flow   | Elevation | Elevation | Crit W.S. | Elevation | Channel  | Area   | Width  | #      |
| Reach   | Station | Profile  | (m³/s) | (m)       | (m)       | (m)       | (m)       | (m/s)    | (m2)   | (m)    |        |
| Reach-1 | 5.48    | 5 Year   | 7.83   | 197.53    | 198.94    |           | 198.99    | 1.01     | 8.41   | 19.27  | 0.36   |
| Reach-1 | 5.48    | 10 Year  | 9.04   | 197.53    | 199.01    |           | 199.07    | 1.06     | 9.96   | 26.82  | 0.36   |
| Reach-1 | 5.48    | 25 Year  | 10.55  | 197.53    | 199.09    |           | 199.15    | 1.11     | 12.46  | 35.79  | 0.36   |
| Reach-1 | 5.48    | 50 Year  | 12.69  | 197.53    | 199.18    |           | 199.24    | 1.18     | 15.97  | 45.50  | 0.37   |
| Reach-1 | 5.48    | 100 Year | 15.60  | 197.53    | 199.27    |           | 199.35    | 1.26     | 20.93  | 52.88  | 0.38   |
| Reach-1 | 5.48    | Regional | 198.16 | 197.53    | 201.20    |           | 201.45    | 3.11     | 138.54 | 69.18  | 0.57   |
|         |         |          |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.47    | 2 Year   | 5.89   | 197.29    | 198.23    |           | 198.34    | 1.52     | 3.90   | 8.31   | 0.67   |
| Reach-1 | 5.47    | 5 Year   | 7.83   | 197.29    | 198.33    |           | 198.47    | 1.66     | 4.91   | 10.76  | 0.68   |
| Reach-1 | 5.47    | 10 Year  | 9.04   | 197.29    | 198.38    |           | 198.54    | 1.75     | 5.47   | 11.92  | 0.70   |
| Reach-1 | 5.47    | 25 Year  | 10.55  | 197.29    | 198.42    | 198.31    | 198.60    | 1.93     | 5.89   | 13.53  | 0.76   |
| Reach-1 | 5.47    | 50 Year  | 12.69  | 197.29    | 198.50    | 198.40    | 198.70    | 2.03     | 7.32   | 22.27  | 0.75   |
| Reach-1 | 5.47    | 100 Year | 15.60  | 197.29    | 198.58    | 198.53    | 198.80    | 2.16     | 9.58   | 29.76  | 0.76   |
| Reach-1 | 5.47    | Regional | 198.16 | 197.29    | 201.06    |           | 201.14    | 1.94     | 206.37 | 100.47 | 0.34   |
|         |         |          |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.46    | 2 Year   | 5.89   | 196.43    | 197.64    |           | 197.71    | 1.15     | 5.59   | 18.43  | 0.45   |
| Reach-1 | 5.46    | 5 Year   | 7.83   | 196.43    | 197.76    |           | 197.83    | 1.24     | 8.16   | 24.74  | 0.46   |
| Reach-1 | 5.46    | 10 Year  | 9.04   | 196.43    | 197.82    | 197.47    | 197.90    | 1.28     | 9.79   | 27.48  | 0.46   |
| Reach-1 | 5.46    | 25 Year  | 10.55  | 196.43    | 197.93    | 197.54    | 198.00    | 1.25     | 12.93  | 31.47  | 0.42   |
| Reach-1 | 5.46    | 50 Year  | 12.69  | 196.43    | 197.98    | 197.70    | 198.06    | 1.38     | 14.75  | 33.56  | 0.45   |
| Reach-1 | 5.46    | 100 Year | 15.60  | 196.43    | 198.07    | 197.80    | 198.16    | 1.49     | 17.71  | 36.70  | 0.47   |
| Reach-1 | 5.46    | Regional | 198.16 | 196.43    | 200.90    |           | 201.02    | 2.31     | 181.55 | 67.16  | 0.37   |
|         |         |          |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.45    | 2 Year   | 5.89   | 196.01    | 196.92    |           | 197.04    | 1.58     | 3.73   | 7.42   | 0.71   |
| Reach-1 | 5.45    | 5 Year   | 7.83   | 196.01    | 197.04    |           | 197.18    | 1.66     | 4.72   | 8.34   | 0.70   |
| Reach-1 | 5.45    | 10 Year  | 9.04   | 196.01    | 197.10    |           | 197.25    | 1.73     | 5.22   | 8.76   | 0.72   |
| Reach-1 | 5.45    | 25 Year  | 10.55  | 196.01    | 197.18    | 197.02    | 197.33    | 1.72     | 6.12   | 15.92  | 0.89   |
| Reach-1 | 5.45    | 50 Year  | 12.69  | 196.01    | 197.27    |           | 197.41    | 1.70     | 7.49   | 16.50  | 0.80   |
| Reach-1 | 5.45    | 100 Year | 15.60  | 196.01    | 197.34    |           | 197.50    | 1.79     | 8.74   | 17.02  | 0.80   |
| Reach-1 | 5.45    | Regional | 198.16 | 196.01    | 200.73    |           | 200.88    | 1.67     | 118.36 | 48.05  | 0.34   |
|         |         |          |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.44    | 2 Year   | 10.32  | 195.43    | 196.90    |           | 196.91    | 0.46     | 29.42  | 36.53  | 0.14   |
| Reach-1 | 5.44    | 5 Year   | 13.25  | 195.43    | 197.03    |           | 197.04    | 0.53     | 34.06  | 38.95  | 0.15   |
| Reach-1 | 5.44    | 10 Year  | 14.82  | 195.43    | 197.09    |           | 197.10    | 0.56     | 36.39  | 40.10  | 0.16   |
| Reach-1 | 5.44    | 25 Year  | 16.70  | 195.43    | 197.15    |           | 197.17    | 0.59     | 39.13  | 41.42  | 0.16   |
| Reach-1 | 5.44    | 50 Year  | 18.87  | 195.43    | 197.23    |           | 197.24    | 0.62     | 42.34  | 42.92  | 0.17   |
| Reach-1 | 5.44    | 100 Year | 21.08  | 195.43    | 197.30    |           | 197.32    | 0.65     | 45.82  | 52.52  | 0.17   |
| Reach-1 | 5.44    | Regional | 252.81 | 195.43    | 200.70    |           | 200.75    | 1.44     | 400.25 | 178.44 | 0.21   |
|         |         |          |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.435   | 2 Year   | 10.32  | 195.27    | 196.81    |           | 196.85    | 0.87     | 11.81  | 18.09  | 0.35   |
| Reach-1 | 5.435   | 5 Year   | 13.25  | 195.27    | 196.92    |           | 196.97    | 0.95     | 13.92  | 19.78  | 0.36   |
| Reach-1 | 5.435   | 10 Year  | 14.82  | 195.27    | 196.98    |           | 197.03    | 0.99     | 14.99  | 20.59  | 0.37   |
| Reach-1 | 5.435   | 25 Year  | 16.70  | 195.27    | 197.04    |           | 197.09    | 1.03     | 16.36  | 23.59  | 0.37   |
| Reach-1 | 5.435   | 50 Year  | 18.87  | 195.27    | 197.11    |           | 197.17    | 1.06     | 18.23  | 27.73  | 0.36   |
|         | 255     |          | _0.07  |           |           |           | ,,        |          |        |        | 5.55   |

## **Existing Conditions Hydraulic Analysis Summary**

#### April 2020 Update

Model: "Basin5\_ExRev2\_Apr2020.prj"

Plan: Plan Ex Updated

Geometry: Basin 5-Updated at Langstaff Steady Flow: 2019 Don River Flow Update

|         |         |          |        | Min Ch    | W.S.      |           | E.G.      | Velocity | Flow   | Тор    | Froude |
|---------|---------|----------|--------|-----------|-----------|-----------|-----------|----------|--------|--------|--------|
|         | River   |          | Flow   | Elevation | Elevation | Crit W.S. | Elevation | Channel  | Area   | Width  | #      |
| Reach   | Station | Profile  | (m³/s) | (m)       | (m)       | (m)       | (m)       | (m/s)    | (m2)   | (m)    |        |
| Reach-1 | 5.435   | 100 Year | 21.08  | 195.27    | 197.18    |           | 197.24    | 1.09     | 20.35  | 31.80  | 0.36   |
| Reach-1 | 5.435   | Regional | 252.81 | 195.27    | 200.65    |           | 200.71    | 1.47     | 365.31 | 181.39 | 0.22   |
|         |         |          |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.43    | 2 Year   | 11.20  | 195.31    | 196.70    |           | 196.72    | 0.62     | 17.92  | 36.02  | 0.28   |
| Reach-1 | 5.43    | 5 Year   | 14.39  | 195.31    | 196.83    |           | 196.85    | 0.64     | 22.72  | 41.53  | 0.26   |
| Reach-1 | 5.43    | 10 Year  | 16.21  | 195.31    | 196.89    |           | 196.91    | 0.65     | 25.23  | 44.68  | 0.26   |
| Reach-1 | 5.43    | 25 Year  | 18.42  | 195.31    | 196.96    |           | 196.98    | 0.67     | 28.52  | 47.93  | 0.25   |
| Reach-1 | 5.43    | 50 Year  | 20.93  | 195.31    | 197.04    |           | 197.06    | 0.68     | 32.63  | 51.05  | 0.24   |
| Reach-1 | 5.43    | 100 Year | 23.42  | 195.31    | 197.12    |           | 197.14    | 0.69     | 36.80  | 53.37  | 0.23   |
| Reach-1 | 5.43    | Regional | 259.19 | 195.31    | 200.64    |           | 200.68    | 1.05     | 421.01 | 208.33 | 0.16   |
|         |         |          |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.425   | 2 Year   | 11.20  | 195.27    | 196.51    |           | 196.56    | 0.99     | 11.30  | 16.07  | 0.38   |
| Reach-1 | 5.425   | 5 Year   | 14.39  | 195.27    | 196.64    |           | 196.70    | 1.06     | 13.65  | 20.12  | 0.38   |
| Reach-1 | 5.425   | 10 Year  | 16.21  | 195.27    | 196.70    |           | 196.76    | 1.11     | 14.89  | 21.99  | 0.38   |
| Reach-1 | 5.425   | 25 Year  | 18.42  | 195.27    | 196.78    |           | 196.84    | 1.15     | 16.64  | 24.38  | 0.38   |
| Reach-1 | 5.425   | 50 Year  | 20.93  | 195.27    | 196.87    |           | 196.94    | 1.18     | 19.02  | 27.40  | 0.37   |
| Reach-1 | 5.425   | 100 Year | 23.42  | 195.27    | 196.96    |           | 197.03    | 1.20     | 21.58  | 30.52  | 0.36   |
| Reach-1 | 5.425   | Regional | 259.19 | 195.27    | 200.60    |           | 200.66    | 1.45     | 328.05 | 137.33 | 0.21   |
|         |         |          |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.42    | 2 Year   | 11.20  | 194.93    | 196.33    |           | 196.50    | 1.83     | 6.34   | 12.23  | 0.71   |
| Reach-1 | 5.42    | 5 Year   | 14.39  | 194.93    | 196.47    | 196.29    | 196.64    | 1.86     | 8.99   | 24.05  | 0.66   |
| Reach-1 | 5.42    | 10 Year  | 16.21  | 194.93    | 196.55    | 196.37    | 196.71    | 1.85     | 11.13  | 30.32  | 0.62   |
| Reach-1 | 5.42    | 25 Year  | 18.42  | 194.93    | 196.70    |           | 196.81    | 1.63     | 16.27  | 37.55  | 0.51   |
| Reach-1 | 5.42    | 50 Year  | 20.93  | 194.93    | 196.83    |           | 196.92    | 1.48     | 21.49  | 39.55  | 0.43   |
| Reach-1 | 5.42    | 100 Year | 23.42  | 194.93    | 196.94    |           | 197.02    | 1.40     | 25.90  | 41.17  | 0.39   |
| Reach-1 | 5.42    | Regional | 259.19 | 194.93    | 200.60    |           | 200.65    | 1.50     | 352.01 | 169.47 | 0.21   |
|         |         |          |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.41    | 2 Year   | 11.20  | 194.93    | 196.32    | 196.06    | 196.46    | 1.66     | 7.43   | 17.46  | 0.57   |
| Reach-1 | 5.41    | 5 Year   | 14.39  | 194.93    | 196.46    | 196.21    | 196.61    | 1.77     | 9.19   | 17.71  | 0.56   |
| Reach-1 | 5.41    | 10 Year  | 16.21  | 194.93    |           |           | 196.69    | 1.83     | 10.06  | 18.09  | 0.56   |
| Reach-1 | 5.41    | 25 Year  | 18.42  | 194.93    |           | 196.35    | 196.78    | 1.91     | 11.03  | 18.54  | 0.57   |
| Reach-1 | 5.41    | 50 Year  | 20.93  |           | 196.69    | 196.41    | 196.88    | 1.99     | 12.06  | 22.12  | 0.57   |
| Reach-1 | 5.41    | 100 Year | 23.42  | 194.93    | 196.77    | 196.47    | 196.97    | 2.07     | 13.03  | 22.84  | 0.58   |
| Reach-1 | 5.41    | Regional | 259.19 | 194.93    | 200.55    | 199.41    | 200.63    | 2.09     | 341.53 | 264.89 | 0.30   |
|         |         |          |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.405   |          | Bridge |           |           |           |           |          |        |        |        |
|         |         |          | 44.00  | 10100     | 10010     | 405       | 10001     |          |        | 10.04  |        |
| Reach-1 | 5.40    | 2 Year   | 11.20  | 194.93    | 196.18    | 195.75    | 196.24    | 1.15     | 11.03  | 18.84  | 0.37   |
| Reach-1 | 5.40    | 5 Year   | 14.39  | 194.93    | 196.34    | 195.84    | 196.41    | 1.25     | 13.08  | 19.42  | 0.37   |
| Reach-1 | 5.40    | 10 Year  | 16.21  | 194.93    | 196.42    | 195.88    | 196.49    | 1.32     | 13.95  | 19.57  | 0.38   |
| Reach-1 | 5.40    | 25 Year  | 18.42  | 194.93    | 196.49    | 195.93    | 196.57    | 1.41     | 14.82  | 19.72  | 0.40   |
| Reach-1 | 5.40    | 50 Year  | 20.93  | 194.93    | 196.55    | 195.99    | 196.65    | 1.52     | 15.64  | 19.86  | 0.42   |
| Reach-1 | 5.40    | 100 Year | 23.42  | 194.93    | 196.61    | 196.04    | 196.73    | 1.62     | 16.39  | 19.96  | 0.43   |
| Reach-1 | 5.40    | Regional | 259.19 | 194.93    | 199.89    | 199.01    | 200.09    | 2.85     | 224.23 | 196.02 | 0.42   |

## **Existing Conditions Hydraulic Analysis Summary**

#### April 2020 Update

Model: "Basin5\_ExRev2\_Apr2020.prj"

Plan: Plan Ex Updated

Geometry: Basin 5-Updated at Langstaff Steady Flow: 2019 Don River Flow Update

|         |         |          |        | Min Ch    | W.S.      |           | E.G.      | Velocity | Flow   | Тор    | Froude |
|---------|---------|----------|--------|-----------|-----------|-----------|-----------|----------|--------|--------|--------|
|         | River   |          | Flow   | Elevation | Elevation | Crit W.S. | Elevation | Channel  | Area   | Width  | #      |
| Reach   | Station | Profile  | (m³/s) | (m)       | (m)       | (m)       | (m)       | (m/s)    | (m2)   | (m)    |        |
|         |         |          |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.38    | 2 Year   | 11.20  | 194.70    | 195.99    |           | 196.08    | 1.32     | 8.53   | 11.75  | 0.46   |
| Reach-1 | 5.38    | 5 Year   | 14.39  | 194.70    | 196.18    |           | 196.27    | 1.34     | 11.67  | 20.63  | 0.43   |
| Reach-1 | 5.38    | 10 Year  | 16.21  | 194.70    | 196.26    |           | 196.35    | 1.37     | 13.45  | 25.13  | 0.43   |
| Reach-1 | 5.38    | 25 Year  | 18.42  | 194.70    | 196.33    |           | 196.43    | 1.43     | 15.42  | 29.34  | 0.43   |
| Reach-1 | 5.38    | 50 Year  | 20.93  | 194.70    | 196.40    |           | 196.51    | 1.50     | 17.56  | 33.29  | 0.44   |
| Reach-1 | 5.38    | 100 Year | 23.42  | 194.70    | 196.46    |           | 196.57    | 1.55     | 19.70  | 36.31  | 0.44   |
| Reach-1 | 5.38    | Regional | 259.19 | 194.70    | 199.93    |           | 199.98    | 1.51     | 376.74 | 229.24 | 0.22   |
|         |         |          |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.37    | 2 Year   | 11.20  | 194.30    | 195.55    |           | 195.62    | 1.12     | 9.96   | 11.07  | 0.38   |
| Reach-1 | 5.37    | 5 Year   | 14.39  | 194.30    | 195.75    |           | 195.82    | 1.15     | 12.55  | 15.30  | 0.40   |
| Reach-1 | 5.37    | 10 Year  | 16.21  | 194.30    | 195.82    |           | 195.90    | 1.18     | 13.74  | 16.99  | 0.42   |
| Reach-1 | 5.37    | 25 Year  | 18.42  | 194.30    | 195.89    |           | 195.97    | 1.24     | 14.92  | 20.48  | 0.43   |
| Reach-1 | 5.37    | 50 Year  | 20.93  | 194.30    | 195.95    |           | 196.03    | 1.32     | 16.21  | 25.25  | 0.45   |
| Reach-1 | 5.37    | 100 Year | 23.42  | 194.30    | 195.99    |           | 196.09    | 1.39     | 17.55  | 29.38  | 0.46   |
| Reach-1 | 5.37    | Regional | 259.19 | 194.30    | 199.85    |           | 199.93    | 1.56     | 340.12 | 175.71 | 0.23   |
|         |         |          |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.36    | 2 Year   | 11.20  | 193.95    | 195.35    |           | 195.40    | 0.98     | 11.48  | 11.24  | 0.30   |
| Reach-1 | 5.36    | 5 Year   | 14.39  | 193.95    | 195.54    |           | 195.59    | 1.05     | 15.26  | 50.07  | 0.31   |
| Reach-1 | 5.36    | 10 Year  | 16.21  | 193.95    | 195.60    |           | 195.66    | 1.09     | 19.11  | 64.99  | 0.31   |
| Reach-1 | 5.36    | 25 Year  | 18.42  | 193.95    | 195.66    |           | 195.72    | 1.13     | 23.75  | 88.27  | 0.32   |
| Reach-1 | 5.36    | 50 Year  | 20.93  | 193.95    | 195.73    |           | 195.78    | 1.15     | 29.97  | 109.14 | 0.31   |
| Reach-1 | 5.36    | 100 Year | 23.42  | 193.95    | 195.79    |           | 195.84    | 1.14     | 36.87  | 110.89 | 0.31   |
| Reach-1 | 5.36    | Regional | 259.19 | 193.95    | 199.86    |           | 199.88    | 0.78     | 547.97 | 134.95 | 0.11   |
|         |         |          |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.35    | 2 Year   | 11.20  | 193.75    | 195.02    |           | 195.12    | 1.42     | 8.50   | 12.85  | 0.47   |
| Reach-1 | 5.35    | 5 Year   | 14.39  | 193.75    | 195.21    |           | 195.31    | 1.44     | 11.52  | 25.84  | 0.49   |
| Reach-1 | 5.35    | 10 Year  | 16.21  | 193.75    | 195.30    |           | 195.40    | 1.43     | 14.95  | 45.52  | 0.46   |
| Reach-1 | 5.35    | 25 Year  | 18.42  | 193.75    | 195.40    |           | 195.48    | 1.38     | 19.42  | 47.95  | 0.43   |
| Reach-1 | 5.35    | 50 Year  | 20.93  |           |           |           | 195.57    | 1.34     |        | 50.45  | 0.40   |
| Reach-1 | 5.35    | 100 Year | 23.42  | 193.75    |           |           | 195.65    | 1.30     | 28.91  | 52.74  | 0.37   |
| Reach-1 | 5.35    | Regional | 259.19 | 193.75    | 199.82    |           | 199.86    | 1.24     | 378.84 | 110.69 | 0.17   |
|         |         |          |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.34    | 2 Year   | 11.20  |           |           |           | 194.91    | 0.78     | 14.32  | 12.46  | 0.23   |
| Reach-1 | 5.34    | 5 Year   | 14.39  | 193.30    |           |           | 195.09    | 0.87     | 16.50  | 13.25  | 0.25   |
| Reach-1 | 5.34    | 10 Year  | 16.21  | 193.30    |           |           | 195.18    | 0.92     | 17.62  | 13.72  | 0.26   |
| Reach-1 | 5.34    | 25 Year  | 18.42  |           |           |           | 195.28    | 0.97     | 18.92  | 14.24  | 0.27   |
| Reach-1 | 5.34    | 50 Year  | 20.93  |           |           |           | 195.38    | 1.03     | 20.32  | 14.84  | 0.28   |
| Reach-1 | 5.34    | 100 Year | 23.42  | 193.3     | 195.41    |           | 195.47    | 1.08     | 21.65  | 15.49  | 0.29   |
| Reach-1 | 5.34    | Regional | 259.19 | 193.3     | 199.76    |           | 199.82    | 1.31     | 323.62 | 130.21 | 0.19   |
|         |         |          |        |           |           |           | 40.5      |          |        |        |        |
| Reach-1 | 5.33    | 2 Year   | 11.2   | 193.3     |           |           | 194.89    | 1.36     | 8.24   | 8.7    | 0.45   |
| Reach-1 | 5.33    | 5 Year   | 14.39  | 193.3     |           | 194.44    | 195.06    | 1.5      | 9.62   | 9.31   | 0.47   |
| Reach-1 | 5.33    | 10 Year  | 16.21  | 193.3     | 195.02    | 194.51    | 195.15    | 1.57     | 10.32  | 9.6    | 0.48   |

## **Existing Conditions Hydraulic Analysis Summary**

#### April 2020 Update

Model: "Basin5\_ExRev2\_Apr2020.prj"

Plan: Plan Ex Updated

Geometry: Basin 5-Updated at Langstaff Steady Flow: 2019 Don River Flow Update

|         |         |          |        | Min Ch    | W.S.      |           | E.G.      | Velocity | Flow   | Тор   | Froude |
|---------|---------|----------|--------|-----------|-----------|-----------|-----------|----------|--------|-------|--------|
|         | River   |          | Flow   | Elevation | Elevation | Crit W.S. | Elevation | Channel  | Area   | Width | #      |
| Reach   | Station | Profile  | (m³/s) | (m)       | (m)       | (m)       | (m)       | (m/s)    | (m2)   | (m)   |        |
| Reach-1 | 5.33    | 25 Year  | 18.42  | 193.3     | 195.1     | 194.59    | 195.24    | 1.66     | 11.1   | 9.93  | 0.5    |
| Reach-1 | 5.33    | 50 Year  | 20.93  | 193.3     | 195.19    | 194.67    | 195.34    | 1.75     | 11.93  | 10.25 | 0.52   |
| Reach-1 | 5.33    | 100 Year | 23.42  | 193.3     | 195.26    | 194.75    | 195.43    | 1.85     | 12.69  | 10.55 | 0.54   |
| Reach-1 | 5.33    | Regional | 259.19 | 193.3     | 199.23    | 197.79    | 199.7     | 3.01     | 86.12  | 26.41 | 0.53   |
|         |         |          |        |           |           |           |           |          |        |       |        |
| Reach-1 | 5.325   |          | Bridge |           |           |           |           |          |        |       |        |
|         |         |          |        |           |           |           |           |          |        |       |        |
| Reach-1 | 5.32    | 2 Year   | 11.2   | 193.29    | 194.69    | 194.29    | 194.81    | 1.51     | 7.42   | 8.31  | 0.51   |
| Reach-1 | 5.32    | 5 Year   | 14.39  | 193.29    | 194.84    | 194.43    | 194.98    | 1.66     | 8.64   | 8.88  | 0.54   |
| Reach-1 | 5.32    | 10 Year  | 16.21  | 193.29    | 194.9     | 194.49    | 195.06    | 1.76     | 9.21   | 9.13  | 0.56   |
| Reach-1 | 5.32    | 25 Year  | 18.42  | 193.29    | 194.96    | 194.57    | 195.14    | 1.88     | 9.82   | 9.39  | 0.59   |
| Reach-1 | 5.32    | 50 Year  | 20.93  | 193.29    | 195.03    | 194.66    | 195.23    | 2.01     | 10.4   | 9.64  | 0.62   |
| Reach-1 | 5.32    | 100 Year | 23.42  | 193.29    | 195.07    | 194.74    | 195.31    | 2.16     | 10.86  | 9.82  | 0.66   |
| Reach-1 | 5.32    | Regional | 259.19 | 193.29    | 197.78    | 197.78    | 199.04    | 4.97     | 52.18  | 20.65 | 1      |
|         |         |          |        |           |           |           |           |          |        |       |        |
| Reach-1 | 5.30    | 2 Year   | 11.2   | 193.2     | 194.46    |           | 194.55    | 1.35     | 8.3    | 15.52 | 0.46   |
| Reach-1 | 5.30    | 5 Year   | 14.39  | 193.2     | 194.62    |           | 194.71    | 1.39     | 12.68  | 29.98 | 0.44   |
| Reach-1 | 5.30    | 10 Year  | 16.21  | 193.2     | 194.69    |           | 194.78    | 1.41     | 14.83  | 32.44 | 0.43   |
| Reach-1 | 5.30    | 25 Year  | 18.42  | 193.2     | 194.76    |           | 194.86    | 1.44     | 17.27  | 39.7  | 0.43   |
| Reach-1 | 5.30    | 50 Year  | 20.93  | 193.2     | 194.83    |           | 194.92    | 1.48     | 20.51  | 55.39 | 0.43   |
| Reach-1 | 5.30    | 100 Year | 23.42  | 193.2     | 194.88    |           | 194.98    | 1.51     | 23.62  | 57.5  | 0.43   |
| Reach-1 | 5.30    | Regional | 259.19 | 193.2     | 196.4     |           | 196.63    | 3.09     | 149.26 | 97.89 | 0.59   |
|         |         |          |        |           |           |           |           |          |        |       |        |

## **Proposed Conditions Hydraulic Analysis Summary**

#### April 2020 Update

Model: "Basin5\_Pr\_Opt4\_Apr2020.prj"

Plan: Proposed at Langstaff

Geometry: Basin 5 Proposed at Langstaff Steady Flow: 2019 Don River Flow Update

|         |         |          |         | Min Ch    | W.S.      |           | E.G.      | Velocity | Flow   | Тор    | Froude |
|---------|---------|----------|---------|-----------|-----------|-----------|-----------|----------|--------|--------|--------|
|         | River   |          | Flow    | Elevation | Elevation | Crit W.S. | Elevation | Channel  | Area   | Width  | #      |
| Reach   | Station | Profile  | (m³/s)  | (m)       | (m)       | (m)       | (m)       | (m/s)    | (m2)   | (m)    |        |
|         |         |          |         |           |           |           |           |          |        |        |        |
| Reach-1 | 5.53    | 2 Year   | 5.89    | 198.60    | 200.21    |           | 200.23    | 0.54     | 14.20  | 38.57  | 0.17   |
| Reach-1 | 5.53    | 5 Year   | 7.83    | 198.60    | 200.58    |           | 200.58    | 0.44     | 32.77  | 60.62  | 0.12   |
| Reach-1 | 5.53    | 10 Year  | 9.04    | 198.60    | 200.73    |           | 200.73    | 0.43     | 42.34  | 66.19  | 0.11   |
| Reach-1 | 5.53    | 25 Year  | 10.55   | 198.60    | 200.87    |           | 200.88    | 0.42     | 52.29  | 71.52  | 0.10   |
| Reach-1 | 5.53    | 50 Year  | 12.69   | 198.60    | 201.02    |           | 201.02    | 0.44     | 63.18  | 76.67  | 0.10   |
| Reach-1 | 5.53    | 100 Year | 15.60   | 198.60    | 201.20    |           | 201.20    | 0.45     | 76.88  | 77.70  | 0.10   |
| Reach-1 | 5.53    | Regional | 198.16  | 198.60    | 204.14    |           | 204.18    | 1.41     | 334.59 | 107.81 | 0.20   |
|         |         |          |         |           |           |           |           |          |        |        |        |
| Reach-1 | 5.52    | 2 Year   | 5.89    | 198.20    | 200.15    |           | 200.17    | 0.69     | 14.16  | 14.32  | 0.18   |
| Reach-1 | 5.52    | 5 Year   | 7.83    | 198.20    | 200.53    |           | 200.55    | 0.68     | 19.78  | 15.17  | 0.16   |
| Reach-1 | 5.52    | 10 Year  | 9.04    | 198.20    | 200.69    |           | 200.70    | 0.71     | 22.11  | 15.51  | 0.16   |
| Reach-1 | 5.52    | 25 Year  | 10.55   | 198.20    | 200.83    |           | 200.85    | 0.76     | 24.34  | 15.82  | 0.17   |
| Reach-1 | 5.52    | 50 Year  | 12.69   | 198.20    | 200.97    |           | 200.99    | 0.85     | 26.59  | 16.13  | 0.18   |
| Reach-1 | 5.52    | 100 Year | 15.60   | 198.20    | 201.14    |           | 201.17    | 0.95     | 29.44  | 18.46  | 0.19   |
| Reach-1 | 5.52    | Regional | 198.16  | 198.20    | 202.91    | 202.34    | 203.81    | 5.79     | 104.94 | 85.61  | 0.90   |
|         |         |          |         |           |           |           |           |          |        |        |        |
| Reach-1 | 5.51    | 2 Year   | 5.89    | 198.20    | 199.85    | 199.46    | 200.10    | 2.23     | 2.70   | 18.68  | 0.61   |
| Reach-1 | 5.51    | 5 Year   | 7.83    | 198.20    | 200.18    | 199.67    | 200.47    | 2.38     | 3.37   | 18.85  | 0.58   |
| Reach-1 | 5.51    | 10 Year  | 9.04    | 198.20    | 200.69    | 199.78    | 200.70    | 0.58     | 32.48  | 19.11  | 0.13   |
| Reach-1 | 5.51    | 25 Year  | 10.55   | 198.20    | 200.83    | 199.93    | 200.84    | 0.63     | 35.22  | 19.19  | 0.13   |
| Reach-1 | 5.51    | 50 Year  | 12.69   | 198.20    | 200.97    | 200.11    | 200.99    | 0.70     | 37.95  | 19.26  | 0.14   |
| Reach-1 | 5.51    | 100 Year | 15.60   | 198.20    | 201.15    | 200.36    | 201.16    | 0.80     | 41.24  | 19.35  | 0.16   |
| Reach-1 | 5.51    | Regional | 198.16  | 198.20    | 203.00    | 201.77    | 203.65    | 5.59     | 84.56  | 77.30  | 0.85   |
|         |         |          |         |           |           |           |           |          |        |        |        |
| Reach-1 | 5.505   |          | Culvert |           |           |           |           |          |        |        |        |
|         |         |          |         |           |           |           |           |          |        |        |        |
| Reach-1 | 5.50    | 2 Year   | 5.89    | 198.00    | 199.18    | 199.00    | 199.22    | 0.98     | 10.77  | 23.58  | 0.34   |
| Reach-1 | 5.50    | 5 Year   | 7.83    | 198.00    | 199.30    | 199.00    | 199.34    | 1.06     | 13.64  | 23.88  | 0.34   |
| Reach-1 | 5.50    | 10 Year  | 9.04    | 198.00    | 199.36    | 199.03    | 199.40    | 1.12     | 15.09  | 24.03  | 0.35   |
| Reach-1 | 5.50    | 25 Year  | 10.55   | 198.00    | 199.43    | 199.08    | 199.48    | 1.18     | 16.71  | 24.19  | 0.36   |
| Reach-1 | 5.50    | 50 Year  | 12.69   | 198.00    | 199.51    | 199.13    | 199.57    | 1.28     | 18.77  | 24.40  | 0.37   |
| Reach-1 | 5.50    | 100 Year | 15.60   | 198.00    | 199.61    | 199.20    | 199.67    | 1.40     | 21.09  | 24.64  | 0.40   |
| Reach-1 | 5.50    | Regional | 198.16  | 198.00    | 201.50    | 201.16    | 202.33    | 5.54     | 72.04  | 29.17  | 0.99   |
|         |         |          |         |           |           |           |           |          |        |        |        |
| Reach-1 | 5.49    | 2 Year   | 5.89    | 197.91    | 199.14    |           | 199.20    | 1.14     | 8.19   | 24.55  | 0.41   |
| Reach-1 | 5.49    | 5 Year   | 7.83    | 197.91    | 199.26    |           | 199.32    | 1.22     | 11.47  | 28.90  | 0.40   |
| Reach-1 | 5.49    | 10 Year  | 9.04    | 197.91    | 199.33    |           | 199.39    | 1.25     | 13.32  | 29.64  | 0.40   |
| Reach-1 | 5.49    | 25 Year  | 10.55   | 197.91    | 199.40    |           | 199.46    | 1.30     | 15.44  | 30.47  | 0.40   |
| Reach-1 | 5.49    | 50 Year  | 12.69   | 197.91    | 199.49    |           | 199.55    | 1.37     | 18.17  | 31.51  | 0.41   |

## **Proposed Conditions Hydraulic Analysis Summary**

#### April 2020 Update

Model: "Basin5\_Pr\_Opt4\_Apr2020.prj"

Plan: Proposed at Langstaff

Geometry: Basin 5 Proposed at Langstaff Steady Flow: 2019 Don River Flow Update

|         |         |          |        | Min Ch    | W.S.      |           | E.G.      | Velocity | Flow   | Тор    | Froude |
|---------|---------|----------|--------|-----------|-----------|-----------|-----------|----------|--------|--------|--------|
|         | River   |          | Flow   | Elevation | Elevation | Crit W.S. | Elevation | Channel  | Area   | Width  | #      |
| Reach   | Station | Profile  | (m³/s) | (m)       | (m)       | (m)       | (m)       | (m/s)    | (m2)   | (m)    |        |
| Reach-1 | 5.49    | 100 Year | 15.60  | 197.91    | 199.58    |           | 199.66    | 1.46     | 21.33  | 32.67  | 0.42   |
| Reach-1 | 5.49    | Regional | 198.16 | 197.91    | 201.69    |           | 202.07    | 4.17     | 133.48 | 89.41  | 0.73   |
|         |         |          |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.48    | 2 Year   | 5.89   | 197.53    | 198.82    |           | 198.86    | 0.91     | 6.64   | 11.50  | 0.35   |
| Reach-1 | 5.48    | 5 Year   | 7.83   | 197.53    | 198.94    |           | 198.99    | 1.01     | 8.42   | 19.35  | 0.36   |
| Reach-1 | 5.48    | 10 Year  | 9.04   | 197.53    | 199.01    |           | 199.07    | 1.07     | 9.95   | 26.78  | 0.36   |
| Reach-1 | 5.48    | 25 Year  | 10.55  | 197.53    | 199.09    |           | 199.15    | 1.11     | 12.43  | 35.70  | 0.36   |
| Reach-1 | 5.48    | 50 Year  | 12.69  | 197.53    | 199.18    |           | 199.24    | 1.18     | 16.08  | 45.78  | 0.37   |
| Reach-1 | 5.48    | 100 Year | 15.60  | 197.53    | 199.28    |           | 199.35    | 1.25     | 21.03  | 52.90  | 0.37   |
| Reach-1 | 5.48    | Regional | 198.16 | 197.53    | 201.19    |           | 201.45    | 3.12     | 138.00 | 69.12  | 0.57   |
|         |         |          |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.47    | 2 Year   | 5.89   | 197.29    | 198.22    |           | 198.34    | 1.53     | 3.87   | 8.25   | 0.67   |
| Reach-1 | 5.47    | 5 Year   | 7.83   | 197.29    | 198.33    |           | 198.47    | 1.67     | 4.87   | 10.69  | 0.69   |
| Reach-1 | 5.47    | 10 Year  | 9.04   | 197.29    | 198.38    |           | 198.54    | 1.76     | 5.44   | 11.85  | 0.71   |
| Reach-1 | 5.47    | 25 Year  | 10.55  | 197.29    | 198.42    | 198.31    | 198.60    | 1.92     | 5.94   | 13.95  | 0.75   |
| Reach-1 | 5.47    | 50 Year  | 12.69  | 197.29    | 198.49    | 198.40    | 198.70    | 2.06     | 7.13   | 21.31  | 0.77   |
| Reach-1 | 5.47    | 100 Year | 15.60  | 197.29    | 198.57    | 198.53    | 198.80    | 2.19     | 9.30   | 28.45  | 0.77   |
| Reach-1 | 5.47    | Regional | 198.16 | 197.29    | 201.05    |           | 201.13    | 1.95     | 205.35 | 100.40 | 0.34   |
|         |         |          |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.46    | 2 Year   | 5.89   | 196.43    | 197.65    | 197.30    | 197.71    | 1.13     | 5.70   | 19.18  | 0.44   |
| Reach-1 | 5.46    | 5 Year   | 7.83   | 196.43    | 197.76    |           | 197.84    | 1.23     | 8.32   | 24.98  | 0.45   |
| Reach-1 | 5.46    | 10 Year  | 9.04   | 196.43    | 197.82    | 197.47    | 197.90    | 1.27     | 9.94   | 27.68  | 0.45   |
| Reach-1 | 5.46    | 25 Year  | 10.55  | 196.43    | 197.92    | 197.54    | 197.99    | 1.27     | 12.68  | 31.16  | 0.43   |
| Reach-1 | 5.46    | 50 Year  | 12.69  | 196.43    | 198.00    | 197.69    | 198.08    | 1.34     | 15.41  | 34.29  | 0.43   |
| Reach-1 | 5.46    | 100 Year | 15.60  | 196.43    | 198.09    | 197.80    | 198.18    | 1.45     | 18.55  | 37.56  | 0.45   |
| Reach-1 | 5.46    | Regional | 198.16 | 196.43    | 200.88    |           | 201.01    | 2.32     | 180.74 | 67.09  | 0.38   |
|         |         |          |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.45    | 2 Year   | 5.89   | 196.01    | 196.90    |           | 197.04    | 1.63     | 3.60   | 7.30   | 0.74   |
| Reach-1 | 5.45    | 5 Year   | 7.83   | 196.01    |           |           | 197.17    | 1.72     | 4.55   | 8.19   | 0.74   |
| Reach-1 | 5.45    | 10 Year  | 9.04   | 196.01    | 197.08    |           | 197.24    | 1.80     | 5.02   | 8.60   | 0.75   |
| Reach-1 | 5.45    | 25 Year  | 10.55  | 196.01    |           | 197.02    | 197.33    | 1.86     | 5.66   | 11.86  | 0.86   |
| Reach-1 | 5.45    | 50 Year  | 12.69  | 196.01    |           | 197.09    | 197.40    | 1.84     | 6.89   | 16.25  | 0.90   |
| Reach-1 | 5.45    | 100 Year | 15.60  | 196.01    | 197.29    | 197.26    | 197.49    | 1.96     | 7.97   | 16.71  | 0.90   |
| Reach-1 | 5.45    | Regional | 198.16 | 196.01    | 200.72    |           | 200.86    | 1.68     | 117.64 | 47.99  | 0.34   |
|         |         |          |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.44    | 2 Year   | 10.32  | 195.43    | 196.89    |           | 196.90    | 0.47     | 28.80  | 36.20  | 0.14   |
| Reach-1 | 5.44    | 5 Year   | 13.25  | 195.43    | 197.01    |           | 197.02    | 0.54     | 33.26  | 38.54  | 0.16   |
| Reach-1 | 5.44    | 10 Year  | 14.82  | 195.43    | 197.06    |           | 197.08    | 0.57     | 35.46  | 39.65  | 0.16   |
| Reach-1 | 5.44    | 25 Year  | 16.70  | 195.43    |           |           | 197.14    | 0.60     | 38.04  | 40.90  | 0.17   |
| Reach-1 | 5.44    | 50 Year  | 18.87  | 195.43    | 197.19    |           | 197.21    | 0.64     | 40.82  | 42.21  | 0.17   |

## **Proposed Conditions Hydraulic Analysis Summary**

#### April 2020 Update

Model: "Basin5\_Pr\_Opt4\_Apr2020.prj"

Plan: Proposed at Langstaff

Geometry: Basin 5 Proposed at Langstaff Steady Flow: 2019 Don River Flow Update

|         | New 2019 | 1.000    |        | Min Ch    | W.S.      |           | E.G.      | Velocity | Flow   | Тор    | Froude |
|---------|----------|----------|--------|-----------|-----------|-----------|-----------|----------|--------|--------|--------|
|         | River    |          | Flow   | Elevation | Elevation | Crit W.S. | Elevation | Channel  | Area   | Width  | #      |
| Reach   | Station  | Profile  | (m³/s) | (m)       | (m)       | (m)       | (m)       | (m/s)    | (m2)   | (m)    |        |
| Reach-1 | 5.44     | 100 Year | 21.08  | 195.43    | 197.26    |           | 197.28    | 0.68     | 43.56  | 45.90  | 0.18   |
| Reach-1 | 5.44     | Regional | 252.81 | 195.43    | 200.68    |           | 200.73    | 1.44     | 397.46 | 177.06 | 0.21   |
|         |          | - Ŭ      |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.435    | 2 Year   | 10.32  | 195.27    | 196.79    |           | 196.83    | 0.91     | 11.38  | 17.72  | 0.36   |
| Reach-1 | 5.435    | 5 Year   | 13.25  | 195.27    | 196.89    |           | 196.94    | 0.99     | 13.32  | 19.32  | 0.38   |
| Reach-1 | 5.435    | 10 Year  | 14.82  | 195.27    | 196.94    |           | 197.00    | 1.04     | 14.29  | 20.07  | 0.39   |
| Reach-1 | 5.435    | 25 Year  | 16.70  | 195.27    | 197.00    |           | 197.06    | 1.08     | 15.46  | 21.31  | 0.40   |
| Reach-1 | 5.435    | 50 Year  | 18.87  | 195.27    | 197.06    |           | 197.12    | 1.13     | 16.82  | 24.66  | 0.40   |
| Reach-1 | 5.435    | 100 Year | 21.08  | 195.27    | 197.11    |           | 197.19    | 1.18     | 18.29  | 27.86  | 0.41   |
| Reach-1 | 5.435    | Regional | 252.81 | 195.27    | 200.63    |           | 200.70    | 1.48     | 362.22 | 181.27 | 0.23   |
|         |          |          |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.43     | 2 Year   | 11.20  | 195.31    | 196.65    |           | 196.68    | 0.70     | 16.09  | 34.38  | 0.32   |
| Reach-1 | 5.43     | 5 Year   | 14.39  | 195.31    | 196.76    |           | 196.79    | 0.71     | 20.18  | 38.07  | 0.31   |
| Reach-1 | 5.43     | 10 Year  | 16.21  | 195.31    | 196.82    |           | 196.85    | 0.73     | 22.40  | 41.12  | 0.30   |
| Reach-1 | 5.43     | 25 Year  | 18.42  | 195.31    | 196.89    |           | 196.91    | 0.74     | 25.21  | 44.66  | 0.29   |
| Reach-1 | 5.43     | 50 Year  | 20.93  | 195.31    | 196.95    |           | 196.98    | 0.76     | 28.33  | 47.75  | 0.29   |
| Reach-1 | 5.43     | 100 Year | 23.42  | 195.31    | 197.02    |           | 197.05    | 0.78     | 31.43  | 50.36  | 0.28   |
| Reach-1 | 5.43     | Regional | 259.19 | 195.31    | 200.63    |           | 200.67    | 1.06     | 417.45 | 206.76 | 0.16   |
|         |          |          |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.425    | 2 Year   | 11.20  | 195.27    | 196.26    | 196.06    | 196.37    | 1.47     | 7.63   | 13.30  | 0.62   |
| Reach-1 | 5.425    | 5 Year   | 14.39  | 195.27    | 196.41    | 196.16    | 196.52    | 1.46     | 9.83   | 15.02  | 0.58   |
| Reach-1 | 5.425    | 10 Year  | 16.21  | 195.27    | 196.48    | 196.21    | 196.60    | 1.48     | 10.93  | 15.81  | 0.57   |
| Reach-1 | 5.425    | 25 Year  | 18.42  | 195.27    | 196.56    | 196.26    | 196.68    | 1.52     | 12.16  | 16.64  | 0.57   |
| Reach-1 | 5.425    | 50 Year  | 20.93  | 195.27    | 196.63    | 196.33    | 196.76    | 1.56     | 13.48  | 19.85  | 0.56   |
| Reach-1 | 5.425    | 100 Year | 23.42  | 195.27    | 196.70    | 196.38    | 196.83    | 1.61     | 14.81  | 21.87  | 0.56   |
| Reach-1 | 5.425    | Regional | 259.19 | 195.27    | 200.29    | 198.39    | 200.56    | 2.54     | 127.03 | 115.04 | 0.39   |
|         |          |          |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.405    |          | Bridge |           |           |           |           |          |        |        |        |
|         |          |          |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.40     | 2 Year   | 11.20  | 194.93    | 196.18    | 195.76    |           | 1.02     | 14.15  | 18.84  | 0.33   |
| Reach-1 | 5.40     | 5 Year   | 14.39  | 194.93    | 196.35    | 195.84    |           | 1.08     | 17.45  | 19.43  | 0.32   |
| Reach-1 | 5.40     | 10 Year  | 16.21  | 194.93    | 196.43    | 195.87    | 196.48    | 1.12     | 18.91  | 19.59  | 0.32   |
| Reach-1 | 5.40     | 25 Year  | 18.42  | 194.93    | 196.50    | 195.92    |           | 1.18     | 20.39  | 19.75  | 0.33   |
| Reach-1 | 5.40     | 50 Year  | 20.93  | 194.93    | 196.57    | 195.97    | 196.64    | 1.26     | 21.82  | 19.90  | 0.34   |
| Reach-1 | 5.40     | 100 Year | 23.42  | 194.93    | 196.64    | 196.01    | 196.71    | 1.33     | 23.08  | 19.99  | 0.35   |
| Reach-1 | 5.40     | Regional | 259.19 | 194.93    | 199.89    | 198.51    | 200.09    | 2.81     | 223.60 | 196.58 | 0.41   |
|         |          |          |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.38     | 2 Year   | 11.20  | 194.70    | 195.99    |           | 196.08    | 1.32     | 8.53   | 11.75  | 0.46   |
| Reach-1 | 5.38     | 5 Year   | 14.39  | 194.70    | 196.18    |           | 196.27    | 1.34     | 11.67  | 20.63  | 0.43   |
| Reach-1 | 5.38     | 10 Year  | 16.21  | 194.70    | 196.26    |           | 196.35    | 1.37     | 13.45  | 25.13  | 0.43   |

## **Proposed Conditions Hydraulic Analysis Summary**

#### April 2020 Update

Model: "Basin5\_Pr\_Opt4\_Apr2020.prj"

Plan: Proposed at Langstaff

Geometry: Basin 5 Proposed at Langstaff Steady Flow: 2019 Don River Flow Update

| Dasca on | New 201 | 7 1 10 W 3 |        | Min Ch    | W.S.             |           | E.G.             | Velocity | Flow            | Тор    | Froude |
|----------|---------|------------|--------|-----------|------------------|-----------|------------------|----------|-----------------|--------|--------|
|          | River   |            | Flow   | Elevation | Elevation        | Crit W.S. | Elevation        | Channel  | Area            | Width  | #      |
| Reach    | Station | Profile    | (m³/s) | (m)       | (m)              | (m)       | (m)              | (m/s)    | (m2)            | (m)    |        |
| Reach-1  | 5.38    | 25 Year    | 18.42  | 194.70    | 196.33           | (,        | 196.43           | 1.43     | 15.42           | 29.34  | 0.43   |
| Reach-1  | 5.38    | 50 Year    | 20.93  | 194.70    |                  |           | 196.51           | 1.50     | 17.56           | 33.29  | 0.44   |
| Reach-1  | 5.38    | 100 Year   | 23.42  | 194.70    |                  |           | 196.57           | 1.55     | 19.70           | 36.31  | 0.44   |
| Reach-1  | 5.38    | Regional   | 259.19 | 194.70    | 199.93           |           | 199.98           | 1.51     | 376.74          | 229.24 | 0.44   |
| Neach-1  | 5.56    | Regional   | 233.13 | 134.70    | 133.33           |           | 155.56           | 1.51     | 370.74          | 223.24 | 0.22   |
| Reach-1  | 5.37    | 2 Year     | 11.20  | 194.30    | 195.55           |           | 195.62           | 1.12     | 9.96            | 11.07  | 0.38   |
| Reach-1  | 5.37    | 5 Year     | 14.39  | 194.30    |                  |           | 195.82           | 1.15     | 12.55           | 15.30  | 0.40   |
| Reach-1  | 5.37    | 10 Year    | 16.21  | 194.30    | 195.82           |           | 195.90           | 1.18     | 13.74           | 16.99  | 0.42   |
| Reach-1  | 5.37    | 25 Year    | 18.42  | 194.30    | 195.89           |           | 195.97           | 1.24     | 14.92           | 20.48  | 0.43   |
| Reach-1  | 5.37    | 50 Year    | 20.93  | 194.30    | 195.95           |           | 196.03           | 1.32     | 16.21           | 25.25  | 0.45   |
| Reach-1  | 5.37    | 100 Year   | 23.42  | 194.30    | 195.99           |           | 196.09           | 1.39     | 17.55           | 29.38  | 0.45   |
| Reach-1  | 5.37    | Regional   | 259.19 | 194.30    |                  |           | 199.93           | 1.56     | 340.12          | 175.71 | 0.40   |
| reacii-1 | 3.37    | Regional   | 239.19 | 194.30    | 199.63           |           | 155.55           | 1.30     | 340.12          | 1/3./1 | 0.23   |
| Reach-1  | 5.36    | 2 Year     | 11.20  | 193.95    | 195.35           |           | 195.40           | 0.98     | 11.48           | 11.24  | 0.30   |
| Reach-1  | 5.36    | 5 Year     | 14.39  | 193.95    | 195.54           |           | 195.59           | 1.05     | 15.26           | 50.07  | 0.31   |
| Reach-1  | 5.36    | 10 Year    | 16.21  | 193.95    | 195.60           |           | 195.66           | 1.09     | 19.11           | 64.99  | 0.31   |
| Reach-1  | 5.36    | 25 Year    | 18.42  | 193.95    | 195.66           |           | 195.72           | 1.13     | 23.75           | 88.27  | 0.31   |
|          | 5.36    | 50 Year    | 20.93  | 193.95    | 195.00           |           | 195.72           |          |                 | 109.14 | 0.32   |
| Reach-1  |         |            |        |           |                  |           |                  | 1.15     | 29.97           |        |        |
| Reach-1  | 5.36    | 100 Year   | 23.42  | 193.95    | 195.79           |           | 195.84           | 1.14     | 36.87           | 110.89 | 0.31   |
| Reach-1  | 5.36    | Regional   | 259.19 | 193.95    | 199.86           |           | 199.88           | 0.78     | 547.97          | 134.95 | 0.11   |
| Reach-1  | 5.35    | 2 Year     | 11.20  | 193.75    | 195.02           |           | 195.12           | 1.42     | 8.50            | 12.85  | 0.47   |
| Reach-1  | 5.35    | 5 Year     | 14.39  | 193.75    | 195.21           |           | 195.31           | 1.44     | 11.52           | 25.84  | 0.49   |
| Reach-1  | 5.35    | 10 Year    | 16.21  | 193.75    | 195.30           |           | 195.40           | 1.43     | 14.95           | 45.52  | 0.45   |
| Reach-1  | 5.35    | 25 Year    | 18.42  | 193.75    | 195.40           |           | 195.48           | 1.43     | 19.42           | 47.95  | 0.43   |
| Reach-1  | 5.35    | 50 Year    | 20.93  | 193.75    | 195.49           |           | 195.57           | 1.34     | 24.25           | 50.45  | 0.43   |
|          |         | 100 Year   |        |           |                  |           |                  |          |                 |        |        |
| Reach-1  | 5.35    |            | 23.42  | 193.75    | 195.58<br>199.82 |           | 195.65<br>199.86 | 1.30     | 28.91<br>378.84 | 52.74  | 0.37   |
| Reach-1  | 5.35    | Regional   | 259.19 | 193.75    | 199.82           |           | 199.80           | 1.24     | 3/8.84          | 110.69 | 0.17   |
| Poach 1  | E 24    | 2 Voor     | 11 20  | 193.30    | 104 00           |           | 194.91           | 0.70     | 14.32           | 12.46  | 0.23   |
| Reach-1  | 5.34    | 2 Year     | 11.20  |           |                  |           |                  | 0.78     |                 | 12.46  |        |
| Reach-1  | 5.34    | 5 Year     | 14.39  | 193.30    |                  |           | 195.09           | 0.87     | 16.50           | 13.25  | 0.25   |
| Reach-1  | 5.34    | 10 Year    | 16.21  | 193.30    |                  |           | 195.18           | 0.92     | 17.62           | 13.72  | 0.26   |
| Reach-1  | 5.34    | 25 Year    | 18.42  | 193.30    |                  |           | 195.28           | 0.97     | 18.92           | 14.24  | 0.27   |
| Reach-1  | 5.34    | 50 Year    | 20.93  |           |                  |           | 195.38           | 1.03     | 20.32           | 14.84  | 0.28   |
| Reach-1  | 5.34    | 100 Year   | 23.42  | 193.30    |                  |           | 195.47           | 1.08     | 21.65           | 15.49  | 0.29   |
| Reach-1  | 5.34    | Regional   | 259.19 | 193.30    | 199.76           |           | 199.82           | 1.31     | 323.62          | 130.21 | 0.19   |
|          |         | 2.7        | 44.00  | 402.22    | 404.00           | 404.22    | 404.00           | 4.00     |                 | 0.70   |        |
| Reach-1  | 5.33    | 2 Year     | 11.20  |           |                  |           | 194.89           | 1.36     | 8.24            | 8.70   | 0.45   |
| Reach-1  | 5.33    | 5 Year     | 14.39  | 193.30    |                  | 194.44    | 195.06           | 1.50     | 9.62            | 9.31   | 0.47   |
| Reach-1  | 5.33    | 10 Year    | 16.21  | 193.30    | 195.02           | 194.51    | 195.15           | 1.57     | 10.32           | 9.60   | 0.48   |

## **Proposed Conditions Hydraulic Analysis Summary**

#### April 2020 Update

Model: "Basin5\_Pr\_Opt4\_Apr2020.prj"

Plan: Proposed at Langstaff

Geometry: Basin 5 Proposed at Langstaff Steady Flow: 2019 Don River Flow Update

|         |         |          |        | Min Ch    | W.S.      |           | E.G.      | Velocity | Flow   | Тор    | Froude |
|---------|---------|----------|--------|-----------|-----------|-----------|-----------|----------|--------|--------|--------|
|         | River   |          | Flow   | Elevation | Elevation | Crit W.S. | Elevation | Channel  | Area   | Width  | #      |
| Reach   | Station | Profile  | (m³/s) | (m)       | (m)       | (m)       | (m)       | (m/s)    | (m2)   | (m)    |        |
| Reach-1 | 5.33    | 25 Year  | 18.42  | 193.30    | 195.10    | 194.59    | 195.24    | 1.66     | 11.10  | 9.93   | 0.50   |
| Reach-1 | 5.33    | 50 Year  | 20.93  | 193.30    | 195.19    | 194.67    | 195.34    | 1.75     | 11.93  | 10.25  | 0.52   |
| Reach-1 | 5.33    | 100 Year | 23.42  | 193.30    | 195.26    | 194.75    | 195.43    | 1.85     | 12.69  | 10.55  | 0.54   |
| Reach-1 | 5.33    | Regional | 259.19 | 193.30    | 199.23    | 197.79    | 199.70    | 3.01     | 86.12  | 26.41  | 0.53   |
|         |         |          |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.325   |          | Bridge |           |           |           |           |          |        |        |        |
|         |         |          |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.32    | 2 Year   | 11.20  | 193.29    | 194.69    | 194.29    | 194.81    | 1.51     | 7.42   | 8.31   | 0.51   |
| Reach-1 | 5.32    | 5 Year   | 14.39  | 193.29    | 194.84    | 194.43    | 194.98    | 1.66     | 8.64   | 8.88   | 0.54   |
| Reach-1 | 5.32    | 10 Year  | 16.21  | 193.29    | 194.90    | 194.49    | 195.06    | 1.76     | 9.21   | 9.13   | 0.56   |
| Reach-1 | 5.32    | 25 Year  | 18.42  | 193.29    | 194.96    | 194.57    | 195.14    | 1.88     | 9.82   | 9.39   | 0.59   |
| Reach-1 | 5.32    | 50 Year  | 20.93  | 193.29    | 195.03    | 194.66    | 195.23    | 2.01     | 10.40  | 9.64   | 0.62   |
| Reach-1 | 5.32    | 100 Year | 23.42  | 193.29    | 195.07    | 194.74    | 195.31    | 2.16     | 10.86  | 9.82   | 0.66   |
| Reach-1 | 5.32    | Regional | 259.19 | 193.29    | 197.78    | 197.78    | 199.04    | 4.97     | 52.18  | 20.65  | 1.00   |
|         |         |          |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.30    | 2 Year   | 11.20  | 193.20    | 194.46    |           | 194.55    | 1.35     | 8.30   | 15.52  | 0.46   |
| Reach-1 | 5.30    | 5 Year   | 14.39  | 193.20    | 194.62    |           | 194.71    | 1.39     | 12.68  | 29.98  | 0.44   |
| Reach-1 | 5.30    | 10 Year  | 16.21  | 193.2     | 194.69    |           | 194.78    | 1.41     | 14.83  | 32.44  | 0.43   |
| Reach-1 | 5.30    | 25 Year  | 18.42  | 193.2     | 194.76    |           | 194.86    | 1.44     | 17.27  | 39.7   | 0.43   |
| Reach-1 | 5.30    | 50 Year  | 20.93  | 193.2     | 194.83    |           | 194.92    | 1.48     | 20.51  | 55.39  | 0.43   |
| Reach-1 | 5.30    | 100 Year | 23.42  | 193.2     | 194.88    |           | 194.98    | 1.51     | 23.62  | 57.5   | 0.43   |
| Reach-1 | 5.30    | Regional | 259.19 | 193.2     | 196.4     |           | 196.63    | 3.09     | 149.26 | 97.89  | 0.59   |
|         |         |          |        |           |           |           |           |          |        |        |        |
| Reach-1 | 5.29    | 2 Year   | 11.2   | 192.79    | 194       |           | 194.11    | 1.44     | 7.76   | 8.17   | 0.47   |
| Reach-1 | 5.29    | 5 Year   | 14.39  | 192.79    | 194.16    |           | 194.29    | 1.57     | 9.63   | 24.73  | 0.49   |
| Reach-1 | 5.29    | 10 Year  | 16.21  | 192.79    | 194.22    | 193.76    | 194.36    | 1.65     | 11.24  | 30.64  | 0.5    |
| Reach-1 | 5.29    | 25 Year  | 18.42  | 192.79    | 194.27    | 193.83    | 194.42    | 1.75     | 13.1   | 36.28  | 0.51   |
| Reach-1 | 5.29    | 50 Year  | 20.93  | 192.79    | 194.33    | 193.91    | 194.49    | 1.84     | 15.25  | 41.88  | 0.53   |
| Reach-1 | 5.29    | 100 Year | 23.42  | 192.79    | 194.38    | 193.99    | 194.55    | 1.91     | 17.5   | 47     | 0.54   |
| Reach-1 | 5.29    | Regional | 259.19 | 192.79    | 196.25    |           | 196.36    | 2.32     | 214.26 | 135.01 | 0.42   |

## York Region Langstaff Road EA

# **Black Creek**

## Langstaff Road Improvements EA

## **Existing Hydraulic Modelling Summary - Black Creek**

| Reach              | River Sta | Profile            | Q Total      | Min Ch El        | W.S. Elev        | Crit W.S. | E.G. Elev        | Vel Chnl     | Flow Area      | Top Width      | Froude # |
|--------------------|-----------|--------------------|--------------|------------------|------------------|-----------|------------------|--------------|----------------|----------------|----------|
|                    |           |                    | $(m^3/s)$    | (m)              | (m)              | (m)       | (m)              | (m/s)        | $(m^2)$        | (m)            |          |
| Reach-1            | 46.45     | 2-year             | 3.73         | 206.50           | 207.00           | 207.00    | 207.14           | 1.68         | 2.23           | 7.96           | 1.01     |
| Reach-1            | 46.45     | 5-year             | 4.83         | 206.50           | 207.06           | 207.06    | 207.22           | 1.74         | 2.77           | 8.86           | 1.00     |
| Reach-1            | 46.45     | 10-year            | 5.61         | 206.50           | 207.10           | 207.10    | 207.26           | 1.80         | 3.12           | 9.39           | 1.00     |
| Reach-1            | 46.45     | 25-year            | 6.57         | 206.50           | 207.14           | 207.14    | 207.32           | 1.86         | 3.53           |                | 1.00     |
| Reach-1            | 46.45     | 50-year            | 7.34         | 206.50           | 207.17           | 207.17    | 207.36           | 1.92         | 3.82           | 10.39          | 1.01     |
| Reach-1            | 46.45     | 100-year           | 7.79         | 206.50           |                  | 207.19    | 207.38           | 1.94         | 4.02           | 10.65          | 1.01     |
| Reach-1            | 46.45     | Regional           | 42.7         | 206.50           | 207.95           | 207.95    | 208.17           | 2.33         | 31.53          | 90.67          | 0.75     |
|                    |           |                    |              |                  |                  |           |                  |              |                |                |          |
| Reach-1            |           | 2-year             | 3.73         | 203.70           | 204.99           |           | 204.99           | 0.40         | 12.94          | 17.82          | 0.12     |
| Reach-1            |           | 5-year             | 4.83         | 203.70           |                  |           | 205.04           | 0.49         | 13.78          |                | 0.14     |
| Reach-1            |           | 10-year            | 5.61         | 203.70           | 205.06           |           | 205.07           | 0.55         | 14.30          |                | 0.16     |
| Reach-1            |           | 25-year            | 6.57         | 203.70           |                  |           | 205.12           | 0.62         | 15.16          |                | 0.17     |
| Reach-1            |           | 50-year            | 7.34         | 203.70           | 205.19           |           | 205.20           | 0.63         | 16.84          |                | 0.17     |
| Reach-1            |           | 100-year           | 7.79         | 203.70           | 205.28           |           | 205.29           | 0.61         | 18.81          | 22.02          | 0.16     |
| Reach-1            | 46.44     | Regional           | 42.7         | 203.70           | 207.45           |           | 207.46           | 0.58         | 171.57         | 129.43         | 0.10     |
| Pooch 1            | 16 10     | 2 1/22"            | 2 70         | 202.50           | 204.98           |           | 204.00           | 0.24         | 2F 40          | E0 04          | 0.07     |
| Reach-1            |           | 2-year<br>5-year   | 3.73         | 203.50           |                  |           | 204.98<br>205.02 | 0.24         | 35.42          |                | 0.07     |
| Reach-1<br>Reach-1 |           | 5-year<br>10-year  | 4.83<br>5.61 | 203.50<br>203.50 | 205.02<br>205.05 |           | 205.02           | 0.30<br>0.33 | 38.09<br>39.67 | 61.15<br>61.32 | 0.08     |
| Reach-1            |           | 25-year            | 6.57         | 203.50           | 205.05           |           | 205.05           | 0.33         | 42.32          | 61.61          | 0.09     |
| Reach-1            |           | 25-year<br>50-year | 7.34         | 203.50           |                  |           | 205.09           | 0.36         | 42.32          | 62.17          | 0.10     |
| Reach-1            |           | 100-year           | 7.34         | 203.50           |                  |           | 205.16           | 0.36         | 53.53          | 62.17          | 0.09     |
| Reach-1            |           | Regional           | 42.7         | 203.50           | 207.45           |           | 207.45           | 0.34         | 213.92         | 99.66          | 0.09     |
| ACCOUNT I          | 70.43     | regional           | 74.1         | 203.30           | 207.43           |           | 207.40           | 0.47         | 210.32         | 33.00          | 0.00     |
| Reach-1            | 46.42     | 2-year             | 3.73         | 203.30           | 204.97           |           | 204.98           | 0.23         | 23.15          | 27.52          | 0.06     |
| Reach-1            |           | 5-year             | 4.83         | 203.30           | 205.01           |           | 205.02           | 0.28         | 24.31          | 28.36          | 0.07     |
| Reach-1            |           | 10-year            | 5.61         | 203.30           |                  |           | 205.04           | 0.32         | 24.99          | 28.96          | 0.08     |
| Reach-1            |           | 25-year            | 6.57         | 203.30           | 205.08           |           | 205.09           | 0.37         | 26.19          | 29.98          | 0.09     |
| Reach-1            |           | 50-year            | 7.34         | 203.30           | 205.16           |           | 205.17           | 0.38         | 28.82          | 32.10          | 0.10     |
| Reach-1            | 46.42     | 100-year           | 7.79         | 203.30           | 205.26           |           | 205.27           | 0.38         | 32.02          | 34.50          | 0.09     |
| Reach-1            | 46.42     | Regional           | 42.7         | 203.30           | 207.44           |           | 207.45           | 0.58         | 174.05         | 130.97         | 0.09     |
| Reach-1            | 46.413    | 2-year             | 1.61         | 203.05           | 204.97           | 203.15    | 204.97           | 0.06         | 28.84          | 50.40          | 0.01     |
| Reach-1            | 46.413    |                    | 2.01         | 203.05           |                  | 203.17    |                  | 0.07         | 29.46          |                |          |
| Reach-1            |           | 10-year            | 2.24         |                  |                  | 203.18    |                  | 0.08         | 29.81          | 50.83          |          |
| Reach-1            |           | 25-year            | 2.66         | 203.05           |                  | 203.20    | 205.08           | 0.09         | 30.42          | 51.10          | 0.02     |
| Reach-1            |           | 50-year            | 3.59         | 203.05           | 205.16           | 203.23    | 205.16           | 0.11         | 31.68          | 51.65          | 0.02     |
| Reach-1            | 46.413    | 100-year           | 4.75         | 203.05           | 205.26           | 203.27    | 205.26           | 0.14         | 33.11          | 52.28          | 0.03     |
| Reach-1            | 46.413    | Regional           | 42.7         | 203.05           | 207.43           | 203.98    | 207.44           | 0.35         | 219.81         | 99.68          | 0.05     |
| Reach-1            | 46.4125   |                    | Inl Struct   |                  |                  |           |                  |              |                |                |          |
|                    |           |                    |              | _                |                  |           |                  |              |                |                |          |
| Reach-1            | 46.412    |                    | 1.61         | 203.05           |                  | 203.15    | 203.33           | 0.39         | 4.12           |                | 0.24     |
| Reach-1            | 46.412    | _                  | 2.01         | 203.05           |                  | 203.17    | 203.44           | 0.35         | 5.79           |                | 0.18     |
| Reach-1            |           | 10-year            | 2.24         | 203.05           |                  | 203.18    | 203.53           | 0.31         | 7.13           |                | 0.15     |
| Reach-1            |           | 25-year            | 2.66         | 203.05           |                  | 203.20    | 203.66           | 0.29         | 9.09           | 26.11          | 0.12     |
| Reach-1            |           | 50-year            | 3.59         | 203.05           |                  | 203.23    | 203.78           | 0.33         | 10.86          |                | 0.12     |
| Reach-1            |           | 100-year           | 4.75         | 203.05           |                  | 203.27    | 203.91           | 0.37         | 12.81          | 39.03          | 0.13     |
| Reach-1            | 46.412    | Regional           | 42.7         | 203.05           | 207.37           | 203.98    | 207.38           | 0.42         | 161.02         | 94.47          | 0.07     |
| Reach-1            | 46.4115   |                    | Culvert      | @ Credit         | View Road        |           |                  |              |                |                |          |
| Reach-1            | 46.411    | 2-year             | 1.61         | 202.96           | 203.31           | 203.07    | 203.31           | 0.31         | 5.20           | 16.93          | 0.17     |
| Reach-1            | 46.411    |                    | 2.01         | 202.96           |                  | 203.08    | 203.43           | 0.29         | 6.96           |                |          |
| Reach-1            |           | 10-year            | 2.24         | 202.96           |                  | 203.09    | 203.52           | 0.27         | 8.34           |                |          |
| Reach-1            |           | 25-year            | 2.66         | 202.96           |                  | 203.11    | 203.65           | 0.26         | 10.33          |                | 0.10     |
| Reach-1            |           | 50-year            | 3.59         | 202.96           |                  | 203.14    | 203.77           | 0.30         | 12.07          | 31.76          | 0.11     |
| Reach-1            |           | 100-year           | 4.75         | 202.96           |                  | 203.18    |                  | 0.34         | 13.99          |                | 0.11     |
| Reach-1            |           | Regional           | 42.7         | 202.96           |                  | 203.90    |                  | 0.41         | 179.93         |                | 0.07     |
|                    |           | - 3                |              |                  |                  |           |                  |              |                |                |          |

## **Existing Hydraulic Modelling Summary - Black Creek**

| Reach   | River Sta  | Profile  | Q Total   | Min Ch Fl   | W.S. Elev  | Crit W.S.  | E.G. Elev   | Vel Chnl  | Flow Area  | Top Width  | Froude #  |
|---|--|--|---|---|--|--|---|---|--|--|---|
| rtodon  | Triver Ota   | 1 101110   | (m <sup>3</sup> /s)   | (m)   | (m)  | (m)  | (m)   | (m/s)   | (m <sup>2</sup> )  | (m)  | 110000 11   |
|   |  |  | (11175)   | (111)   | (111)  | (111)  | (111)   | (111/5)   | (111 )   | (111)  |   |
| Reach-1   | 46 41  | 2-year   | 3.07  | 202.50  | 203.24   |  | 203.25  | 0.56  | 6.35   | 19.32  | 0.24  |
| Reach-1   |  | 5-year   | 4.07  | 202.50  | 203.27   |  | 203.39  | 0.57  | 9.33   | 25.52  | 0.22  |
| Reach-1   |  | 10-year  | 4.85  | 202.50  | 203.47   |  | 203.49  | 0.57  | 12.15  | 30.26  | 0.21  |
| Reach-1   |  | 25-year  | 5.93  | 202.50  | 203.62   |  | 203.63  | 0.53  | 19.20  | 76.27  | 0.18  |
| Reach-1   |  | 50-year  | 6.83  | 202.50  | 203.75   |  | 203.75  | 0.45  | 29.51  | 82.90  | 0.14  |
| Reach-1   |  | 100-year   | 7.62  | 202.50  | 203.88   |  | 203.89  | 0.37  | 41.32  | 89.89  | 0.11  |
| Reach-1   |  | Regional   | 47.8  |   | 206.91   |  | 206.91  | 0.20  | 393.09   | 131.61   | 0.03  |
| 11000111  | 10111  | rtogionai  | 11.10   | 202.00  | 200.01   |  | 200.01  | 0.20  | 000.00   | 101101   | 0.00  |
| Reach-1   | 46.402   | 2-vear   | 3.07  | 202.40  | 203.16   | 202.64   | 203.17  | 0.47  | 6.47   | 13.29  | 0.17  |
| Reach-1   | 46.402   |  | 4.07  | 202.40  | 203.30   | 202.68   | 203.31  | 0.53  | 7.65   | 14.40  | 0.18  |
| Reach-1   |  | 10-year  | 4.85  | 202.40  | 203.41   | 202.72   | 203.42  | 0.57  | 8.54   | 15.24  | 0.18  |
| Reach-1   |  | 25-year  | 5.93  | 202.40  | 203.56   | 202.77   | 203.57  | 0.60  | 9.82   | 16.45  | 0.18  |
| Reach-1   |  | 50-year  | 6.83  | 202.40  | 203.69   | 202.81   | 203.71  | 0.62  | 10.99  | 17.54  | 0.17  |
| Reach-1   |  | 100-year   | 7.62  | 202.40  | 203.84   | 202.84   | 203.86  | 0.62  | 12.23  | 18.71  | 0.17  |
| Reach-1   |  | Regional   | 47.8  | 202.40  | 206.90   | 203.88   | 206.90  | 0.36  | 329.94   | 241.16   | 0.05  |
|   |  |  |   |   |  |  |   |   |  |  |   |
| Reach-1   | 46.4015  |  | Culvert   | @ Highwa  | y 400, 3 Ce  | ll - 2.4 m W   | x 2.4 m H   | x 80 m L C  | oncrete Box  | c Culverts   |   |
|   |  |  |   |   |  |  |   |   |  |  |   |
| Reach-1   | 46.401   | 2-year   | 3.07  | 202.40  | 203.13   | 202.64   | 203.14  | 0.49  | 6.23   | 13.06  | 0.18  |
| Reach-1   | 46.401   |  | 4.07  | 202.40  | 203.27   | 202.68   | 203.28  | 0.55  | 7.36   | 14.13  | 0.19  |
| Reach-1   | 46.401   | 10-year  | 4.85  | 202.40  | 203.37   | 202.72   | 203.39  | 0.59  | 8.23   | 14.95  | 0.19  |
| Reach-1   |  | 25-year  | 5.93  | 202.40  | 203.52   | 202.77   | 203.54  | 0.62  | 9.49   | 16.13  | 0.19  |
| Reach-1   | 46.401   | 50-year  | 6.83  | 202.40  | 203.65   | 202.81   | 203.67  | 0.64  | 10.65  | 17.22  | 0.18  |
| Reach-1   | 46.401   | 100-year   | 7.62  | 202.40  | 203.80   | 202.84   | 203.82  | 0.64  | 11.90  | 18.40  | 0.17  |
| Reach-1   | 46.401   | Regional   | 47.8  | 202.40  | 206.55   | 203.88   | 206.56  | 0.57  | 233.89   | 250.91   | 0.09  |
|   |  |  |   |   |  |  |   |   |  |  |   |
| Reach-1   | 46.392   |  | 3.07  | 202.50  | 203.06   | 202.74   | 203.08  | 0.64  | 4.80   | 12.32  | 0.27  |
| Reach-1   | 46.392   | 5-V02r   | 4.07  | 202.50  | 203.20   | 202.78   | 203.22  | 0.68  | 5.98   | 13.08  | 0.26  |
|   |  |  |   |   |  |  |   |   |  |  |   |
| Reach-1   | 46.392   | 10-year  | 4.85  | 202.50  | 203.30   | 202.82   | 203.33  | 0.70  | 6.90   | 13.67  | 0.25  |
| Reach-1<br>Reach-1  | 46.392<br>46.392   | 10-year<br>25-year   | 4.85<br>5.93  | 202.50<br>202.50  | 203.30<br>203.46   | 202.82<br>202.87   | 203.33<br>203.49  | 0.70<br>0.72  | 6.90<br>8.24   | 13.67<br>14.52   | 0.25<br>0.23  |
| Reach-1<br>Reach-1<br>Reach-1   | 46.392<br>46.392<br>46.392   | 10-year<br>25-year<br>50-year  | 4.85<br>5.93<br>6.83  | 202.50<br>202.50<br>202.50  | 203.30<br>203.46<br>203.60   | 202.82<br>202.87<br>202.90   | 203.33<br>203.49<br>203.63  | 0.70<br>0.72<br>0.72  | 6.90<br>8.24<br>9.48   | 13.67<br>14.52<br>15.32  | 0.25<br>0.23<br>0.22  |
| Reach-1<br>Reach-1<br>Reach-1<br>Reach-1  | 46.392<br>46.392<br>46.392<br>46.392   | 10-year<br>25-year<br>50-year<br>100-year  | 4.85<br>5.93<br>6.83<br>7.62  | 202.50<br>202.50<br>202.50<br>202.50  | 203.30<br>203.46<br>203.60<br>203.76   | 202.82<br>202.87<br>202.90<br>202.93   | 203.33<br>203.49<br>203.63<br>203.78  | 0.70<br>0.72<br>0.72<br>0.70  | 6.90<br>8.24<br>9.48<br>10.82  | 13.67<br>14.52<br>15.32<br>16.17   | 0.25<br>0.23<br>0.22<br>0.20  |
| Reach-1<br>Reach-1<br>Reach-1   | 46.392<br>46.392<br>46.392<br>46.392   | 10-year<br>25-year<br>50-year  | 4.85<br>5.93<br>6.83<br>7.62  | 202.50<br>202.50<br>202.50<br>202.50  | 203.30<br>203.46<br>203.60<br>203.76   | 202.82<br>202.87<br>202.90   | 203.33<br>203.49<br>203.63<br>203.78  | 0.70<br>0.72<br>0.72<br>0.70  | 6.90<br>8.24<br>9.48<br>10.82  | 13.67<br>14.52<br>15.32  | 0.25<br>0.23<br>0.22<br>0.20<br>0.10  |
| Reach-1<br>Reach-1<br>Reach-1<br>Reach-1  | 46.392<br>46.392<br>46.392<br>46.392   | 10-year<br>25-year<br>50-year<br>100-year<br>Regional  | 4.85<br>5.93<br>6.83<br>7.62<br>47.8  | 202.50<br>202.50<br>202.50<br>202.50<br>202.50  | 203.30<br>203.46<br>203.60<br>203.76<br>206.54   | 202.82<br>202.87<br>202.90<br>202.93<br>203.96   | 203.33<br>203.49<br>203.63<br>203.78<br>206.55  | 0.70<br>0.72<br>0.72<br>0.70<br>0.64  | 6.90<br>8.24<br>9.48<br>10.82<br>140.52  | 13.67<br>14.52<br>15.32<br>16.17<br>166.93   | 0.25<br>0.23<br>0.22<br>0.20<br>0.10  |
| Reach-1<br>Reach-1<br>Reach-1<br>Reach-1  | 46.392<br>46.392<br>46.392<br>46.392   | 10-year<br>25-year<br>50-year<br>100-year<br>Regional  | 4.85<br>5.93<br>6.83<br>7.62  | 202.50<br>202.50<br>202.50<br>202.50<br>202.50  | 203.30<br>203.46<br>203.60<br>203.76<br>206.54   | 202.82<br>202.87<br>202.90<br>202.93<br>203.96   | 203.33<br>203.49<br>203.63<br>203.78<br>206.55  | 0.70<br>0.72<br>0.72<br>0.70<br>0.64  | 6.90<br>8.24<br>9.48<br>10.82<br>140.52  | 13.67<br>14.52<br>15.32<br>16.17<br>166.93   | 0.25<br>0.23<br>0.22<br>0.20<br>0.10  |
| Reach-1<br>Reach-1<br>Reach-1<br>Reach-1<br>Reach-1   | 46.392<br>46.392<br>46.392<br>46.392<br>46.391   | 10-year<br>25-year<br>50-year<br>100-year<br>Regional  | 4.85<br>5.93<br>6.83<br>7.62<br>47.8<br><b>Mult Open</b>  | 202.50<br>202.50<br>202.50<br>202.50<br>202.50<br>ing @Lang   | 203.30<br>203.46<br>203.60<br>203.76<br>206.54<br>gstaff Road  | 202.82<br>202.87<br>202.90<br>202.93<br>203.96   | 203.33<br>203.49<br>203.63<br>203.78<br>206.55  | 0.70<br>0.72<br>0.72<br>0.70<br>0.64  | 6.90<br>8.24<br>9.48<br>10.82<br>140.52  | 13.67<br>14.52<br>15.32<br>16.17<br>166.93   | 0.25<br>0.23<br>0.22<br>0.20<br>0.10  |
| Reach-1<br>Reach-1<br>Reach-1<br>Reach-1<br>Reach-1<br>Reach-1  | 46.392<br>46.392<br>46.392<br>46.392<br>46.391<br>46.391   | 10-year<br>25-year<br>50-year<br>100-year<br>Regional<br>2-year  | 4.85<br>5.93<br>6.83<br>7.62<br>47.8<br><b>Mult Open</b><br>3.07  | 202.50<br>202.50<br>202.50<br>202.50<br>202.50<br>202.40  | 203.30<br>203.46<br>203.60<br>203.76<br>206.54<br>205.54   | 202.82<br>202.87<br>202.90<br>202.93<br>203.96<br>I - 3 Cell - 2   | 203.33<br>203.49<br>203.63<br>203.78<br>206.55<br>2.4 m W x 2   | 0.70<br>0.72<br>0.72<br>0.70<br>0.64<br>2.4 m H x 6   | 6.90<br>8.24<br>9.48<br>10.82<br>140.52<br><b>0 m L Con</b>  | 13.67<br>14.52<br>15.32<br>16.17<br>166.93<br>crete Box (  | 0.25<br>0.23<br>0.22<br>0.20<br>0.10<br>Culverts  |
| Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1   | 46.392<br>46.392<br>46.392<br>46.392<br>46.391<br>46.391   | 10-year<br>25-year<br>50-year<br>100-year<br>Regional<br>2-year<br>5-year  | 4.85<br>5.93<br>6.83<br>7.62<br>47.8<br><b>Mult Open</b><br>3.07<br>4.07  | 202.50<br>202.50<br>202.50<br>202.50<br>202.50<br>202.40<br>202.40  | 203.30<br>203.46<br>203.60<br>203.76<br>206.54<br>203.01<br>203.01   | 202.82<br>202.87<br>202.90<br>202.93<br>203.96<br>I - 3 Cell - 2<br>202.63<br>202.68   | 203.33<br>203.49<br>203.63<br>203.78<br>206.55<br>2.4 m W x 2<br>203.03<br>203.17   | 0.70<br>0.72<br>0.72<br>0.70<br>0.64<br>2.4 m H x 6<br>0.58<br>0.64   | 6.90<br>8.24<br>9.48<br>10.82<br>140.52<br>0 m L Cond<br>5.26<br>6.41  | 13.67<br>14.52<br>15.32<br>16.17<br>166.93<br>crete Box (<br>12.06<br>12.80  | 0.25<br>0.23<br>0.22<br>0.20<br>0.10<br>Culverts  |
| Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1   | 46.392<br>46.392<br>46.392<br>46.392<br>46.391<br>46.391<br>46.391<br>46.391   | 10-year<br>25-year<br>50-year<br>100-year<br>Regional<br>2-year<br>5-year<br>10-year   | 4.85<br>5.93<br>6.83<br>7.62<br>47.8<br><b>Mult Open</b><br>3.07<br>4.07<br>4.85  | 202.50<br>202.50<br>202.50<br>202.50<br>202.50<br>202.40<br>202.40<br>202.40  | 203.30<br>203.46<br>203.60<br>203.76<br>206.54<br>203.01<br>203.01<br>203.15<br>203.25   | 202.82<br>202.87<br>202.90<br>202.93<br>203.96<br>I - 3 Cell - 2<br>202.63<br>202.68<br>202.72   | 203.33<br>203.49<br>203.63<br>203.78<br>206.55<br>2.4 m W x 2<br>203.03<br>203.17<br>203.27   | 0.70<br>0.72<br>0.72<br>0.70<br>0.64<br>2.4 m H x 6<br>0.58<br>0.64<br>0.66   | 6.90<br>8.24<br>9.48<br>10.82<br>140.52<br><b>0 m L Cono</b><br>5.26<br>6.41<br>7.33   | 13.67<br>14.52<br>15.32<br>16.17<br>166.93<br><b>crete Box (</b><br>12.06<br>12.80<br>13.39  | 0.25<br>0.23<br>0.22<br>0.20<br>0.10<br>Culverts<br>0.24<br>0.23<br>0.23  |
| Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1   | 46.392<br>46.392<br>46.392<br>46.392<br>46.391<br>46.391<br>46.391<br>46.391   | 10-year<br>25-year<br>50-year<br>100-year<br>Regional<br>2-year<br>5-year<br>10-year<br>25-year  | 4.85<br>5.93<br>6.83<br>7.62<br>47.8<br><b>Mult Open</b><br>3.07<br>4.07<br>4.85<br>5.93  | 202.50<br>202.50<br>202.50<br>202.50<br>202.50<br>ing @Lang<br>202.40<br>202.40<br>202.40<br>202.40   | 203.30<br>203.46<br>203.60<br>203.76<br>206.54<br><b>gstaff Road</b><br>203.01<br>203.15<br>203.25<br>203.41   | 202.82<br>202.87<br>202.90<br>202.93<br>203.96<br>I - 3 Cell - 2<br>202.63<br>202.68<br>202.72<br>202.76   | 203.33<br>203.49<br>203.63<br>203.78<br>206.55<br>2.4 m W x 2<br>203.03<br>203.17<br>203.27<br>203.43   | 0.70<br>0.72<br>0.72<br>0.70<br>0.64<br>2.4 m H x 6<br>0.58<br>0.64<br>0.66<br>0.68   | 6.90<br>8.24<br>9.48<br>10.82<br>140.52<br><b>0 m L Con</b><br>5.26<br>6.41<br>7.33<br>8.67  | 13.67<br>14.52<br>15.32<br>16.17<br>166.93<br><b>crete Box (</b><br>12.80<br>13.39<br>14.25  | 0.25<br>0.23<br>0.22<br>0.20<br>0.10<br>Culverts<br>0.24<br>0.23<br>0.23<br>0.22  |
| Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1   | 46.392<br>46.392<br>46.392<br>46.392<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391   | 10-year<br>25-year<br>50-year<br>100-year<br>Regional<br>2-year<br>5-year<br>10-year<br>25-year<br>50-year   | 4.85<br>5.93<br>6.83<br>7.62<br>47.8<br>Mult Open<br>3.07<br>4.07<br>4.85<br>5.93<br>6.83   | 202.50<br>202.50<br>202.50<br>202.50<br>202.50<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40  | 203.30<br>203.46<br>203.60<br>203.76<br>206.54<br>203.01<br>203.15<br>203.25<br>203.41<br>203.55   | 202.82<br>202.87<br>202.90<br>202.93<br>203.96<br>I - 3 Cell - 2<br>202.63<br>202.68<br>202.72<br>202.76<br>202.80   | 203.33<br>203.49<br>203.63<br>203.78<br>206.55<br>2.4 m W x 2<br>203.03<br>203.17<br>203.27<br>203.43<br>203.58   | 0.70<br>0.72<br>0.72<br>0.70<br>0.64<br>2.4 m H x 6<br>0.58<br>0.64<br>0.66<br>0.68   | 6.90<br>8.24<br>9.48<br>10.82<br>140.52<br><b>0 m L Con</b><br>5.26<br>6.41<br>7.33<br>8.67<br>9.93  | 13.67<br>14.52<br>15.32<br>16.17<br>166.93<br>crete Box (<br>12.06<br>12.80<br>13.39<br>14.25<br>15.05   | 0.25<br>0.23<br>0.22<br>0.20<br>0.10<br>Culverts<br>0.24<br>0.23<br>0.23<br>0.22<br>0.20  |
| Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1   | 46.392<br>46.392<br>46.392<br>46.392<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391   | 10-year<br>25-year<br>50-year<br>100-year<br>Regional<br>2-year<br>5-year<br>10-year<br>25-year<br>100-year  | 4.85<br>5.93<br>6.83<br>7.62<br>47.8<br>Mult Open<br>3.07<br>4.07<br>4.85<br>5.93<br>6.83<br>7.62   | 202.50<br>202.50<br>202.50<br>202.50<br>202.50<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40  | 203.30<br>203.46<br>203.60<br>203.76<br>206.54<br>203.01<br>203.15<br>203.25<br>203.41<br>203.55<br>203.71   | 202.82<br>202.87<br>202.90<br>202.93<br>203.96<br>I - 3 Cell - 2<br>202.63<br>202.68<br>202.72<br>202.76<br>202.80<br>202.83   | 203.33<br>203.49<br>203.63<br>203.78<br>206.55<br>2.4 m W x 2<br>203.03<br>203.17<br>203.27<br>203.43<br>203.58<br>203.74   | 0.70<br>0.72<br>0.72<br>0.70<br>0.64<br>2.4 m H x 6<br>0.58<br>0.64<br>0.66<br>0.68<br>0.69   | 6.90<br>8.24<br>9.48<br>10.82<br>140.52<br>0 m L Cond<br>5.26<br>6.41<br>7.33<br>8.67<br>9.93<br>11.30   | 13.67<br>14.52<br>15.32<br>16.17<br>166.93<br>crete Box (<br>12.06<br>12.80<br>13.39<br>14.25<br>15.05<br>15.93  | 0.25<br>0.23<br>0.22<br>0.20<br>0.10<br>Culverts<br>0.24<br>0.23<br>0.23<br>0.22<br>0.20<br>0.19  |
| Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1   | 46.392<br>46.392<br>46.392<br>46.392<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391   | 10-year<br>25-year<br>50-year<br>100-year<br>Regional<br>2-year<br>5-year<br>10-year<br>25-year<br>50-year   | 4.85<br>5.93<br>6.83<br>7.62<br>47.8<br>Mult Open<br>3.07<br>4.07<br>4.85<br>5.93<br>6.83   | 202.50<br>202.50<br>202.50<br>202.50<br>202.50<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40  | 203.30<br>203.46<br>203.60<br>203.76<br>206.54<br>203.01<br>203.15<br>203.25<br>203.41<br>203.55   | 202.82<br>202.87<br>202.90<br>202.93<br>203.96<br>I - 3 Cell - 2<br>202.63<br>202.68<br>202.72<br>202.76<br>202.80   | 203.33<br>203.49<br>203.63<br>203.78<br>206.55<br>2.4 m W x 2<br>203.03<br>203.17<br>203.27<br>203.43<br>203.58   | 0.70<br>0.72<br>0.72<br>0.70<br>0.64<br>2.4 m H x 6<br>0.58<br>0.64<br>0.66<br>0.68   | 6.90<br>8.24<br>9.48<br>10.82<br>140.52<br><b>0 m L Con</b><br>5.26<br>6.41<br>7.33<br>8.67<br>9.93  | 13.67<br>14.52<br>15.32<br>16.17<br>166.93<br>crete Box (<br>12.06<br>12.80<br>13.39<br>14.25<br>15.05   | 0.25<br>0.23<br>0.22<br>0.20<br>0.10<br>Culverts<br>0.24<br>0.23<br>0.23<br>0.22<br>0.20  |
| Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1   | 46.392<br>46.392<br>46.392<br>46.392<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391   | 10-year<br>25-year<br>50-year<br>100-year<br>Regional<br>2-year<br>5-year<br>10-year<br>25-year<br>100-year<br>Regional  | 4.85<br>5.93<br>6.83<br>7.62<br>47.8<br>Mult Open<br>3.07<br>4.07<br>4.85<br>5.93<br>6.83<br>7.62<br>47.8   | 202.50<br>202.50<br>202.50<br>202.50<br>202.50<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40  | 203.30<br>203.46<br>203.60<br>203.76<br>206.54<br>203.01<br>203.15<br>203.25<br>203.41<br>203.55<br>203.71<br>206.45   | 202.82<br>202.90<br>202.93<br>203.96<br>I - 3 Cell - 2<br>202.63<br>202.68<br>202.72<br>202.76<br>202.80<br>202.83<br>203.87   | 203.33<br>203.49<br>203.63<br>203.78<br>206.55<br>2.4 m W x 2<br>203.03<br>203.17<br>203.27<br>203.43<br>203.58<br>203.74<br>206.46   | 0.70<br>0.72<br>0.72<br>0.70<br>0.64<br>2.4 m H x 6<br>0.58<br>0.64<br>0.66<br>0.68<br>0.69<br>0.67<br>0.45   | 6.90<br>8.24<br>9.48<br>10.82<br>140.52<br><b>0 m L Con</b><br>5.26<br>6.41<br>7.33<br>8.67<br>9.93<br>11.30<br>130.23   | 13.67<br>14.52<br>15.32<br>16.17<br>166.93<br>2 rete Box (<br>12.06<br>12.80<br>13.39<br>14.25<br>15.05<br>15.93<br>166.34                                   | 0.25 0.23 0.22 0.20 0.10  Culverts  0.24 0.23 0.23 0.23 0.29 0.10 0.10  |
| Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1   | 46.392<br>46.392<br>46.392<br>46.392<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391   | 10-year 25-year 50-year 100-year Regional  2-year 5-year 10-year 25-year 50-year 100-year Regional  2-year   | 4.85<br>5.93<br>6.83<br>7.62<br>47.8<br>Mult Open<br>3.07<br>4.07<br>4.85<br>5.93<br>6.83<br>7.62<br>47.8   | 202.50<br>202.50<br>202.50<br>202.50<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40  | 203.30<br>203.46<br>203.60<br>203.76<br>206.54<br>203.01<br>203.15<br>203.25<br>203.41<br>203.55<br>203.71<br>206.45   | 202.82<br>202.87<br>202.90<br>202.93<br>203.96<br>I - 3 Cell - 2<br>202.63<br>202.68<br>202.72<br>202.76<br>202.80<br>202.83<br>203.87   | 203.33<br>203.49<br>203.63<br>203.78<br>206.55<br>2.4 m W x 2<br>203.03<br>203.17<br>203.27<br>203.43<br>203.58<br>203.74<br>206.46   | 0.70<br>0.72<br>0.72<br>0.70<br>0.64<br>2.4 m H x 6<br>0.58<br>0.64<br>0.66<br>0.68<br>0.69<br>0.67<br>0.45   | 6.90<br>8.24<br>9.48<br>10.82<br>140.52<br><b>0 m L Con</b><br>5.26<br>6.41<br>7.33<br>8.67<br>9.93<br>11.30<br>130.23   | 13.67<br>14.52<br>15.32<br>16.17<br>166.93<br>12.06<br>12.80<br>13.39<br>14.25<br>15.05<br>15.93<br>166.34   | 0.25 0.23 0.22 0.20 0.10  Culverts  0.24 0.23 0.23 0.22 0.20 0.19 0.07  |
| Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1   | 46.392<br>46.392<br>46.392<br>46.392<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391   | 10-year 25-year 50-year 100-year Regional 2-year 5-year 10-year 25-year 100-year Regional Regional 2-year 5-year   | 4.85<br>5.93<br>6.83<br>7.62<br>47.8<br>Mult Open<br>3.07<br>4.85<br>5.93<br>6.83<br>7.62<br>47.8<br>3.07<br>4.07   | 202.50<br>202.50<br>202.50<br>202.50<br>202.50<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40  | 203.30<br>203.46<br>203.60<br>203.76<br>206.54<br>203.01<br>203.15<br>203.25<br>203.41<br>203.55<br>203.71<br>206.45<br>202.96<br>203.10   | 202.82<br>202.87<br>202.90<br>202.93<br>203.96<br>I - 3 Cell - 2<br>202.63<br>202.68<br>202.72<br>202.76<br>202.80<br>202.83<br>203.87<br>202.62<br>202.62   | 203.33<br>203.49<br>203.63<br>203.78<br>206.55<br>2.4 m W x 2<br>203.03<br>203.17<br>203.27<br>203.43<br>203.58<br>203.74<br>206.46   | 0.70<br>0.72<br>0.72<br>0.70<br>0.64<br>2.4 m H x 6<br>0.58<br>0.64<br>0.66<br>0.68<br>0.69<br>0.67<br>0.45   | 6.90<br>8.24<br>9.48<br>10.82<br>140.52<br>0 m L Cond<br>5.26<br>6.41<br>7.33<br>8.67<br>9.93<br>11.30<br>130.23   | 13.67<br>14.52<br>15.32<br>16.17<br>166.93<br>12.06<br>12.80<br>13.39<br>14.25<br>15.05<br>15.93<br>166.34   | 0.25 0.23 0.22 0.20 0.10  Culverts  0.24 0.23 0.22 0.20 0.19 0.07  0.24 0.21  |
| Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1   | 46.392<br>46.392<br>46.392<br>46.392<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391   | 10-year 25-year 50-year 100-year Regional 2-year 5-year 10-year 25-year 100-year Regional 2-year 5-year 100-year 100-year  | 4.85<br>5.93<br>6.83<br>7.62<br>47.8<br>Mult Open<br>3.07<br>4.07<br>4.85<br>5.93<br>6.83<br>7.62<br>47.8<br>3.07<br>4.07<br>4.85                                 | 202.50<br>202.50<br>202.50<br>202.50<br>202.50<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40  | 203.30<br>203.46<br>203.60<br>203.76<br>206.54<br>203.01<br>203.15<br>203.25<br>203.41<br>203.55<br>203.71<br>206.45<br>202.96<br>203.10<br>203.22   | 202.82<br>202.87<br>202.90<br>202.93<br>203.96<br>I - 3 Cell - 2<br>202.63<br>202.68<br>202.72<br>202.76<br>202.80<br>202.83<br>203.87<br>202.62<br>202.62   | 203.33<br>203.49<br>203.63<br>203.78<br>206.55<br>2.4 m W x 2<br>203.03<br>203.17<br>203.27<br>203.43<br>203.58<br>203.74<br>206.46<br>202.97<br>203.12<br>203.23   | 0.70<br>0.72<br>0.72<br>0.70<br>0.64<br>2.4 m H x 6<br>0.58<br>0.64<br>0.66<br>0.68<br>0.69<br>0.67<br>0.45<br>0.51<br>0.51   | 6.90<br>8.24<br>9.48<br>10.82<br>140.52<br>0 m L Cond<br>5.26<br>6.41<br>7.33<br>8.67<br>9.93<br>11.30<br>130.23<br>6.03<br>8.04<br>9.80   | 13.67<br>14.52<br>15.32<br>16.17<br>166.93<br>12.06<br>12.80<br>13.39<br>14.25<br>15.05<br>15.93<br>166.34<br>12.71<br>14.47                                 | 0.25 0.23 0.22 0.20 0.10  Culverts  0.24 0.23 0.22 0.20 0.19 0.07  0.24 0.21 0.19   |
| Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1 Reach-1   | 46.392<br>46.392<br>46.392<br>46.392<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.39<br>46.39<br>46.39  | 10-year 25-year 50-year 100-year Regional 2-year 5-year 10-year 25-year 100-year Regional 2-year 50-year 100-year 100-year 25-year   | 4.85<br>5.93<br>6.83<br>7.62<br>47.8<br>Mult Open<br>3.07<br>4.07<br>4.85<br>5.93<br>6.83<br>7.62<br>47.8<br>3.07<br>4.07<br>4.85<br>5.93                         | 202.50<br>202.50<br>202.50<br>202.50<br>202.50<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40  | 203.30<br>203.46<br>203.60<br>203.76<br>206.54<br>203.01<br>203.15<br>203.25<br>203.41<br>203.55<br>203.71<br>206.45<br>202.96<br>203.10<br>203.22<br>203.39   | 202.82<br>202.87<br>202.90<br>202.93<br>203.96<br>I - 3 Cell - 2<br>202.63<br>202.68<br>202.72<br>202.76<br>202.80<br>202.83<br>203.87<br>202.62<br>202.67<br>202.70<br>202.74                                 | 203.33<br>203.49<br>203.63<br>203.78<br>206.55<br>2.4 m W x 2<br>203.03<br>203.17<br>203.27<br>203.43<br>203.58<br>203.74<br>206.46<br>202.97<br>203.12<br>203.23<br>203.40   | 0.70<br>0.72<br>0.72<br>0.70<br>0.64<br>2.4 m H x 6<br>0.58<br>0.64<br>0.68<br>0.69<br>0.67<br>0.45<br>0.51<br>0.51<br>0.50   | 6.90<br>8.24<br>9.48<br>10.82<br>140.52<br>0 m L Cond<br>5.26<br>6.41<br>7.33<br>8.67<br>9.93<br>11.30<br>130.23<br>6.03<br>8.04<br>9.80<br>12.66  | 13.67<br>14.52<br>15.32<br>16.17<br>166.93<br>12.06<br>12.80<br>13.39<br>14.25<br>15.05<br>15.93<br>166.34<br>12.71<br>14.47<br>16.09<br>18.40               | 0.25 0.23 0.22 0.20 0.10  Culverts  0.24 0.23 0.22 0.20 0.19 0.07  0.24 0.21 0.19 0.17  |
| Reach-1   | 46.392<br>46.392<br>46.392<br>46.392<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391   | 10-year 25-year 50-year 100-year Regional 2-year 5-year 10-year 25-year 100-year Regional 2-year 100-year 100-year 100-year 25-year 10-year 5-year 10-year   | 4.85<br>5.93<br>6.83<br>7.62<br>47.8<br>Mult Open<br>3.07<br>4.07<br>4.85<br>5.93<br>6.83<br>7.62<br>47.8<br>3.07<br>4.07<br>4.85<br>5.93<br>6.83                 | 202.50<br>202.50<br>202.50<br>202.50<br>202.50<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40  | 203.30<br>203.46<br>203.60<br>203.76<br>206.54<br>203.01<br>203.15<br>203.25<br>203.41<br>203.55<br>203.71<br>206.45<br>202.96<br>203.10<br>203.22<br>203.39<br>203.54   | 202.82<br>202.90<br>202.93<br>203.96<br>I - 3 Cell - 2<br>202.63<br>202.68<br>202.72<br>202.76<br>202.80<br>202.80<br>202.80<br>202.80<br>202.80<br>202.72<br>202.74<br>202.77                                 | 203.33<br>203.49<br>203.63<br>203.78<br>206.55<br>2.4 m W x 2<br>203.03<br>203.17<br>203.27<br>203.43<br>203.58<br>203.74<br>206.46<br>202.97<br>203.12<br>203.23<br>203.40<br>203.55   | 0.70<br>0.72<br>0.72<br>0.70<br>0.64<br>2.4 m H x 6<br>0.58<br>0.64<br>0.66<br>0.69<br>0.67<br>0.45<br>0.51<br>0.51<br>0.50<br>0.49   | 6.90<br>8.24<br>9.48<br>10.82<br>140.52<br>0 m L Cond<br>5.26<br>6.41<br>7.33<br>8.67<br>9.93<br>11.30<br>130.23<br>6.03<br>8.04<br>9.80<br>12.66<br>15.63   | 13.67<br>14.52<br>15.32<br>16.17<br>166.93<br>12.06<br>12.80<br>13.39<br>14.25<br>15.05<br>15.93<br>166.34<br>12.71<br>14.47<br>16.09<br>18.40<br>20.54      | 0.25 0.23 0.22 0.20 0.10  Culverts  0.24 0.23 0.23 0.29 0.19 0.07  0.24 0.21 0.19 0.17 0.15   |
| Reach-1   | 46.392<br>46.392<br>46.392<br>46.392<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.393<br>46.39<br>46.39   | 10-year 25-year 100-year Regional 2-year 50-year 10-year 25-year 100-year Regional 2-year 100-year 100-year 2-year 5-year 10-year 25-year 10-year 10-year  | 4.85<br>5.93<br>6.83<br>7.62<br>47.8<br>Mult Open<br>3.07<br>4.07<br>4.85<br>5.93<br>6.83<br>7.62<br>47.8<br>3.07<br>4.07<br>4.85<br>5.93<br>6.83<br>7.62         | 202.50<br>202.50<br>202.50<br>202.50<br>202.50<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40  | 203.30<br>203.46<br>203.60<br>203.76<br>206.54<br>206.54<br>203.01<br>203.15<br>203.25<br>203.41<br>203.55<br>203.71<br>206.45<br>203.22<br>203.39<br>203.54<br>203.70   | 202.82<br>202.90<br>202.93<br>203.96<br>I - 3 Cell - 2<br>202.63<br>202.68<br>202.72<br>202.76<br>202.80<br>202.83<br>203.87<br>202.62<br>202.67<br>202.70<br>202.74<br>202.77<br>202.80                       | 203.33<br>203.49<br>203.63<br>203.78<br>206.55<br>2.4 m W x 2<br>203.03<br>203.17<br>203.27<br>203.43<br>203.58<br>203.74<br>206.46<br>202.97<br>203.12<br>203.23<br>203.40<br>203.55<br>203.71   | 0.70<br>0.72<br>0.72<br>0.70<br>0.64<br>2.4 m H x 6<br>0.58<br>0.64<br>0.66<br>0.68<br>0.69<br>0.67<br>0.45<br>0.51<br>0.51<br>0.50<br>0.49<br>0.46   | 6.90<br>8.24<br>9.48<br>10.82<br>140.52<br>0 m L Conc<br>5.26<br>6.41<br>7.33<br>8.67<br>9.93<br>11.30<br>130.23<br>6.03<br>8.04<br>9.80<br>12.66<br>15.63<br>19.21  | 13.67 14.52 15.32 16.17 166.93  crete Box (  12.06 12.80 13.39 14.25 15.05 15.93 166.34  12.71 14.47 16.09 18.40 20.54 22.85                                 | 0.25 0.23 0.22 0.20 0.10  Culverts  0.24 0.23 0.23 0.22 0.20 0.19 0.07  0.24 0.21 0.19 0.17 0.15 0.13                                     |
| Reach-1   | 46.392<br>46.392<br>46.392<br>46.392<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.393<br>46.39<br>46.39   | 10-year 25-year 50-year 100-year Regional 2-year 5-year 10-year 25-year 100-year Regional 2-year 100-year 100-year 100-year 25-year 10-year 5-year 10-year   | 4.85<br>5.93<br>6.83<br>7.62<br>47.8<br>Mult Open<br>3.07<br>4.07<br>4.85<br>5.93<br>6.83<br>7.62<br>47.8<br>3.07<br>4.07<br>4.85<br>5.93<br>6.83                 | 202.50<br>202.50<br>202.50<br>202.50<br>202.50<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40  | 203.30<br>203.46<br>203.60<br>203.76<br>206.54<br>206.54<br>203.01<br>203.15<br>203.25<br>203.41<br>203.55<br>203.71<br>206.45<br>203.22<br>203.39<br>203.54<br>203.70   | 202.82<br>202.90<br>202.93<br>203.96<br>I - 3 Cell - 2<br>202.63<br>202.68<br>202.72<br>202.76<br>202.80<br>202.80<br>202.80<br>202.80<br>202.80<br>202.72<br>202.74<br>202.77                                 | 203.33<br>203.49<br>203.63<br>203.78<br>206.55<br>2.4 m W x 2<br>203.03<br>203.17<br>203.27<br>203.43<br>203.58<br>203.74<br>206.46<br>202.97<br>203.12<br>203.23<br>203.40<br>203.55   | 0.70<br>0.72<br>0.72<br>0.70<br>0.64<br>2.4 m H x 6<br>0.58<br>0.64<br>0.66<br>0.69<br>0.67<br>0.45<br>0.51<br>0.51<br>0.50<br>0.49   | 6.90<br>8.24<br>9.48<br>10.82<br>140.52<br>0 m L Cond<br>5.26<br>6.41<br>7.33<br>8.67<br>9.93<br>11.30<br>130.23<br>6.03<br>8.04<br>9.80<br>12.66<br>15.63   | 13.67<br>14.52<br>15.32<br>16.17<br>166.93<br>12.06<br>12.80<br>13.39<br>14.25<br>15.05<br>15.93<br>166.34<br>12.71<br>14.47<br>16.09<br>18.40<br>20.54      | 0.25 0.23 0.22 0.20 0.10  Culverts  0.24 0.23 0.23 0.22 0.20 0.19 0.07  0.24 0.21 0.19 0.17 0.15 0.13                                     |
| Reach-1   | 46.392<br>46.392<br>46.392<br>46.392<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39  | 10-year 25-year 50-year 100-year Regional 2-year 5-year 10-year 25-year 100-year Regional 2-year 5-year 100-year 25-year 10-year 10-year 25-year 10-year 25-year   | 4.85 5.93 6.83 7.62 47.8  Mult Open 3.07 4.07 4.85 5.93 6.83 7.62 47.8  3.07 4.07 4.85 5.93 6.83 7.62 47.8  | 202.50<br>202.50<br>202.50<br>202.50<br>202.50<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40<br>202.40  | 203.30<br>203.46<br>203.60<br>203.76<br>206.54<br>206.54<br>203.01<br>203.15<br>203.25<br>203.41<br>203.55<br>203.71<br>206.45<br>203.22<br>203.39<br>203.54<br>203.70<br>206.45   | 202.82<br>202.87<br>202.90<br>202.93<br>203.96<br>I - 3 Cell - 2<br>202.63<br>202.68<br>202.72<br>202.76<br>202.80<br>202.83<br>203.87<br>202.62<br>202.67<br>202.70<br>202.74<br>202.77<br>202.80<br>203.62   | 203.33<br>203.49<br>203.63<br>203.78<br>206.55<br>2.4 m W x 2<br>203.03<br>203.17<br>203.27<br>203.43<br>203.58<br>203.74<br>206.46<br>202.97<br>203.12<br>203.23<br>203.40<br>203.55<br>203.71<br>206.45   | 0.70<br>0.72<br>0.72<br>0.70<br>0.64<br>2.4 m H x 6<br>0.58<br>0.64<br>0.66<br>0.68<br>0.69<br>0.67<br>0.45<br>0.51<br>0.51<br>0.51<br>0.50<br>0.49<br>0.46<br>0.38                                 | 6.90<br>8.24<br>9.48<br>10.82<br>140.52<br>0 m L Cond<br>5.26<br>6.41<br>7.33<br>8.67<br>9.93<br>11.30<br>130.23<br>6.03<br>8.04<br>9.80<br>12.66<br>15.63<br>19.21<br>239.56  | 13.67 14.52 15.32 16.17 166.93 12.06 12.80 13.39 14.25 15.05 15.93 166.34 12.71 14.47 16.09 18.40 20.54 22.85 219.40   | 0.25 0.23 0.22 0.20 0.10  Culverts  0.24 0.23 0.22 0.20 0.19 0.07  0.24 0.21 0.19 0.17 0.15 0.13 0.06                                     |
| Reach-1   | 46.392<br>46.392<br>46.392<br>46.392<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39  | 10-year 25-year 50-year 100-year Regional 2-year 5-year 10-year 25-year 100-year Regional 2-year 5-year 100-year 5-year 10-year 5-year 10-year 25-year 10-year 25-year   | 4.85 5.93 6.83 7.62 47.8  Mult Open 3.07 4.07 4.85 5.93 6.83 7.62 47.8 3.07 4.07 4.85 5.93 6.83 7.62 47.8 3.07  | 202.50 202.50 202.50 202.50 202.50 202.50 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40   | 203.30<br>203.46<br>203.60<br>203.76<br>206.54<br>206.54<br>203.01<br>203.15<br>203.25<br>203.41<br>206.45<br>202.96<br>203.10<br>203.22<br>203.39<br>203.54<br>203.70<br>206.45   | 202.82 202.87 202.90 202.93 203.96  I - 3 Cell - 2  202.63 202.68 202.72 202.76 202.80 202.83 203.87  202.62 202.67 202.70 202.74 202.77 202.80 203.62   | 203.33<br>203.49<br>203.63<br>203.78<br>206.55<br>2.4 m W x 2<br>203.03<br>203.17<br>203.27<br>203.43<br>203.58<br>203.74<br>206.46<br>202.97<br>203.12<br>203.23<br>203.40<br>203.55<br>203.71<br>206.45   | 0.70<br>0.72<br>0.72<br>0.70<br>0.64<br>2.4 m H x 6<br>0.58<br>0.64<br>0.66<br>0.68<br>0.69<br>0.67<br>0.45<br>0.51<br>0.51<br>0.51<br>0.51<br>0.51<br>0.50<br>0.49<br>0.46                         | 6.90<br>8.24<br>9.48<br>10.82<br>140.52<br>0 m L Cond<br>5.26<br>6.41<br>7.33<br>8.67<br>9.93<br>11.30<br>130.23<br>6.03<br>8.04<br>9.80<br>12.66<br>15.63<br>19.21<br>239.56  | 13.67 14.52 15.32 16.17 166.93 12.06 12.80 13.39 14.25 15.05 15.93 166.34 12.71 14.47 16.09 18.40 20.54 22.85 219.40   | 0.25 0.23 0.22 0.20 0.10  Culverts  0.24 0.23 0.22 0.20 0.19 0.07  0.24 0.19 0.17 0.15 0.13 0.06  |
| Reach-1   | 46.392<br>46.392<br>46.392<br>46.392<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39   | 10-year 25-year 50-year 100-year Regional  2-year 5-year 10-year 25-year 100-year Regional  2-year 5-year 10-year 25-year 10-year 10-year 25-year 10-year 25-year 50-year 100-year 50-year   | 4.85 5.93 6.83 7.62 47.8  Mult Open 3.07 4.07 4.85 5.93 6.83 7.62 47.8  3.07 4.07 4.85 5.93 6.83 7.62 47.8  3.07 4.07 4.85 5.93 6.83 7.62 47.8                    | 202.50 202.50 202.50 202.50 202.50 202.50 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40  | 203.30<br>203.46<br>203.60<br>203.76<br>206.54<br>206.54<br>203.01<br>203.15<br>203.25<br>203.41<br>203.55<br>203.71<br>206.45<br>203.22<br>203.39<br>203.54<br>203.70<br>206.45   | 202.82 202.87 202.90 202.93 203.96  I - 3 Cell - 2  202.63 202.68 202.72 202.76 202.80 202.87 202.67 202.70 202.74 202.77 202.80 203.62 202.63 202.63 202.63   | 203.33<br>203.49<br>203.63<br>203.78<br>206.55<br>2.4 m W x 2<br>203.03<br>203.17<br>203.27<br>203.43<br>203.58<br>203.74<br>206.46<br>202.97<br>203.12<br>203.23<br>203.40<br>203.55<br>203.71<br>206.45   | 0.70<br>0.72<br>0.72<br>0.70<br>0.64<br>2.4 m H x 6<br>0.58<br>0.64<br>0.66<br>0.68<br>0.69<br>0.67<br>0.45<br>0.51<br>0.51<br>0.51<br>0.51<br>0.51<br>0.51<br>0.51<br>0.52<br>0.49<br>0.46<br>0.38 | 6.90<br>8.24<br>9.48<br>10.82<br>140.52<br>0 m L Cond<br>5.26<br>6.41<br>7.33<br>8.67<br>9.93<br>11.30<br>130.23<br>6.03<br>8.04<br>9.80<br>12.66<br>15.63<br>19.21<br>239.56  | 13.67 14.52 15.32 16.17 166.93  crete Box ( 12.06 12.80 13.39 14.25 15.05 15.93 166.34  12.71 14.47 16.09 18.40 20.54 22.85 219.40  18.20 20.75              | 0.25 0.23 0.22 0.20 0.10  Culverts  0.24 0.23 0.22 0.20 0.19 0.07  0.24 0.21 0.19 0.17 0.15 0.13 0.06  0.32 0.28                          |
| Reach-1   | 46.392<br>46.392<br>46.392<br>46.392<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39  | 10-year 25-year 100-year Regional 2-year 50-year 10-year 25-year 10-year Regional 2-year 100-year Regional 2-year 50-year 10-year 25-year 10-year 25-year 10-year 25-year 100-year   | 4.85 5.93 6.83 7.62 47.8  Mult Open 3.07 4.07 4.85 5.93 6.83 7.62 47.8  3.07 4.07 4.85 5.93 6.83 7.62 47.8  | 202.50 202.50 202.50 202.50 202.50 202.50 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40 202.40  | 203.30<br>203.46<br>203.60<br>203.76<br>206.54<br>206.54<br>203.01<br>203.15<br>203.25<br>203.41<br>203.55<br>203.71<br>206.45<br>203.22<br>203.39<br>203.54<br>203.70<br>206.45   | 202.82 202.90 202.93 203.96  I - 3 Cell - 2  202.63 202.68 202.72 202.76 202.80 202.67 202.77 202.77 202.80 203.62 202.63 202.63 202.63 202.63 202.68  | 203.33<br>203.49<br>203.63<br>203.78<br>206.55<br>2.4 m W x 2<br>203.03<br>203.17<br>203.27<br>203.43<br>203.58<br>203.74<br>206.46<br>202.97<br>203.12<br>203.23<br>203.40<br>203.55<br>203.71<br>206.45   | 0.70 0.72 0.72 0.70 0.64  2.4 m H x 6  0.58 0.64 0.66 0.69 0.67 0.45  0.51 0.51 0.51 0.50 0.49 0.46 0.38  | 6.90<br>8.24<br>9.48<br>10.82<br>140.52<br>0 m L Cond<br>5.26<br>6.41<br>7.33<br>8.67<br>9.93<br>11.30<br>130.23<br>6.03<br>8.04<br>9.80<br>12.66<br>15.63<br>19.21<br>239.56<br>4.31<br>5.70<br>6.73                          | 13.67 14.52 15.32 16.17 166.93  crete Box (  12.06 12.80 13.39 14.25 15.05 15.93 166.34  12.71 14.47 16.09 18.40 20.54 22.85 219.40  18.20 20.75 22.20       | 0.25 0.23 0.22 0.20 0.10  Culverts  0.24 0.23 0.23 0.22 0.20 0.19 0.07  0.24 0.21 0.19 0.17 0.15 0.13 0.06  0.32 0.28 0.26                |
| Reach-1   | 46.392<br>46.392<br>46.392<br>46.392<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39                               | 10-year 25-year 100-year Regional 2-year 50-year 10-year 25-year 10-year 25-year 100-year Regional 2-year 5-year 10-year 25-year 10-year 25-year 100-year 100-year 50-year 100-year 25-year  | 4.85 5.93 6.83 7.62 47.8  Mult Open  3.07 4.07 4.85 5.93 6.83 7.62 47.8  3.07 4.07 4.85 5.93 6.83 7.62 47.8  3.07 4.07 4.85 5.93 6.83 7.62 47.8                   | 202.50 202.50 202.50 202.50 202.50 202.50 202.40   | 203.30<br>203.46<br>203.60<br>203.76<br>206.54<br>206.54<br>203.01<br>203.15<br>203.25<br>203.41<br>203.55<br>203.71<br>206.45<br>203.22<br>203.39<br>203.54<br>203.70<br>206.45   | 202.82 202.90 202.93 203.96  I - 3 Cell - 2  202.63 202.68 202.72 202.76 202.80 202.67 202.77 202.77 202.80 203.62 202.68 202.72 202.76 202.77 202.80 203.62   | 203.33<br>203.49<br>203.63<br>203.78<br>206.55<br>2.4 m W x 2<br>203.03<br>203.17<br>203.27<br>203.43<br>203.58<br>203.74<br>206.46<br>202.97<br>203.12<br>203.23<br>203.40<br>203.55<br>203.71<br>206.45<br>202.93<br>203.09<br>203.21<br>203.38 | 0.70 0.72 0.72 0.70 0.64  2.4 m H x 6  0.58 0.64 0.66 0.68 0.69 0.67 0.45  0.51 0.51 0.51 0.50 0.49 0.46 0.38  0.71 0.72 0.72 0.72  | 6.90<br>8.24<br>9.48<br>10.82<br>140.52<br>0 m L Cond<br>5.26<br>6.41<br>7.33<br>8.67<br>9.93<br>11.30<br>130.23<br>6.03<br>8.04<br>9.80<br>12.66<br>15.63<br>19.21<br>239.56<br>4.31<br>5.70<br>6.73<br>8.20                  | 13.67 14.52 15.32 16.17 166.93  crete Box (  12.06 12.80 13.39 14.25 15.05 15.93 166.34  12.71 14.47 16.09 18.40 20.54 22.85 219.40  18.20 20.75 22.20 24.24 | 0.25 0.23 0.22 0.20 0.10  Culverts  0.24 0.23 0.22 0.20 0.19 0.07  0.24 0.21 0.19 0.17 0.15 0.13 0.06  0.32 0.28 0.26 0.24                |
| Reach-1                         | 46.392<br>46.392<br>46.392<br>46.392<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.38<br>46.38<br>46.38<br>46.382<br>46.382<br>46.382 | 10-year 25-year 50-year 100-year Regional  2-year 5-year 10-year 25-year 100-year Regional  2-year 50-year 100-year 25-year 10-year 25-year 10-year 25-year 10-year 100-year 100-year 100-year 100-year 100-year 100-year 100-year | 4.85<br>5.93<br>6.83<br>7.62<br>47.8<br>Mult Open<br>3.07<br>4.07<br>4.85<br>5.93<br>6.83<br>7.62<br>47.8<br>3.07<br>4.07<br>4.85<br>5.93<br>6.83<br>7.62<br>47.8 | 202.50 202.50 202.50 202.50 202.50 202.50 202.40 | 203.30<br>203.46<br>203.60<br>203.76<br>206.54<br>206.54<br>203.01<br>203.15<br>203.25<br>203.41<br>203.55<br>203.71<br>206.45<br>202.96<br>203.10<br>203.22<br>203.39<br>203.54<br>203.70<br>206.45                               | 202.82 202.87 202.90 202.93 203.96  I - 3 Cell - 2  202.63 202.76 202.80 202.83 203.87  202.62 202.67 202.70 202.74 202.77 202.80 203.62  202.63 202.63 202.63 202.68 202.72 202.76 202.76 202.76 202.70       | 203.33<br>203.49<br>203.63<br>203.78<br>206.55<br>2.4 m W x 2<br>203.03<br>203.17<br>203.27<br>203.43<br>203.58<br>203.74<br>206.46<br>202.97<br>203.12<br>203.23<br>203.40<br>203.55<br>203.71<br>206.45   | 0.70 0.72 0.72 0.70 0.64  2.4 m H x 6  0.58 0.64 0.66 0.68 0.69 0.67 0.45  0.51 0.51 0.51 0.51 0.51 0.72 0.72 0.72 0.72 0.72  | 6.90<br>8.24<br>9.48<br>10.82<br>140.52<br>0 m L Cond<br>5.26<br>6.41<br>7.33<br>8.67<br>9.93<br>11.30<br>130.23<br>6.03<br>8.04<br>9.80<br>12.66<br>15.63<br>19.21<br>239.56<br>4.31<br>5.70<br>6.73<br>8.20<br>9.54          | 13.67 14.52 15.32 16.17 166.93 12.06 12.80 13.39 14.25 15.05 15.93 166.34 12.71 14.47 16.09 18.40 20.54 22.85 219.40 18.20 20.75 22.20 24.24 26.12           | 0.25 0.23 0.22 0.20 0.10  Culverts  0.24 0.23 0.22 0.20 0.19 0.07  0.24 0.21 0.19 0.17 0.15 0.13 0.06  0.32 0.28 0.26 0.24 0.21           |
| Reach-1   | 46.392<br>46.392<br>46.392<br>46.392<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39                                 | 10-year 25-year 50-year 100-year Regional 2-year 5-year 10-year 25-year 100-year Regional 2-year 5-year 10-year 25-year 10-year 25-year 100-year Regional 2-year 50-year 100-year Regional 2-year 50-year 100-year 100-year        | 4.85 5.93 6.83 7.62 47.8  Mult Open 3.07 4.07 4.85 5.93 6.83 7.62 47.8 3.07 4.07 4.85 5.93 6.83 7.62 47.8 3.07 4.07 4.85 5.93 6.83 7.62 47.8                      | 202.50 202.50 202.50 202.50 202.50 202.50 202.40 | 203.30<br>203.46<br>203.60<br>203.76<br>206.54<br>206.54<br>203.01<br>203.15<br>203.25<br>203.41<br>203.55<br>203.71<br>206.45<br>202.96<br>203.10<br>203.22<br>203.39<br>203.54<br>203.54<br>203.70<br>206.45<br>203.70<br>206.45 | 202.82 202.87 202.90 202.93 203.96  I - 3 Cell - 2  202.63 202.68 202.72 202.76 202.80 202.67 202.70 202.74 202.77 202.80 203.62  202.63 202.63 202.63 202.63 202.68 202.72 202.76 202.76 202.80 202.80 202.80 | 203.33<br>203.49<br>203.63<br>203.78<br>206.55<br>2.4 m W x 2<br>203.03<br>203.17<br>203.27<br>203.43<br>203.58<br>203.74<br>206.46<br>202.97<br>203.12<br>203.23<br>203.40<br>203.55<br>203.71<br>206.45<br>202.93<br>203.71<br>206.45           | 0.70 0.72 0.72 0.70 0.64  2.4 m H x 6  0.58 0.64 0.66 0.68 0.69 0.67 0.45  0.51 0.51 0.51 0.51 0.51 0.51 0.72 0.72 0.72 0.72 0.72 0.72 0.69   | 6.90<br>8.24<br>9.48<br>10.82<br>140.52<br>0 m L Cond<br>5.26<br>6.41<br>7.33<br>8.67<br>9.93<br>11.30<br>130.23<br>6.03<br>8.04<br>9.80<br>12.66<br>15.63<br>19.21<br>239.56<br>4.31<br>5.70<br>6.73<br>8.20<br>9.54<br>10.99 | 13.67 14.52 15.32 16.17 166.93 12.06 12.80 13.39 14.25 15.05 15.93 166.34 12.71 14.47 16.09 18.40 20.54 22.85 219.40 18.20 20.75 22.20 24.24 26.12 28.14     | 0.25 0.23 0.22 0.20 0.10  Culverts  0.24 0.23 0.22 0.20 0.19 0.07  0.24 0.21 0.19 0.17 0.15 0.13 0.06  0.32 0.28 0.26 0.24 0.21 0.29 0.20 |
| Reach-1 | 46.392<br>46.392<br>46.392<br>46.392<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.391<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39<br>46.39                                 | 10-year 25-year 50-year 100-year Regional  2-year 5-year 10-year 25-year 100-year Regional  2-year 50-year 100-year 25-year 10-year 25-year 10-year 25-year 10-year 100-year 100-year 100-year 100-year 100-year 100-year 100-year | 4.85<br>5.93<br>6.83<br>7.62<br>47.8<br>Mult Open<br>3.07<br>4.07<br>4.85<br>5.93<br>6.83<br>7.62<br>47.8<br>3.07<br>4.07<br>4.85<br>5.93<br>6.83<br>7.62<br>47.8 | 202.50 202.50 202.50 202.50 202.50 202.50 202.40 | 203.30<br>203.46<br>203.60<br>203.76<br>206.54<br>206.54<br>203.01<br>203.15<br>203.25<br>203.41<br>203.55<br>203.71<br>206.45<br>202.96<br>203.10<br>203.22<br>203.39<br>203.54<br>203.70<br>206.45                               | 202.82 202.87 202.90 202.93 203.96  I - 3 Cell - 2  202.63 202.76 202.80 202.83 203.87  202.62 202.67 202.70 202.74 202.77 202.80 203.62  202.63 202.63 202.63 202.68 202.72 202.76 202.76 202.76 202.70       | 203.33<br>203.49<br>203.63<br>203.78<br>206.55<br>2.4 m W x 2<br>203.03<br>203.17<br>203.27<br>203.43<br>203.58<br>203.74<br>206.46<br>202.97<br>203.12<br>203.23<br>203.40<br>203.55<br>203.71<br>206.45   | 0.70 0.72 0.72 0.70 0.64  2.4 m H x 6  0.58 0.64 0.66 0.68 0.69 0.67 0.45  0.51 0.51 0.51 0.51 0.51 0.72 0.72 0.72 0.72 0.72  | 6.90<br>8.24<br>9.48<br>10.82<br>140.52<br>0 m L Cond<br>5.26<br>6.41<br>7.33<br>8.67<br>9.93<br>11.30<br>130.23<br>6.03<br>8.04<br>9.80<br>12.66<br>15.63<br>19.21<br>239.56<br>4.31<br>5.70<br>6.73<br>8.20<br>9.54          | 13.67 14.52 15.32 16.17 166.93 12.06 12.80 13.39 14.25 15.05 15.93 166.34 12.71 14.47 16.09 18.40 20.54 22.85 219.40 18.20 20.75 22.20 24.24 26.12           | 0.25 0.23 0.22 0.20 0.10  Culverts  0.24 0.23 0.22 0.20 0.19 0.07  0.24 0.21 0.19 0.15 0.13 0.06  0.32 0.28 0.26 0.24 0.21                |

## **Existing Hydraulic Modelling Summary - Black Creek**

| Reach-1  | Reach     | River Sta | Profile   | Q Total             | Min Ch El | W.S. Elev  | Crit W.S.   | E.G. Elev | Vel Chnl    | Flow Area  | Top Width   | Froude #     |
|--|-----------|-----------|-----------|---------------------|-----------|------------|-------------|-----------|-------------|------------|-------------|--------------|
| Reach-1  |           |           |           | (m <sup>3</sup> /s) | (m)       | (m)        | (m)         | (m)       | (m/s)       | $(m^2)$    | (m)         |              |
| Reach-1  | Reach-1   | 46.3815   |           | Culvert             | @ Langsta | ff Road Ra | mp 3 Cell - | 2.4 m W x | 2.4 m H x 6 | 0 m L Cond | crete Box C | ulverts      |
| Reach-1  |           |           |           |                     |           |            |             |           |             |            |             |              |
| Reach-1  |           |           |           |                     |           |            |             |           |             |            |             | 0.29         |
| Reach-1  |           |           |           |                     |           |            |             |           |             |            |             | 0.25         |
| Reach-1  |           |           |           |                     |           |            |             |           |             |            |             | 0.24         |
| Reach-1  |           |           |           |                     |           |            |             |           |             |            |             | 0.22         |
| Reach-1  |           |           |           |                     |           |            |             |           |             |            |             | 0.20         |
| Reach-1         46.36 2-year         6.21 201.60 202.56         202.59 0.77 9.01 13.27           Reach-1         46.36 5-year         8.54 201.60 202.77 202.80 0.84 11.96 14.88           Reach-1 46.36 10-year 10.17 201.60 202.92 202.95 0.86 14.29 16.04           Reach-1 46.36 5-year 12.32 201.60 203.13 203.16 0.88 17.78 17.63           Reach-1 46.36 50-year 14.3 201.60 203.31 203.34 0.89 21.11 19.02           Reach-1 46.36 100-year 16.31 201.60 203.50 203.54 0.89 24.97 20.51           Reach-1 46.36 Regional 66.49 201.60 206.02 206.05 1.05 128.82 96.09           Reach-1 46.35 5-year 6.21 201.40 202.44 202.46 0.71 9.52 14.43           Reach-1 46.35 5-year 8.54 201.40 202.67 202.69 0.76 13.10 16.76           Reach-1 46.35 5-year 10.17 201.40 202.87 202.69 0.76 13.10 16.76           Reach-1 46.35 5-year 12.32 201.40 203.05 203.08 0.77 20.40 20.72           Reach-1 46.35 5-year 10.17 201.40 202.83 202.86 0.77 16.01 18.44           Reach-1 46.35 5-year 12.32 201.40 203.05 203.08 0.77 20.40 20.72           Reach-1 46.35 10-year 10.17 201.40 203.05 203.08 0.77 24.55 22.68           Reach-1 46.35 10-year 11.3 201.40 203.25 203.28 0.77 24.55 22.68           Reach-1 46.35 5-year 12.32 201.40 203.05 203.08 0.77 24.55 22.68           Reach-1 46.35 10-year 14.3 201.40 203.45 203.28 0.77 24.55 22.68           Reach-1 46.35 10-year 14.3 201.40 203.45 203.28 0.77 24.55 22.68           Reach-1 46.35 2-year 20.20 20.20 20.20 20.20 20.20 20.20 20.20 20.20 20.20 20.20 20.20 20.20 20.20 20.20 20.20 20.20 20                 |           |           |           |                     |           |            |             |           |             |            |             | 0.18         |
| Reach-1  | Reach-1   | 46.381    | Regional  | 47.8                | 202.30    | 206.08     | 203.76      | 206.08    | 0.29        | 334.18     | 237.29      | 0.05         |
| Reach-1  | Doodb 1   | 46.26     | 2         | 6.04                | 204.60    | 202.56     |             | 202.50    | 0.77        | 0.01       | 12.27       | 0.26         |
| Reach-1  |           |           |           |                     |           |            |             |           |             |            |             | 0.26<br>0.26 |
| Reach-1  |           |           |           |                     |           |            |             |           |             |            |             | 0.26         |
| Reach-1  |           |           |           |                     |           |            |             |           |             |            |             | 0.23         |
| Reach-1  |           |           |           |                     |           |            |             |           |             |            |             | 0.23         |
| Reach-1  |           |           |           |                     |           |            |             |           |             |            |             | 0.22         |
| Reach-1         46.35 2-year         6.21 201.40 202.44         202.46 0.71 9.52 14.43           Reach-1         46.35 5-year 8.54 201.40 202.67 202.69 0.76 13.10 16.76           Reach-1         46.35 10-year 10.17 201.40 202.83 202.86 0.77 16.01 18.44           Reach-1 46.35 25-year 12.32 201.40 203.05 203.08 0.77 20.40 207.2           Reach-1 46.35 50-year 14.3 201.40 203.25 203.28 0.77 24.58 22.68           Reach-1 46.35 100-year 16.31 201.40 203.45 203.48 0.77 29.45 22.77           Reach-1 46.35 Regional 66.49 201.40 206.00 206.03 0.96 137.63 64.98           Reach-1 46.34 2-year 6.21 201.20 202.36 202.38 0.63 10.24 14.07           Reach-1 46.34 5-year 8.54 201.20 202.60 202.60 202.60 13.90 15.52           Reach-1 46.34 5-year 12.32 201.20 202.60 202.60 20.66 13.90 15.52           Reach-1 46.34 10-year 10.17 201.20 202.78 202.80 0.67 16.71 16.54           Reach-1 46.34 10-year 12.32 201.20 203.01 203.04 0.67 20.76 17.91           Reach-1 46.34 100-year 16.31 201.20 203.21 203.24         203.24 203.44 0.68 24.42 19.07           Reach-1 46.34 50-year 14.3 201.20 203.21 203.42 203.44 0.68 24.42 19.07           Reach-1 46.33 10-year 16.31 201.20 203.42 203.44 0.68 28.56 20.29           Reach-1 46.33 10-year 14.45 201.00 202.63 202.69 203.44 0.68 28.56 20.29           Reach-1 46.33 2-year 8.66 201.00 202.44 202.48 0.94 13.43 13.78           Reach-1 46.33 10-year 14.45 201.00 202.63 202.69 0.95 16.25 15.02           Reach-1 46.33 10-year 14.45 201.00 202.89 202.99 0.96 20.33 16.6                          |           |           |           |                     |           |            |             |           |             |            |             | 0.16         |
| Reach-1         46.35 5-year         8.54         201.40         202.67         202.69         0.76         13.10         16.76           Reach-1         46.35 10-year         10.17         201.40         202.83         202.86         0.77         10.01         18.44           Reach-1         46.35 52-year         12.32         201.40         203.05         203.08         0.77         20.40         20.72           Reach-1         46.35 50-year         14.3         201.40         203.25         203.28         0.77         24.58         22.68           Reach-1         46.35 100-year         16.31         201.40         203.45         203.48         0.77         29.45         24.77           Reach-1         46.35 Regional         66.49         201.40         206.00         206.03         0.96         137.63         64.98           Reach-1         46.34 Loyear         6.21         201.20         202.36         202.38         0.63         10.24         14.07           Reach-1         46.34 10-year         10.17         201.20         202.60         202.62         0.66         15.51           Reach-1         46.34 10-year         14.3         201.20         203.01         203.01  | 1100011   | 10.00     | rtogionai | 00110               | 201100    | 200.02     |             | 200.00    | 1.00        | 120.02     | 00.00       | 0.10         |
| Reach-1         46.35 5-year         8.54         201.40         202.67         202.69         0.76         13.10         16.76           Reach-1         46.35 10-year         10.17         201.40         202.83         202.86         0.77         10.01         18.44           Reach-1         46.35 52-year         12.32         201.40         203.05         203.08         0.77         20.40         20.72           Reach-1         46.35 50-year         14.3         201.40         203.25         203.28         0.77         24.58         22.68           Reach-1         46.35 100-year         16.31         201.40         203.45         203.48         0.77         29.45         24.77           Reach-1         46.35 Regional         66.49         201.40         206.00         206.03         0.96         137.63         64.98           Reach-1         46.34 Loyear         6.21         201.20         202.36         202.38         0.63         10.24         14.07           Reach-1         46.34 10-year         10.17         201.20         202.60         202.62         0.66         15.51           Reach-1         46.34 10-year         14.3         201.20         203.01         203.01  | Reach-1   | 46.35     | 2-year    | 6.21                | 201.40    | 202.44     |             | 202.46    | 0.71        | 9.52       | 14.43       | 0.25         |
| Reach-1         46.35 10 year         10.17 201.40         202.83         202.86 0.77 16.01         18.44           Reach-1 46.35 25-year         12.32 201.40 203.05 203.08 0.77 20.40 20.72         20.40 20.72           Reach-1 46.35 50-year 14.3 201.40 203.25 203.28 0.77 24.58 22.68         Reach-1 46.35 100-year 16.31 201.40 203.45 203.48 0.77 29.45 24.77           Reach-1 46.35 Regional 66.49 201.40 206.00 206.00 206.03 0.96 137.63 64.98           Reach-1 46.34 2-year 6.21 201.20 202.36 202.38 0.63 10.24 14.07           Reach-1 46.34 5-year 8.54 201.20 202.60 202.60 202.62 0.66 13.90 15.52           Reach-1 46.34 10-year 10.17 201.20 202.78 203.04 0.67 16.71 16.54           Reach-1 46.34 25-year 12.32 201.20 203.01 203.04 0.67 20.76 17.91           Reach-1 46.34 100-year 11.33 201.20 203.21 203.23 0.68 24.42 19.07           Reach-1 46.34 100-year 16.31 201.20 203.21 203.42 203.44 0.68 28.56 20.29           Reach-1 46.34 Regional 66.49 201.20 205.98 206.01 0.92 126.31 107.94           Reach-1 46.33 2-year 8.66 201.00 202.14 202.19 0.90 9.66 11.92           Reach-1 46.33 10-year 14.45 201.00 202.63 202.69 0.95 16.25 15.02           Reach-1 46.33 10-year 14.45 201.00 202.63 202.69 0.95 16.25 15.02           Reach-1 46.33 10-year 17.55 201.00 202.89 202.94 0.96 20.33 16.65           Reach-1 46.33 10-year 17.55 201.00 202.89 202.94 0.96 20.33 16.55           Reach-1 46.33 100-year 20.24 201.00 203.30 203.30 203.37 0.97 28.14 19.39           Reach-1 46.33 25-year 17.55 201.00 203.33 203.                  |           |           |           |                     |           |            |             |           |             |            |             | 0.23         |
| Reach-1         46.35 bream         12.32 bream         201.40 bream         203.05 bream         203.08 bream         0.77 bream         20.40 bream         20.72 bream           Reach-1         46.35 bream         16.31 bream         201.40 bream         203.25 bream         203.28 bream         0.77 bream         24.58 bream         22.68 bream           Reach-1         46.35 Regional         66.49 bream         201.40 bream         206.00 bream         206.03 bream         0.96 bream         137.63 bream         64.98 bream           Reach-1         46.34 bream         2.9ear         6.21 bream         201.20 bream         202.36 bream         202.38 bream         0.63 bream         10.24 bream         14.07 bream           Reach-1         46.34 bream         2.9ear         8.54 bream         201.20 bream         202.60 bream         202.62 bream         0.66 bream         13.90 bream         15.52 bream           Reach-1         46.34 bream         10-year         10.17 bream         202.20 bream         202.80 bream         0.67 bream         16.71 bream         16.54 bream         202.80 bream         0.67 bream         16.71 bream         16.54 bream         202.80 bream         0.67 bream         16.71 bream         16.52 bream         16.52 bream         202.20 bream         202.80 bream         202.80 b  |           |           |           |                     |           |            |             |           |             |            |             | 0.22         |
| Reach-1         46.35 50-year         14.3         201.40         203.25         203.28         0.77         24.58         22.68           Reach-1         46.35 100-year         16.31 201.40         203.45         203.48         0.77         29.45         24.77           Reach-1         46.35 Regional         66.49         201.40         206.00         206.03         0.96         137.63         64.98           Reach-1         46.35 Pegar         6.21 201.20         202.36         202.38         0.63         10.24         14.07           Reach-1         46.34 5-year         8.54 201.20         202.60         202.62         0.66         13.90         15.52           Reach-1         46.34 10-year         10.17 201.20         202.78         202.80         0.67 16.71         16.54           Reach-1         46.34 10-year         12.32 201.20         203.01         203.04         0.67 20.76         17.91           Reach-1         46.34 5-year         12.32 201.20         203.01         203.23         0.68 24.42         19.07           Reach-1         46.34 100-year         14.3 201.20         203.42         203.44         0.68 28.56         20.29           Reach-1         46.33 2-year         8.66 201.20   |           |           |           |                     |           |            |             |           |             |            |             | 0.20         |
| Reach-1         46.35         Regional         66.49         201.40         206.00         206.03         0.96         137.63         64.98           Reach-1         46.34         2-year         6.21         201.20         202.36         202.38         0.63         10.24         14.07           Reach-1         46.34         5-year         8.54         201.20         202.60         202.62         0.66         13.90         15.52           Reach-1         46.34         10-year         10.17         201.20         202.78         202.80         0.67         16.71         16.54           Reach-1         46.34         10-year         12.32         201.20         203.01         203.04         0.67         20.76         17.91           Reach-1         46.34         50-year         14.3         201.20         203.41         203.23         0.68         24.42         19.07           Reach-1         46.34         100-year         16.31         201.20         203.42         203.44         0.68         28.56         20.29           Reach-1         46.33         5-year         12.09         201.00         202.14         202.19         0.90         9.66         11.92  |           |           |           |                     |           |            |             |           | 0.77        | 24.58      | 22.68       | 0.19         |
| Reach-1         46.34         2-year         6.21         201.20         202.36         202.38         0.63         10.24         14.07           Reach-1         46.34         5-year         8.54         201.20         202.60         202.62         0.66         13.90         15.52           Reach-1         46.34         10-year         10.17         201.20         202.78         202.80         0.67         16.71         16.54           Reach-1         46.34         25-year         12.32         201.20         203.01         203.04         0.67         20.76         17.91           Reach-1         46.34         50-year         14.3         201.20         203.21         203.23         0.68         24.42         19.07           Reach-1         46.34         100-year         16.31         201.20         203.42         203.44         0.68         28.56         20.29           Reach-1         46.34         Regional         66.49         201.20         205.98         206.01         0.92         126.31         107.94           Reach-1         46.33         5-year         8.66         201.00         202.14         202.19         0.90         9.66         11.92  | Reach-1   | 46.35     | 100-year  | 16.31               | 201.40    | 203.45     |             | 203.48    | 0.77        | 29.45      | 24.77       | 0.18         |
| Reach-1         46.34 5-year         8.54 201.20         202.60         202.62 0.66         13.90         15.52           Reach-1         46.34 10-year         10.17 201.20         202.78         202.80 0.67 16.71         16.54           Reach-1         46.34 25-year         12.32 201.20 203.01         203.04 0.67 20.76 17.91           Reach-1         46.34 50-year         14.3 201.20 203.21         203.23 0.68 24.42 19.07           Reach-1         46.34 100-year 16.31 201.20 203.42 203.44 0.68 28.56 20.29           Reach-1         46.34 Regional 66.49 201.20 205.98 206.01 0.92 126.31 107.94           Reach-1         46.33 2-year 8.66 201.00 202.14 202.19 0.90 9.66 11.92           Reach-1 46.33 5-year 12.09 201.00 202.44 202.48 0.94 13.43 13.78           Reach-1 46.33 10-year 14.45 201.00 202.63 202.68 0.95 16.25 15.02           Reach-1 46.33 25-year 17.55 201.00 202.63 202.94 0.96 20.33 16.65           Reach-1 46.33 50-year 20.24 201.00 203.10 203.15 0.97 23.98 17.98           Reach-1 46.33 100-year 22.97 201.00 203.33 203.37 0.97 28.14 19.39           Reach-1 46.32 Peyear 8.66 201.00 205.95 205.98 0.89 179.01 115.00           Reach-1 46.32 2-year 8.66 201.00 202.59 201.38 202.08 0.65 13.25 14.45           Reach-1 46.32 2-year 8.66 201.00 202.58 201.53 202.61 0.72 20.07 17.43           Reach-1 46.322 5-year 17.55 201.00 202.58 201.60 202.87 0.75 23.54 18.95           Reach-1 46.322 10-year 14.45 201.00   | Reach-1   | 46.35     | Regional  | 66.49               | 201.40    | 206.00     |             | 206.03    | 0.96        | 137.63     | 64.98       | 0.15         |
| Reach-1         46.34 5-year         8.54 201.20         202.60         202.62 0.66         13.90         15.52           Reach-1         46.34 10-year         10.17 201.20         202.78         202.80 0.67 16.71         16.54           Reach-1         46.34 25-year         12.32 201.20 203.01         203.04 0.67 20.76 17.91           Reach-1         46.34 50-year         14.3 201.20 203.21         203.23 0.68 24.42 19.07           Reach-1         46.34 100-year 16.31 201.20 203.42 203.44 0.68 28.56 20.29           Reach-1         46.34 Regional 66.49 201.20 205.98 206.01 0.92 126.31 107.94           Reach-1         46.33 2-year 8.66 201.00 202.14 202.19 0.90 9.66 11.92           Reach-1 46.33 5-year 12.09 201.00 202.44 202.48 0.94 13.43 13.78           Reach-1 46.33 10-year 14.45 201.00 202.63 202.68 0.95 16.25 15.02           Reach-1 46.33 25-year 17.55 201.00 202.63 202.94 0.96 20.33 16.65           Reach-1 46.33 50-year 20.24 201.00 203.10 203.15 0.97 23.98 17.98           Reach-1 46.33 100-year 22.97 201.00 203.33 203.37 0.97 28.14 19.39           Reach-1 46.32 Peyear 8.66 201.00 205.95 205.98 0.89 179.01 115.00           Reach-1 46.32 2-year 8.66 201.00 202.59 201.38 202.08 0.65 13.25 14.45           Reach-1 46.32 2-year 8.66 201.00 202.58 201.53 202.61 0.72 20.07 17.43           Reach-1 46.322 5-year 17.55 201.00 202.58 201.60 202.87 0.75 23.54 18.95           Reach-1 46.322 10-year 14.45 201.00   |           |           |           |                     |           |            |             |           |             |            |             |              |
| Reach-1         46.34 10-year         10.17         201.20         202.78         202.80         0.67         16.71         16.54           Reach-1         46.34 25-year         12.32 201.20 203.01         203.04 0.67 20.76         17.91           Reach-1         46.34 50-year         14.3 201.20 203.21 203.23 0.68 24.42 19.07           Reach-1         46.34 100-year         16.31 201.20 203.42 203.44 0.68 28.56 20.29           Reach-1         46.34 Regional 66.49 201.20 205.98 206.01 0.92 126.31 107.94           Reach-1         46.33 2-year 8.66 201.00 202.14 202.19 0.90 9.66 11.92           Reach-1         46.33 10-year 12.09 201.00 202.44 202.48 0.94 13.43 13.78           Reach-1         46.33 10-year 14.45 201.00 202.63 202.68 0.95 16.25 15.02           Reach-1         46.33 25-year 17.55 201.00 202.89 202.94 0.96 20.33 16.65           Reach-1         46.33 10-year 20.24 201.00 203.10 203.15 0.97 23.98 17.98           Reach-1         46.33 100-year 20.24 201.00 203.33 203.37 0.97 28.14 19.39           Reach-1         46.33 100-year 20.24 201.00 203.33 203.37 0.97 28.14 19.39           Reach-1         46.33 100-year 20.97 201.00 203.33 203.37 0.97 28.14 19.39           Reach-1         46.33 100-year 20.97 201.00 203.33 203.37 0.97 28.14 19.39           Reach-1         46.322 2-year 8.66 201.00 202.59 202.59 205.98 0.89 179.01 115.00           Reach-1         <  | Reach-1   |           |           |                     |           |            |             |           | 0.63        |            |             | 0.22         |
| Reach-1         46.34         25-year         12.32         201.20         203.01         203.04         0.67         20.76         17.91           Reach-1         46.34         50-year         14.3         201.20         203.21         203.23         0.68         24.42         19.07           Reach-1         46.34         100-year         16.31         201.20         203.42         203.44         0.68         28.56         20.29           Reach-1         46.34         Regional         66.49         201.20         205.98         206.01         0.92         126.31         107.94           Reach-1         46.33         Pear         8.66         201.00         202.14         202.19         0.90         9.66         11.92           Reach-1         46.33         Fear         12.09         201.00         202.44         202.48         0.94         13.43         13.78           Reach-1         46.33         10-year         14.45         201.00         202.63         202.68         0.95         16.25         15.02           Reach-1         46.33         20-year         17.55         201.00         202.89         202.94         0.96         20.33         16.65   |           |           |           |                     |           |            |             |           |             |            |             | 0.20         |
| Reach-1         46.34 50-year         14.3         201.20         203.21         203.23         0.68         24.42         19.07           Reach-1         46.34 100-year         16.31 201.20         203.42         203.44 0.68         28.56 20.29           Reach-1         46.34 Regional         66.49 201.20 205.98         206.01 0.92 126.31 107.94           Reach-1         46.33 2-year         8.66 201.00 202.14 202.19 0.90 9.66 11.92           Reach-1         46.33 5-year 12.09 201.00 202.44 202.48 0.94 13.43 13.78           Reach-1         46.33 10-year 14.45 201.00 202.63 202.68 0.95 16.25 15.02           Reach-1         46.33 25-year 17.55 201.00 202.89 202.94 0.96 20.33 16.65           Reach-1         46.33 50-year 20.24 201.00 203.10 203.15 0.97 23.98 17.98           Reach-1         46.33 100-year 20.24 201.00 203.33 203.7 0.97 28.14 19.39           Reach-1         46.33 100-year 22.97 201.00 203.33 203.7 0.97 28.14 19.39           Reach-1         46.32 100-year 20.29 201.00 202.55 201.38 202.08 0.65 13.25 14.45           Reach-1         46.32 2-year 8.66 201.00 202.05 201.38 202.08 0.65 13.25 14.45           Reach-1         46.322 10-year 12.09 201.00 202.58 201.53 202.61 0.72 20.07 17.43           Reach-1         46.322 5-year 17.55 201.00 202.58 201.53 202.61 0.72 20.07 17.43           Reach-1         46.322 10-year 17.55 201.00 202.58 201.60 202.87 0.75 23.54 18.95 </td <td></td> <td></td> <td>_</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>0.19</td> |           |           | _         |                     |           |            |             |           |             |            |             | 0.19         |
| Reach-1         46.34 100-year         16.31 201.20         203.42 203.42         203.44 206.01         0.68 28.56 20.29           Reach-1         46.34 Regional         66.49 201.20 205.98         206.01 0.92 126.31 107.94           Reach-1         46.33 Pyear         8.66 201.00 202.14 202.19 0.90 9.66 11.92           Reach-1         46.33 S-year 12.09 201.00 202.44 202.48 0.94 13.43 13.78           Reach-1         46.33 10-year 14.45 201.00 202.63 202.68 0.95 16.25 15.02           Reach-1         46.33 25-year 17.55 201.00 202.89 202.94 0.96 20.33 16.65           Reach-1         46.33 50-year 20.24 201.00 203.10 203.15 0.97 23.98 17.98           Reach-1         46.33 100-year 20.29 201.00 203.33 203.37 0.97 28.14 19.39           Reach-1         46.33 Regional 74.78 201.00 205.95 205.98 0.89 179.01 115.00           Reach-1         46.322 5-year 12.09 201.00 202.37 201.47 202.40 0.70 17.39 16.26           Reach-1         46.322 10-year 14.45 201.00 202.58 201.53 202.61 0.72 20.07 17.43           Reach-1         46.322 5-year 17.55 201.00 202.85 201.60 202.87 0.75 23.54 18.95           Reach-1         46.322 10-year 17.55 201.00 202.85 201.60 202.87 0.75 23.54 18.95           Reach-1         46.322 8-year 17.55 201.00 202.85 201.60 202.87 0.75 23.54 18.95           Reach-1         46.322 8-year 17.55 201.00 202.85 201.60 202.87 0.75 23.54 18.95           Reach-1         46.322 8-year 20.24 201.00 202.85   |           |           |           |                     |           |            |             |           |             |            |             | 0.18         |
| Reach-1         46.34 Regional         66.49         201.20         205.98         206.01         0.92         126.31         107.94           Reach-1         46.33 2-year         8.66         201.00         202.14         202.19         0.90         9.66         11.92           Reach-1         46.33 5-year         12.09         201.00         202.44         202.48         0.94         13.43         13.78           Reach-1         46.33 10-year         14.45         201.00         202.63         202.68         0.95         16.25         15.02           Reach-1         46.33 25-year         17.55         201.00         202.89         202.94         0.96         20.33         16.65           Reach-1         46.33 50-year         20.24         201.00         203.10         203.15         0.97         23.98         17.98           Reach-1         46.33 100-year         22.97         201.00         203.33         203.37         0.97         28.14         19.39           Reach-1         46.33 Regional         74.78         201.00         205.95         205.98         0.89         179.01         115.00           Reach-1         46.322 2-year         8.66         201.00         202.05  |           |           |           |                     |           |            |             |           |             |            |             | 0.17         |
| Reach-1         46.33         2-year         8.66         201.00         202.14         202.19         0.90         9.66         11.92           Reach-1         46.33         5-year         12.09         201.00         202.44         202.48         0.94         13.43         13.78           Reach-1         46.33         10-year         14.45         201.00         202.63         202.68         0.95         16.25         15.02           Reach-1         46.33         25-year         17.55         201.00         202.89         202.94         0.96         20.33         16.65           Reach-1         46.33         50-year         20.24         201.00         203.10         203.15         0.97         23.98         17.98           Reach-1         46.33         100-year         22.97         201.00         203.33         203.37         0.97         28.14         19.39           Reach-1         46.33         100-year         22.97         201.00         205.95         205.98         0.89         179.01         115.00           Reach-1         46.322         2-year         8.66         201.00         202.05         201.38         202.08         0.65         13.25         14   |           |           |           |                     |           |            |             |           |             |            |             | 0.16         |
| Reach-1         46.33         5-year         12.09         201.00         202.44         202.48         0.94         13.43         13.78           Reach-1         46.33         10-year         14.45         201.00         202.63         202.68         0.95         16.25         15.02           Reach-1         46.33         25-year         17.55         201.00         202.89         202.94         0.96         20.33         16.65           Reach-1         46.33         50-year         20.24         201.00         203.10         203.15         0.97         23.98         17.98           Reach-1         46.33         100-year         22.97         201.00         203.33         203.37         0.97         28.14         19.39           Reach-1         46.33         Regional         74.78         201.00         205.95         205.98         0.89         179.01         115.00           Reach-1         46.322         2-year         8.66         201.00         202.05         201.38         202.08         0.65         13.25         14.45           Reach-1         46.322         5-year         12.09         201.00         202.37         201.47         202.40         0.70 <t< td=""><td>Reach-1</td><td>46.34</td><td>Regional</td><td>66.49</td><td>201.20</td><td>205.98</td><td></td><td>206.01</td><td>0.92</td><td>126.31</td><td>107.94</td><td>0.14</td></t<>   | Reach-1   | 46.34     | Regional  | 66.49               | 201.20    | 205.98     |             | 206.01    | 0.92        | 126.31     | 107.94      | 0.14         |
| Reach-1         46.33         5-year         12.09         201.00         202.44         202.48         0.94         13.43         13.78           Reach-1         46.33         10-year         14.45         201.00         202.63         202.68         0.95         16.25         15.02           Reach-1         46.33         25-year         17.55         201.00         202.89         202.94         0.96         20.33         16.65           Reach-1         46.33         50-year         20.24         201.00         203.10         203.15         0.97         23.98         17.98           Reach-1         46.33         100-year         22.97         201.00         203.33         203.37         0.97         28.14         19.39           Reach-1         46.33         Regional         74.78         201.00         205.95         205.98         0.89         179.01         115.00           Reach-1         46.322         2-year         8.66         201.00         202.05         201.38         202.08         0.65         13.25         14.45           Reach-1         46.322         5-year         12.09         201.00         202.37         201.47         202.40         0.70 <t< td=""><td></td><td>40.00</td><td></td><td>0.00</td><td>224.22</td><td>222.44</td><td></td><td>222.42</td><td></td><td></td><td>44.00</td><td></td></t<>  |           | 40.00     |           | 0.00                | 224.22    | 222.44     |             | 222.42    |             |            | 44.00       |              |
| Reach-1         46.33 10-year         14.45         201.00         202.63         202.68         0.95         16.25         15.02           Reach-1         46.33 25-year         17.55         201.00         202.89         202.94         0.96         20.33         16.65           Reach-1         46.33 50-year         20.24         201.00         203.10         203.15         0.97         23.98         17.98           Reach-1         46.33 100-year         22.97         201.00         203.33         203.37         0.97         28.14         19.39           Reach-1         46.33 Regional         74.78         201.00         205.95         205.98         0.89         179.01         115.00           Reach-1         46.322 2-year         8.66         201.00         202.05         201.38         202.08         0.65         13.25         14.45           Reach-1         46.322 5-year         12.09         201.00         202.37         201.47         202.40         0.70         17.39         16.26           Reach-1         46.322 10-year         14.45         201.00         202.58         201.53         202.61         0.72         20.07         17.43           Reach-1         46.322 50-year <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>0.31</td>  |           |           |           |                     |           |            |             |           |             |            |             | 0.31         |
| Reach-1         46.33         25-year         17.55         201.00         202.89         202.94         0.96         20.33         16.65           Reach-1         46.33         50-year         20.24         201.00         203.10         203.15         0.97         23.98         17.98           Reach-1         46.33         100-year         22.97         201.00         203.33         203.37         0.97         28.14         19.39           Reach-1         46.33         Regional         74.78         201.00         205.95         205.98         0.89         179.01         115.00           Reach-1         46.322         2-year         8.66         201.00         202.05         201.38         202.08         0.65         13.25         14.45           Reach-1         46.322         5-year         12.09         201.00         202.37         201.47         202.40         0.70         17.39         16.26           Reach-1         46.322         10-year         14.45         201.00         202.58         201.53         202.61         0.72         20.07         17.43           Reach-1         46.322         25-year         17.55         201.00         202.85         201.60   |           |           |           |                     |           |            |             |           |             |            |             | 0.28         |
| Reach-1         46.33 50-year         20.24 201.00         203.10         203.15 0.97         23.98 17.98           Reach-1         46.33 100-year         22.97 201.00         203.33 203.37         0.97 28.14 19.39           Reach-1         46.33 Regional         74.78 201.00 205.95         205.98 0.89 179.01 115.00           Reach-1         46.322 2-year         8.66 201.00 202.05 201.38 202.08 0.65 13.25 14.45           Reach-1 46.322 5-year         12.09 201.00 202.37 201.47 202.40 0.70 17.39 16.26           Reach-1 46.322 10-year 14.45 201.00 202.58 201.53 202.61 0.72 20.07 17.43           Reach-1 46.322 25-year 17.55 201.00 202.85 201.60 202.87 0.75 23.54 18.95           Reach-1 46.322 50-year 20.24 201.00 203.06 201.66 203.09 0.77 26.35 20.18           Reach-1 46.322 100-year 22.97 201.00 203.29 201.72 203.32 0.78 29.31 21.47           Reach-1 46.322 Regional 74.78 201.00 205.92 202.53 205.96 0.98 117.80 57.00  |           |           |           |                     |           |            |             |           |             |            |             | 0.26         |
| Reach-1         46.33         100-year         22.97         201.00         203.33         203.37         0.97         28.14         19.39           Reach-1         46.33         Regional         74.78         201.00         205.95         205.98         0.89         179.01         115.00           Reach-1         46.322         2-year         8.66         201.00         202.05         201.38         202.08         0.65         13.25         14.45           Reach-1         46.322         5-year         12.09         201.00         202.37         201.47         202.40         0.70         17.39         16.26           Reach-1         46.322         10-year         14.45         201.00         202.58         201.53         202.61         0.72         20.07         17.43           Reach-1         46.322         25-year         17.55         201.00         202.85         201.60         202.87         0.75         23.54         18.95           Reach-1         46.322         50-year         20.24         201.00         203.06         201.66         203.09         0.77         26.35         20.18           Reach-1         46.322         100-year         22.97         201.00  |           |           |           |                     |           |            |             |           |             |            |             | 0.24         |
| Reach-1         46.33         Regional         74.78         201.00         205.95         205.98         0.89         179.01         115.00           Reach-1         46.322         2-year         8.66         201.00         202.05         201.38         202.08         0.65         13.25         14.45           Reach-1         46.322         5-year         12.09         201.00         202.37         201.47         202.40         0.70         17.39         16.26           Reach-1         46.322         10-year         14.45         201.00         202.58         201.53         202.61         0.72         20.07         17.43           Reach-1         46.322         25-year         17.55         201.00         202.85         201.60         202.87         0.75         23.54         18.95           Reach-1         46.322         50-year         20.24         201.00         203.06         201.66         203.09         0.77         26.35         20.18           Reach-1         46.322         100-year         22.97         201.00         203.29         201.72         203.32         0.78         29.31         21.47           Reach-1         46.322         Regional         74.78   |           |           |           |                     |           |            |             |           |             |            |             | 0.23         |
| Reach-1       46.322 2-year       8.66       201.00       202.05       201.38       202.08       0.65       13.25       14.45         Reach-1       46.322 5-year       12.09       201.00       202.37       201.47       202.40       0.70       17.39       16.26         Reach-1       46.322 10-year       14.45       201.00       202.58       201.53       202.61       0.72       20.07       17.43         Reach-1       46.322 25-year       17.55       201.00       202.85       201.60       202.87       0.75       23.54       18.95         Reach-1       46.322 50-year       20.24       201.00       203.06       201.66       203.09       0.77       26.35       20.18         Reach-1       46.322 100-year       22.97       201.00       203.29       201.72       203.32       0.78       29.31       21.47         Reach-1       46.322 Regional       74.78       201.00       205.92       202.53       205.96       0.98       117.80       57.00  |           |           |           |                     |           |            |             |           |             |            |             | 0.22<br>0.13 |
| Reach-1         46.322         5-year         12.09         201.00         202.37         201.47         202.40         0.70         17.39         16.26           Reach-1         46.322         10-year         14.45         201.00         202.58         201.53         202.61         0.72         20.07         17.43           Reach-1         46.322         25-year         17.55         201.00         202.85         201.60         202.87         0.75         23.54         18.95           Reach-1         46.322         50-year         20.24         201.00         203.06         201.66         203.09         0.77         26.35         20.18           Reach-1         46.322         100-year         22.97         201.00         203.29         201.72         203.32         0.78         29.31         21.47           Reach-1         46.322         Regional         74.78         201.00         205.92         202.53         205.96         0.98         117.80         57.00  | incacii-i | 40.33     | rvegional | 14.10               | 201.00    | 200.90     |             | 200.90    | 0.09        | 178.01     | 113.00      | 0.13         |
| Reach-1         46.322         5-year         12.09         201.00         202.37         201.47         202.40         0.70         17.39         16.26           Reach-1         46.322         10-year         14.45         201.00         202.58         201.53         202.61         0.72         20.07         17.43           Reach-1         46.322         25-year         17.55         201.00         202.85         201.60         202.87         0.75         23.54         18.95           Reach-1         46.322         50-year         20.24         201.00         203.06         201.66         203.09         0.77         26.35         20.18           Reach-1         46.322         100-year         22.97         201.00         203.29         201.72         203.32         0.78         29.31         21.47           Reach-1         46.322         Regional         74.78         201.00         205.92         202.53         205.96         0.98         117.80         57.00  | Reach-1   | 46 322    | 2-vear    | 2 66                | 201.00    | 202.05     | 201 38      | 202.08    | 0.65        | 13 25      | 14 45       | 0.21         |
| Reach-1       46.322       10-year       14.45       201.00       202.58       201.53       202.61       0.72       20.07       17.43         Reach-1       46.322       25-year       17.55       201.00       202.85       201.60       202.87       0.75       23.54       18.95         Reach-1       46.322       50-year       20.24       201.00       203.06       201.66       203.09       0.77       26.35       20.18         Reach-1       46.322       100-year       22.97       201.00       203.29       201.72       203.32       0.78       29.31       21.47         Reach-1       46.322       Regional       74.78       201.00       205.92       202.53       205.96       0.98       117.80       57.00   |           |           |           |                     |           |            |             |           |             |            |             | 0.21         |
| Reach-1         46.322         25-year         17.55         201.00         202.85         201.60         202.87         0.75         23.54         18.95           Reach-1         46.322         50-year         20.24         201.00         203.06         201.66         203.09         0.77         26.35         20.18           Reach-1         46.322         100-year         22.97         201.00         203.29         201.72         203.32         0.78         29.31         21.47           Reach-1         46.322         Regional         74.78         201.00         205.92         202.53         205.96         0.98         117.80         57.00   |           |           |           |                     |           |            |             |           |             |            |             | 0.19         |
| Reach-1     46.322     50-year     20.24     201.00     203.06     201.66     203.09     0.77     26.35     20.18       Reach-1     46.322     100-year     22.97     201.00     203.29     201.72     203.32     0.78     29.31     21.47       Reach-1     46.322     Regional     74.78     201.00     205.92     202.53     205.96     0.98     117.80     57.00   |           |           |           |                     |           |            |             |           |             |            |             | 0.19         |
| Reach-1         46.322         100-year         22.97         201.00         203.29         201.72         203.32         0.78         29.31         21.47           Reach-1         46.322         Regional         74.78         201.00         205.92         202.53         205.96         0.98         117.80         57.00   |           |           |           |                     |           |            |             |           |             |            |             | 0.17         |
| Reach-1         46.322         Regional         74.78         201.00         205.92         202.53         205.96         0.98         117.80         57.00  |           |           |           |                     |           |            |             |           |             |            |             | 0.17         |
|  |           |           |           |                     |           |            |             |           |             |            |             | 0.14         |
| Reach-1 46.3215 Culvert Applewood Crescent   |           |           |           |                     |           |            |             |           |             |            |             |              |
|  | Reach-1   | 46.3215   |           | Culvert             | Applewood | Crescent   |             |           |             |            |             |              |
|  |           |           |           |                     |           |            |             |           |             |            |             |              |
| Reach-1 46.321 2-year 8.66 200.60 202.02 200.98 202.03 0.49 17.81 14.27  | Reach-1   | 46.321    | 2-year    | 8.66                | 200.60    | 202.02     | 200.98      | 202.03    | 0.49        | 17.81      | 14.27       | 0.13         |
| Reach-1 46.321 5-year 12.09 200.60 202.33 201.07 202.35 0.55 21.84 16.03   |           |           | •         |                     |           |            |             |           |             |            |             | 0.14         |
| Reach-1 46.321 10-year 14.45 200.60 202.53 201.13 202.55 0.59 24.46 17.18  |           |           |           |                     |           |            |             |           |             |            |             | 0.14         |
| Reach-1 46.321 25-year 17.55 200.60 202.80 201.21 202.82 0.63 27.86 18.66  |           |           |           |                     |           |            |             |           |             |            |             | 0.14         |
| Reach-1 46.321 50-year 20.24 200.60 203.01 201.26 203.03 0.66 30.61 19.87  |           |           |           |                     |           |            |             |           |             |            |             | 0.14         |
| Reach-1 46.321 100-year 22.97 200.60 203.22 201.32 203.24 0.69 33.37 21.07   | Reach-1   |           |           | 22.97               | 200.60    | 203.22     | 201.32      | 203.24    | 0.69        | 33.37      | 21.07       | 0.14         |
| Reach-1 46.321 Regional 74.78 200.60 205.31 202.15 205.36 1.09 95.59 32.96   | Reach-1   |           |           | 74.78               | 200.60    | 205.31     | 202.15      | 205.36    | 1.09        | 95.59      | 32.96       |              |

## York Region Langstaff Road EA

# **Westminster Creek**

## Langstaff Road EA

#### **Westminster Creek**

## **Existing Conditions Hydraulic Analysis Summary**

#### May 2019 Update

Model: "Basin 5\_May2019\_Rev Opt 4"

Plan: Proposed at Langstaff

Geometry: Basin 5 Proposed at Langstaff Steady Flow: 2019 Don River Flow Update

| Daseu on | NCW 201 | 3110443  |            |           |           |           |           |          |        | _     |        |
|----------|---------|----------|------------|-----------|-----------|-----------|-----------|----------|--------|-------|--------|
|          |         |          | El         | Min Ch    | W.S.      | Cook MAC  | E.G.      | Velocity | Flow   | Top   | Froude |
|          | River   |          | Flow       | Elevation | Elevation | Crit W.S. | Elevation | Channel  | Area   | Width | #      |
| Reach    | Station | Profile  | (m³/s)     | (m)       | (m)       | (m)       | (m)       | (m/s)    | (m2)   | (m)   |        |
|          |         |          | 2.00       | 04040     | 04000     | 21521     | 245.27    | 0.74     |        | 47.05 | 0.50   |
| Reach-1  | 50.44   | 2 Year   | 0.89       | 216.18    |           |           | 216.37    | 0.51     | 1.73   | 17.85 | 0.53   |
| Reach-1  | 50.44   | 5 Year   | 1.18       | 216.18    |           | 216.33    | 216.39    | 0.58     | 2.03   | 19.31 | 0.57   |
| Reach-1  | 50.44   | 10 Year  | 1.37       | 216.18    |           |           | 216.40    | 0.62     | 2.20   | 20.11 | 0.60   |
| Reach-1  | 50.44   | 25 Year  | 1.61       | 216.18    |           | 216.35    | 216.41    | 0.68     | 2.35   | 20.78 | 0.65   |
| Reach-1  | 50.44   | 50 Year  | 1.84       | 216.18    | 216.39    | 216.36    | 216.42    | 0.75     | 2.46   | 21.23 | 0.70   |
| Reach-1  | 50.44   | 100 Year | 2.34       |           |           |           | 216.44    | 0.89     | 2.62   | 21.92 | 0.82   |
| Reach-1  | 50.44   | Regional | 27.60      | 216.18    | 216.75    | 216.75    | 216.92    | 1.84     | 15.03  | 44.78 | 1.01   |
|          |         |          |            |           |           |           |           |          |        |       |        |
|          |         |          |            |           |           |           |           |          |        |       |        |
| Reach-1  | 50.29   | 2 Year   | 1.67       | 205.81    | 205.80    | 205.41    | 205.80    |          | 21.65  | 50.36 | 0.00   |
| Reach-1  | 50.29   | 5 Year   | 2.27       | 205.81    | 205.89    | 205.42    | 205.89    | 0.03     | 27.16  | 63.18 | 0.04   |
| Reach-1  | 50.29   | 10 Year  | 2.66       | 205.81    | 205.94    | 205.43    | 205.94    | 0.05     | 30.36  | 63.58 | 0.04   |
| Reach-1  | 50.29   | 25 Year  | 3.16       | 205.81    | 205.99    | 205.44    | 205.99    | 0.06     | 34.03  | 64.04 | 0.05   |
| Reach-1  | 50.29   | 50 Year  | 3.69       | 205.81    | 206.05    | 205.44    | 206.05    | 0.07     | 37.64  | 64.72 | 0.05   |
| Reach-1  | 50.29   | 100 Year | 4.42       | 205.81    | 206.12    | 205.45    | 206.12    | 0.09     | 42.14  | 65.59 | 0.05   |
| Reach-1  | 50.29   | Regional | 36.24      | 205.81    | 207.63    | 205.74    | 207.63    | 0.31     | 155.51 | 84.64 | 0.07   |
|          |         |          |            |           |           |           |           |          |        |       |        |
| Reach-1  | 50.285  |          | Inl Struct |           |           |           |           |          |        |       |        |
|          |         |          |            |           |           |           |           |          |        |       |        |
| Reach-1  | 50.28   | 2 Year   | 1.67       | 205.75    | 205.79    |           | 205.79    | 0.02     | 19.64  | 57.73 | 0.04   |
| Reach-1  | 50.28   | 5 Year   | 2.27       | 205.75    | 205.88    |           | 205.88    | 0.05     | 24.94  | 58.82 | 0.05   |
| Reach-1  | 50.28   | 10 Year  | 2.66       | 205.75    | 205.93    |           | 205.93    | 0.07     | 27.90  | 59.42 | 0.05   |
| Reach-1  | 50.28   | 25 Year  | 3.16       | 205.75    | 205.99    |           | 205.99    | 0.08     | 31.34  | 60.10 | 0.05   |
| Reach-1  | 50.28   | 50 Year  | 3.69       | 205.75    | 206.05    |           | 206.05    | 0.09     | 34.74  | 61.09 | 0.05   |
| Reach-1  | 50.28   | 100 Year | 4.42       | 205.75    | 206.12    |           | 206.12    | 0.11     | 39.01  | 62.37 | 0.06   |
| Reach-1  | 50.28   | Regional | 36.24      | 205.75    | 207.63    |           | 207.63    | 0.33     | 153.57 | 87.87 | 0.08   |
|          |         | -0 -     |            |           |           |           |           |          |        |       |        |
| Reach-1  | 50.27   | 2 Year   | 1.67       | 205.30    | 205.77    |           | 205.78    | 0.28     | 5.94   | 15.60 | 0.15   |
| Reach-1  | 50.27   | 5 Year   | 2.27       |           |           |           | 205.87    | 0.31     | 7.39   | 16.13 | 0.15   |
| Reach-1  | 50.27   | 10 Year  | 2.66       |           |           |           | 205.92    | 0.32     | 8.20   | 16.42 | 0.15   |
| Reach-1  | 50.27   | 25 Year  | 3.16       |           |           |           | 205.98    | 0.35     | 9.14   | 16.75 | 0.15   |
| Reach-1  | 50.27   | 50 Year  | 3.69       |           |           |           | 206.03    | 0.37     | 10.08  | 17.08 | 0.15   |
| Reach-1  | 50.27   | 100 Year | 4.42       |           |           |           | 206.10    | 0.39     | 11.25  | 17.47 | 0.16   |
| Reach-1  | 50.27   | Regional | 36.24      |           |           |           | 207.61    | 0.84     | 43.39  | 25.70 | 0.10   |
| cacii I  | 30.27   | regional | 30.24      | 200.00    | 207.50    |           | 207.01    | 0.04     | +3.33  | 23.70 | 0.21   |
| Reach-1  | 50.26   | 2 Year   | 1.67       | 205.08    | 205.72    |           | 205.73    | 0.36     | 4.70   | 10.58 | 0.17   |
| Reach-1  | 50.26   | 5 Year   | 2.27       | 205.08    |           |           | 205.82    | 0.40     | 5.69   | 11.42 | 0.17   |
| Reach-1  | 50.26   | 10 Year  | 2.66       |           |           |           | 205.82    | 0.40     | 6.25   | 11.42 | 0.18   |
| Reach-1  | 50.26   | 25 Year  | 3.16       |           |           |           | 205.87    | 0.45     | 6.23   | 12.37 | 0.19   |
|          |         |          | 3.69       |           |           |           | 205.92    | 0.46     | 7.58   |       | 0.20   |
| Reach-1  | 50.26   | 50 Year  |            |           |           |           |           |          |        | 12.86 |        |
| Reach-1  | 50.26   | 100 Year | 4.42       |           |           |           | 206.04    | 0.52     | 8.42   | 13.46 | 0.21   |
| Reach-1  | 50.26   | Regional | 36.24      | 205.08    | 207.48    |           | 207.54    | 1.11     | 36.01  | 23.65 | 0.25   |
| Decel 4  | F0 3F   | 2 V      | 4.67       | 20454     | 205.72    | 204.70    | 205 72    | 0.30     | F 04   | C 35  | 0.00   |
| Reach-1  | 50.25   | 2 Year   | 1.67       | 204.54    | 205.72    | 204.76    | 205.73    | 0.28     | 5.91   | 6.25  | 0.08   |

# **Langstaff Road EA**

# **Westminster Creek**

# **Existing Conditions Hydraulic Analysis Summary**

# May 2019 Update

Model: "Basin 5\_May2019\_Rev Opt 4"

Plan: Proposed at Langstaff

Geometry: Basin 5 Proposed at Langstaff Steady Flow: 2019 Don River Flow Update

# Based on New 2019 Flows

|         |         |          |                | Min Ch    | W.S.      |           | E.G.      | Velocity | Flow  | Тор   | Froude |
|---------|---------|----------|----------------|-----------|-----------|-----------|-----------|----------|-------|-------|--------|
|         | River   |          | Flow<br>(m³/s) | Elevation | Elevation | Crit W.S. | Elevation | Channel  | Area  | Width | #      |
| Reach   | Station | Profile  |                | (m)       | (m)       | (m)       | (m)       | (m/s)    | (m2)  | (m)   |        |
| Reach-1 | 50.25   | 5 Year   | 2.27           | 204.54    | 205.81    | 204.82    | 205.82    | 0.36     | 6.35  | 6.32  | 0.10   |
| Reach-1 | 50.25   | 10 Year  | 2.66           | 204.54    | 205.86    | 204.85    | 205.87    | 0.40     | 6.59  | 6.35  | 0.11   |
| Reach-1 | 50.25   | 25 Year  | 3.16           | 204.54    | 205.91    | 204.88    | 205.92    | 0.46     | 6.86  | 6.38  | 0.13   |
| Reach-1 | 50.25   | 50 Year  | 3.69           | 204.54    | 205.96    | 204.92    | 205.98    | 0.52     | 7.11  | 6.40  | 0.14   |
| Reach-1 | 50.25   |          | 4.42           | 204.54    | 206.02    | 204.97    | 206.04    | 0.60     | 7.42  | 6.43  | 0.16   |
| Reach-1 | 50.25   | Regional | 36.24          | 204.54    | 207.09    | 206.29    | 207.50    | 2.84     | 12.75 | 7.72  | 0.57   |
| Reach-1 | 50.245  |          | Culvert        |           |           |           |           |          |       |       |        |
| Reach-1 | 50.24   | 2 Year   | 1.67           | 204.44    | 205.72    | 204.67    | 205.72    | 0.26     | 6.40  | 7.44  | 0.07   |
| Reach-1 | 50.24   | 5 Year   | 2.27           | 204.44    | 205.81    | 204.72    | 205.81    | 0.33     | 6.84  | 7.61  | 0.09   |
| Reach-1 | 50.24   | 10 Year  | 2.66           | 204.44    | 205.85    | 204.75    | 205.86    | 0.38     | 7.07  | 7.69  | 0.10   |
| Reach-1 | 50.24   | 25 Year  | 3.16           | 204.44    | 205.91    | 204.78    | 205.92    | 0.43     | 7.34  | 7.79  | 0.11   |
| Reach-1 | 50.24   | 50 Year  | 3.69           | 204.44    | 205.96    | 204.82    | 205.97    | 0.49     | 7.59  | 7.89  | 0.13   |
| Reach-1 | 50.24   | 100 Year | 4.42           | 204.44    | 206.02    | 204.87    | 206.03    | 0.56     | 7.88  | 8.00  | 0.14   |
| Reach-1 | 50.24   | Regional | 36.24          | 204.44    | 206.70    | 206.19    | 207.22    | 3.21     | 11.28 | 9.17  | 0.68   |
| Reach-1 | 50.23   | 2 Year   | 1.67           | 205.05    | 205.64    | 205.55    | 205.72    | 1.20     | 1.40  | 4.50  | 0.68   |
| Reach-1 | 50.23   | 5 Year   | 2.27           | 205.05    | 205.72    | 205.62    | 205.80    | 1.27     | 1.79  | 5.33  | 0.70   |
| Reach-1 | 50.23   | 10 Year  | 2.66           | 205.05    | 205.76    | 205.66    | 205.85    | 1.32     | 2.02  | 5.76  | 0.71   |
| Reach-1 | 50.23   | 25 Year  | 3.16           | 205.05    | 205.81    | 205.71    | 205.91    | 1.38     | 2.29  | 6.23  | 0.73   |
| Reach-1 | 50.23   | 50 Year  | 3.69           | 205.05    | 205.85    | 205.76    | 205.96    | 1.43     | 2.58  | 6.70  | 0.74   |
| Reach-1 | 50.23   |          | 4.42           | 205.05    | 205.90    | 205.81    | 206.02    | 1.51     | 2.93  | 7.24  | 0.76   |
| Reach-1 | 50.23   | Regional | 36.24          | 205.05    | 206.75    | 206.75    | 207.16    | 2.86     | 12.67 | 15.50 | 1.01   |
|         |         |          |                |           |           |           |           |          |       |       |        |
| Reach-1 | 50.22   | 2 Year   | 1.67           | 203.31    | 203.66    | 203.66    | 203.76    | 1.42     | 1.17  | 5.69  | 1.00   |
| Reach-1 | 50.22   | 5 Year   | 2.27           | 203.31    | 203.72    | 203.72    | 203.83    | 1.44     | 1.58  | 7.63  | 1.01   |
| Reach-1 | 50.22   | 10 Year  |                | 203.31    | 203.75    | 203.75    | 203.86    | 1.46     | 1.82  | 8.59  | 1.01   |
| Reach-1 | 50.22   |          | 3.16           |           | 203.78    |           |           |          | 2.13  | 9.67  | 1.01   |
| Reach-1 | 50.22   |          | 3.69           | 203.31    | 203.81    | 203.81    | 203.93    | 1.53     | 2.41  | 10.50 | 1.02   |
| Reach-1 | 50.22   |          | 4.42           | 203.31    | 203.84    | 203.84    | 203.97    | 1.61     | 2.74  | 10.76 | 1.02   |
| Reach-1 | 50.22   | Regional | 36.24          | 203.31    | 204.85    |           | 205.11    | 2.24     | 16.19 | 15.29 | 0.69   |
| Reach-1 | 50.21   | 2 Year   | 1.67           | 201.65    | 202.29    |           | 202.31    | 0.61     | 2.73  | 7.50  | 0.32   |
| Reach-1 | 50.21   | 5 Year   | 2.27           | 201.65    | 202.35    |           | 202.37    | 0.70     | 3.23  | 8.10  | 0.36   |
| Reach-1 | 50.21   | 10 Year  | 2.66           | 201.65    | 202.39    |           | 202.42    | 0.75     | 3.53  | 8.41  | 0.37   |
| Reach-1 | 50.21   | 25 Year  | 3.16           | 201.65    | 202.43    |           | 202.46    | 0.81     | 3.92  | 8.72  | 0.38   |
| Reach-1 | 50.21   | 50 Year  | 3.69           | 201.65    | 202.49    |           | 202.52    | 0.83     | 4.43  | 9.02  | 0.38   |
| Reach-1 | 50.21   | 100 Year | 4.42           | 201.65    | 202.54    |           | 202.59    | 0.90     | 4.93  | 9.31  | 0.39   |
| Reach-1 | 50.21   | Regional | 36.24          | 201.65    | 204.84    |           | 204.88    | 0.87     | 41.85 | 24.02 | 0.21   |
| Reach-1 | 50.20   | 2 Year   | 2.63           | 201.20    | 201.79    |           | 201.85    | 1.08     | 2.43  | 6.81  | 0.58   |
| Reach-1 | 50.20   |          | 3.07           | 201.20    | 201.83    |           | 201.89    | 1.14     | 2.68  | 7.04  | 0.59   |
| Reach-1 | 50.20   |          |                | 201.20    |           |           | 201.92    | 1.18     | 2.83  | 7.17  | 0.60   |
| Reach-1 | 50.20   |          |                | 201.20    | 201.88    |           | 201.96    |          | 3.08  | 7.39  | 0.61   |

# **Langstaff Road EA**

# **Westminster Creek**

# **Existing Conditions Hydraulic Analysis Summary**

# May 2019 Update

Model: "Basin 5\_May2019\_Rev Opt 4"

Plan: Proposed at Langstaff

Geometry: Basin 5 Proposed at Langstaff Steady Flow: 2019 Don River Flow Update

# Based on New 2019 Flows

|         |         |          |            | Min Ch    | W.S.        |           | E.G.      | Velocity | Flow  | Тор   | Froude |
|---------|---------|----------|------------|-----------|-------------|-----------|-----------|----------|-------|-------|--------|
|         | River   |          | Flow       | Elevation | Elevation   | Crit W.S. | Elevation | Channel  | Area  | Width | #      |
| Reach   | Station | Profile  | (m³/s)     | (m)       | (m)         | (m)       | (m)       | (m/s)    | (m2)  | (m)   |        |
| Reach-1 | 50.20   | 50 Year  | 4.56       | 201.20    | 201.94      |           | 202.02    | 1.31     | 3.48  | 7.72  | 0.62   |
| Reach-1 | 50.20   | 100 Year | 5.22       | 201.20    | 201.98      |           | 202.07    | 1.37     | 3.82  | 8.00  | 0.63   |
| Reach-1 | 50.20   | Regional | 62.64      | 201.20    | 204.70      |           | 204.78    | 1.24     | 51.47 | 42.13 | 0.29   |
|         |         |          |            |           |             |           |           |          |       |       |        |
| Reach-1 | 50.19   | 2 Year   | 2.63       | 199.73    | 200.31      | 200.31    | 200.49    | 1.85     | 1.42  | 4.16  | 1.01   |
| Reach-1 | 50.19   | 5 Year   | 3.07       | 199.73    | 200.37      | 200.37    | 200.54    | 1.87     | 1.64  | 5.09  | 0.99   |
| Reach-1 | 50.19   | 10 Year  | 3.34       | 199.73    | 200.39      | 200.39    | 200.57    | 1.90     | 1.79  | 5.67  | 0.98   |
| Reach-1 | 50.19   | 25 Year  | 3.80       | 199.73    | 200.43      | 200.43    | 200.62    | 1.96     | 2.00  | 5.78  | 0.97   |
| Reach-1 | 50.19   | 50 Year  | 4.56       | 199.73    | 200.48      | 200.48    | 200.69    | 2.06     | 2.31  | 5.96  | 0.96   |
| Reach-1 | 50.19   | 100 Year | 5.22       | 199.73    | 200.52      | 200.52    | 200.75    | 2.14     | 2.57  | 6.09  | 0.96   |
| Reach-1 | 50.19   | Regional | 62.64      | 199.73    | 204.59      |           | 204.69    | 1.69     | 77.31 | 65.28 | 0.25   |
|         |         |          |            |           |             |           |           |          |       |       |        |
| Reach-1 | 50.18   | 2 Year   | 2.63       | 199.56    | 200.22      | 199.95    | 200.25    | 0.82     | 3.20  | 6.38  | 0.37   |
| Reach-1 | 50.18   | 5 Year   | 3.07       | 199.56    | 200.28      | 199.98    | 200.31    | 0.86     | 3.56  | 6.53  | 0.37   |
| Reach-1 | 50.18   | 10 Year  | 3.34       | 199.56    | 200.31      | 200.00    | 200.35    | 0.88     | 3.78  | 6.61  | 0.37   |
| Reach-1 | 50.18   | 25 Year  | 3.80       | 199.56    | 200.36      | 200.03    | 200.40    | 0.92     | 4.12  | 6.75  | 0.38   |
| Reach-1 | 50.18   | 50 Year  | 4.56       | 199.56    | 200.44      | 200.08    | 200.49    | 0.98     | 4.65  | 6.95  | 0.38   |
| Reach-1 | 50.18   | 100 Year | 5.22       | 199.56    | 200.50      | 200.11    | 200.56    | 1.02     | 5.10  | 7.12  | 0.39   |
| Reach-1 | 50.18   | Regional | 62.64      | 199.56    | 204.60      | 201.72    | 204.66    | 1.17     | 84.85 | 48.28 | 0.17   |
| Danah 1 | E0 47E  |          | Colorant a | + \4/+    |             | -         |           |          |       |       |        |
| Reach-1 | 50.175  |          | Cuivert a  | t westmir | nster Creel | <b>(</b>  |           |          |       |       |        |
| Danah 1 | FO 47   | 2.٧      | 2.62       | 100.40    | 200.24      | 100.00    | 200.25    | 0.04     | 2.42  | 0.27  | 0.42   |
| Reach-1 | 50.17   | 2 Year   | 2.63       | 199.49    | 200.21      | 199.99    | 200.25    | 0.84     | 3.12  | 9.27  | 0.42   |
| Reach-1 | 50.17   | 5 Year   | 3.07       | 199.49    | 200.27      | 200.02    | 200.30    | 0.86     | 3.57  | 10.06 | 0.41   |
| Reach-1 | 50.17   | 10 Year  | 3.34       | 199.49    | 200.30      | 200.04    | 200.34    | 0.87     | 3.85  | 10.43 | 0.41   |
| Reach-1 | 50.17   | 25 Year  | 3.8        | 199.49    | 200.35      | 200.07    | 200.39    | 0.88     | 4.30  | 10.89 | 0.40   |
| Reach-1 | 50.17   | 50 Year  | 4.56       | 199.49    | 200.43      | 200.12    | 200.47    | 0.92     | 4.98  | 11.23 | 0.39   |
| Reach-1 | 50.17   | 100 Year | 5.22       | 199.49    |             | 200.16    | 200.54    | 0.94     | 5.54  | 11.50 | 0.38   |
| Reach-1 | 50.17   | Regional | 62.64      | 199.49    | 202.77      | 201.37    | 202.90    | 1.58     | 42.05 | 22.30 | 0.32   |
| Reach-1 | 50.16   | 2 Year   | 2.63       | 199.48    | 200.20      |           | 200.23    | 0.76     | 3.48  | 7.24  | 0.34   |
| Reach-1 | 50.16   | 5 Year   | 3.07       | 199.48    | 200.26      |           | 200.29    | 0.80     | 3.90  | 7.62  | 0.34   |
| Reach-1 | 50.16   | 10 Year  |            | 199.48    | 200.29      |           | 200.33    | 0.82     | 4.15  | 7.73  | 0.34   |
| Reach-1 | 50.16   | 25 Year  | 3.8        | 199.48    |             |           | 200.38    | 0.85     | 4.56  | 7.91  | 0.34   |
| Reach-1 | 50.16   | 50 Year  | 4.56       | 199.48    | 200.42      |           | 200.46    | 0.91     | 5.23  | 9.67  | 0.34   |
| Reach-1 | 50.16   |          | 5.22       | 199.48    |             |           | 200.53    | 0.95     | 5.86  | 9.99  | 0.34   |
| Reach-1 | 50.16   |          | 62.64      | 199.48    | 202.72      |           | 202.89    | 2.10     | 43.61 | 24.83 | 0.39   |
|         | 00120   |          |            |           |             |           |           |          |       |       |        |
| Reach-1 | 50.15   | 2 Year   | 2.63       | 199.20    | 200.05      |           | 200.08    | 0.85     | 3.11  | 5.85  | 0.37   |
| Reach-1 | 50.15   | 5 Year   | 3.07       | 199.20    | 200.10      |           | 200.14    | 0.89     | 3.43  | 6.13  | 0.38   |
| Reach-1 | 50.15   | 10 Year  | 3.34       | 199.20    |             |           | 200.17    | 0.92     | 3.62  | 6.28  | 0.39   |
| Reach-1 | 50.15   | 25 Year  | 3.8        | 199.20    | 200.18      |           | 200.23    | 0.96     | 3.94  | 6.54  | 0.40   |
| Reach-1 | 50.15   | 50 Year  | 4.56       | 199.20    | 200.26      |           | 200.31    | 1.02     | 4.45  | 6.93  | 0.41   |
| Reach-1 | 50.15   |          | 5.22       | 199.20    | 200.32      |           | 200.38    | 1.07     | 4.90  | 7.35  | 0.42   |
| Reach-1 | 50.15   | Regional | 62.64      | 199.20    | 202.65      |           | 202.78    | 1.76     | 51.34 | 45.61 | 0.36   |

# **Langstaff Road EA**

# **Westminster Creek**

# **Existing Conditions Hydraulic Analysis Summary**

# May 2019 Update

Model: "Basin 5\_May2019\_Rev Opt 4"

Plan: Proposed at Langstaff

Geometry: Basin 5 Proposed at Langstaff Steady Flow: 2019 Don River Flow Update

# Based on New 2019 Flows

|             |            |           |           | Min Ch    | W.S.      |           | E.G.      | Velocity | Flow   | Тор    | Froude |
|-------------|------------|-----------|-----------|-----------|-----------|-----------|-----------|----------|--------|--------|--------|
|             | <b>5</b> . |           | Flow      | Elevation | Elevation | Crit W.S. | Elevation | Channel  | Area   | Width  | #      |
| Danah       | River      | Duckila   | (m³/s)    |           | (m)       |           | (m)       | (m/s)    | (m2)   | (m)    | "      |
| Reach       | Station    | Profile   | (111 / 3) | (m)       | (111)     | (m)       | (111)     | (111/5)  | (1112) | (111)  |        |
| D = = =   1 | FO 1.4     | 2 //      | 2.62      | 100.64    | 100.24    | 100.20    | 100.20    | 1.00     | 4.57   | 4.24   | 0.00   |
| Reach-1     | 50.14      | 2 Year    | 2.63      | 198.64    | 199.24    | 199.20    | 199.38    | 1.68     | 1.57   | 4.24   | 0.88   |
| Reach-1     | 50.14      | 5 Year    | 3.07      | 198.64    | 199.30    |           | 199.44    | 1.68     | 1.83   | 4.57   | 0.85   |
| Reach-1     | 50.14      | 10 Year   | 3.34      | 198.64    | 199.33    |           | 199.48    | 1.68     | 1.99   | 4.75   | 0.83   |
| Reach-1     | 50.14      | 25 Year   | 3.8       | 198.64    | 199.38    |           | 199.53    | 1.69     | 2.24   | 5.04   | 0.81   |
| Reach-1     | 50.14      | 50 Year   | 4.56      | 198.64    | 199.46    |           | 199.61    | 1.72     | 2.65   | 5.46   | 0.79   |
| Reach-1     | 50.14      | 100 Year  | 5.22      | 198.64    | 199.52    |           | 199.68    | 1.75     | 2.98   | 5.79   | 0.78   |
| Reach-1     | 50.14      | Regional  | 62.64     | 198.64    | 202.66    |           | 202.68    | 0.70     | 162.65 | 182.32 | 0.15   |
|             |            |           |           |           |           |           |           |          |        |        |        |
| Reach-1     | 50.13      | 2 Year    | 2.63      |           | 199.32    | 198.76    | 199.33    | 0.49     | 5.36   | 7.63   | 0.17   |
| Reach-1     | 50.13      | 5 Year    | 3.07      | 198.50    | 199.38    | 198.78    | 199.39    | 0.53     | 5.74   | 7.71   | 0.18   |
| Reach-1     | 50.13      | 10 Year   | 3.34      | 198.50    | 199.41    | 198.80    | 199.43    | 0.56     | 5.95   | 7.76   | 0.19   |
| Reach-1     | 50.13      | 25 Year   | 3.8       | 198.50    | 199.46    | 198.83    | 199.48    | 0.60     | 6.29   | 7.83   | 0.20   |
| Reach-1     | 50.13      | 50 Year   | 4.56      | 198.50    | 199.54    | 198.87    | 199.56    | 0.67     | 6.80   | 7.94   | 0.21   |
| Reach-1     | 50.13      | 100 Year  | 5.22      | 198.50    | 199.60    | 198.90    | 199.62    | 0.73     | 7.18   | 8.02   | 0.22   |
| Reach-1     | 50.13      | Regional  | 62.64     | 198.50    | 202.66    | 200.61    | 202.68    | 0.74     | 185.73 | 212.04 | 0.13   |
|             |            |           |           |           |           |           |           |          |        |        |        |
| Reach-1     | 50.125     |           | Culvert   |           |           |           |           |          |        |        |        |
|             |            |           |           |           |           |           |           |          |        |        |        |
| Reach-1     | 50.12      | 2 Year    | 2.63      | 198.38    | 199.31    | 198.64    | 199.32    | 0.43     | 6.09   | 8.21   | 0.14   |
| Reach-1     | 50.12      | 5 Year    | 3.07      | 198.38    | 199.37    | 198.66    | 199.38    | 0.48     | 6.45   | 8.27   | 0.15   |
| Reach-1     | 50.12      | 10 Year   | 3.34      | 198.38    | 199.40    | 198.68    | 199.41    | 0.50     | 6.66   | 8.31   | 0.16   |
| Reach-1     | 50.12      | 25 Year   | 3.8       | 198.38    | 199.45    | 198.71    | 199.46    | 0.54     | 6.99   | 8.36   | 0.17   |
| Reach-1     | 50.12      | 50 Year   | 4.56      | 198.38    | 199.52    | 198.75    | 199.54    | 0.61     | 7.47   | 8.44   | 0.18   |
| Reach-1     | 50.12      | 100 Year  | 5.22      | 198.38    | 199.58    | 198.78    | 199.60    | 0.67     | 7.83   | 8.51   | 0.19   |
| Reach-1     | 50.12      | Regional  | 62.64     | 198.38    | 201.41    | 200.30    | 201.69    | 2.35     | 27.58  | 16.95  | 0.47   |
|             |            | <u> </u>  |           |           |           |           |           |          |        |        |        |
| Reach-1     | 50.11      | 2 Year    | 2.63      | 198.50    | 199.11    | 199.11    | 199.30    | 1.89     | 1.39   | 3.92   | 1.01   |
| Reach-1     | 50.11      | 5 Year    |           |           |           |           |           |          | 1.58   | 4.17   | 1.01   |
| Reach-1     | 50.11      | 10 Year   | 3.34      |           |           |           | 199.39    | 1.97     | 1.70   | 4.38   | 1.01   |
| Reach-1     | 50.11      | 25 Year   | 3.8       |           |           |           | 199.44    | 1.99     | 1.91   | 4.73   | 1.00   |
| Reach-1     | 50.11      | 50 Year   | 4.56      |           |           |           | 199.51    | 2.06     | 2.21   | 5.22   | 1.01   |
| Reach-1     | 50.11      | 100 Year  | 5.22      |           |           | 199.35    | 199.57    | 2.09     | 2.50   | 5.63   | 1.00   |
| Reach-1     | 50.11      | Regional  |           |           |           | 133.33    | 201.65    | 2.08     | 30.13  | 20.69  | 0.55   |
| incacii 1   | 30.11      | ricgional | 02.04     | 130.30    | 201.43    |           | 201.03    | 2.00     | 30.13  | 20.03  | 0.55   |
| Reach-1     | 50.10      | 2 Year    | 2.72      | 197.86    | 198.73    |           | 198.76    | 0.78     | 3.47   | 6.80   | 0.35   |
| Reach-1     | 50.10      | 5 Year    | 3.19      |           |           |           | 198.83    | 0.78     | 3.89   | 7.19   | 0.36   |
| Reach-1     | 50.10      | 10 Year   | 3.46      |           |           |           | 198.86    | 0.82     | 4.11   | 7.19   | 0.36   |
|             |            |           |           |           |           |           |           |          |        |        |        |
| Reach-1     | 50.10      | 25 Year   |           |           |           |           | 198.91    |          | 4.50   | 7.72   | 0.37   |
| Reach-1     | 50.10      | 50 Year   | 4.71      | 197.86    |           |           | 198.99    | 0.92     | 5.09   | 8.20   | 0.37   |
| Reach-1     | 50.10      |           | 5.42      |           |           |           | 199.06    | 0.96     | 5.63   | 8.61   | 0.38   |
| Reach-1     | 50.10      | Regional  | 63.27     | 197.86    | 201.35    |           | 201.47    | 1.49     | 42.43  | 23.20  | 0.35   |
|             |            |           |           |           |           |           |           |          |        |        |        |

# York Region Langstaff Road EA

# **Culvert Hydraulics**

# **Culvert Designer/Analyzer Report Culvert LC1**

| Peak Discharge Method:<br>User-Specified    |             |              |          |              |
|---|-------------|--------------|----------|--------------|
| Design Discharge                            | 2.8970 m³/s | Check Discha | arge     | 3.2140 m³/s  |
| Grades Model: Inverts                       |             |              |          |              |
| Invert Upstream                             | 205.35 m    | Invert Downs | tream    | 205.10 m     |
| Length                                      | 68.00 m     | Slope        |          | 0.003676 m/m |
| Drop  | 0.25 m      |              |          |              |
| Headwater Model:<br>Unspecified             |             |              |          |              |
|   |             |              |          |              |
| Tailwater Conditions:<br>Constant Tailwater |             |              |          |              |
| Tailwater Elevation                         | 205.50 m    |              |          |              |
| Name  | Description | Discharge    | HW Elev. | Velocity     |

# Culvert Designer/Analyzer Report Culvert LC1

Design: Trial-4 (50-Year)

Solve For: Headwater Elevation

| Culvert Summary                 |                    |                              |                          |
|---------------------------------|--------------------|------------------------------|--------------------------|
| Allowable HW Elevation          | N/A m              | Storm Event                  | Design                   |
| Computed Headwater<br>Elevation | 206.24 m           | Discharge                    | 2.8970 m <sup>3</sup> /s |
| Headwater Depth/Height          | 0.58               | Tailwater Elevation          | 205.50 m                 |
| Inlet Control HW Elev.          | 206.24 m           | Control Type                 | Inlet                    |
| 0 4 4 0 4 1 1 1 1 1 1 1 1       | 000.40             |                              | Control                  |
| Outlet Control HW Elev.         | 206.19 m           |                              |                          |
| Grades                          |                    |                              |                          |
| Upstream Invert                 | 205.35 m           | Downstream Invert            | 205.10 m                 |
| Length                          | 68.00 m            | Constructed Slope            | 0.003676 m/m             |
|                                 |                    |                              |                          |
| Hydraulic Profile               |                    |                              |                          |
| Profile                         | S2                 | Depth, Downstream            | 0.51 m                   |
| Slope Type                      | Steep              | Normal Depth                 | 0.51 m                   |
| Flow Regime                     | Supercritical      | Critical Depth               | 0.52 m                   |
| Velocity Downstream             | 2.35 m             | /s Critical Slope            | 0.003311 m/m             |
|                                 |                    |                              |                          |
| Section                         |                    |                              |                          |
| Section Shape                   | Box                | Manning's Coefficient        | 0.013                    |
| Section Material                | Concrete           | Span                         | 2.44 m                   |
| Section Size                    | 2440 x 1520 mm     | Rise                         | 1.52 m                   |
| Number Sections                 | 1                  |                              |                          |
| Outlet Control Properties       |                    |                              |                          |
| Outlet Control HW Elev.         | 206.19 m           | Upstream Velocity Head       | 0.26 m                   |
| Ke                              | 0.20               | Entrance Loss                | 0.05 m                   |
|                                 |                    |                              |                          |
| Inlet Control Properties        |                    |                              |                          |
| Inlet Control HW Elev.          | 206.24 m           | Flow Control                 | Unsubme rged             |
| Inlet Type                      | 0° wingwall flares | Area Full                    | 3.7 m <sup>2</sup>       |
| K                               | 0.06100            | HDS 5 Chart                  | 8                        |
| 1.5                             |                    |                              |                          |
| M                               | 0.75000            | HDS 5 Scale                  | 3                        |
| * *                             |                    | HDS 5 Scale<br>Equation Form | 3<br>1                   |

# Culvert Designer/Analyzer Report Culvert LC1

Check: Trial-1 (100-year)

Solve For: Headwater Elevation

| Culvert Summary           |                    |               |                       |                 |      |
|---------------------------|--------------------|---------------|-----------------------|-----------------|------|
| Allowable HW Elevation    | N/A                | m             | Storm Event           | Check           |      |
| Computed Headwater        | 206.30             | m             | Discharge             | 3.2140          | m³/s |
| Elevation                 |                    |               | T 11 ( E) (1          | 005.50          |      |
| Headwater Depth/Height    | 0.62               |               | Tailwater Elevation   | 205.50          | m    |
| Inlet Control HW Elev.    | 206.30             | m             | Control Type          | Inlet           |      |
| Outlet Control HW Elev.   | 206.25             | m             |                       | Control         |      |
| Grades                    |                    |               |                       |                 |      |
| Upstream Invert           | 205.35             | m             | Downstream Invert     | 205.10          | m    |
| Length                    | 68.00              |               | Constructed Slope     | 0.003676        |      |
|                           |                    |               |                       |                 |      |
| Hydraulic Profile         |                    |               |                       |                 |      |
| Profile                   | S2                 |               | Depth, Downstream     | 0.54            | m    |
| Slope Type                | Steep              |               | Normal Depth          | 0.54            | m    |
| Flow Regime               | Supercritical      |               | Critical Depth        | 0.56            | m    |
| Velocity Downstream       | 2.43               | m/s           | Critical Slope        | 0.003329        | m/m  |
| Section                   |                    |               |                       |                 |      |
| Section Shape             | Box                |               | Manning's Coefficient | 0.013           |      |
| Section Material          | Concrete           |               | Span                  | 2.44            | m    |
| Section Size              | 2440 x 1520 mm     |               | Rise                  | 1.52            | m    |
| Number Sections           | 1                  |               |                       |                 |      |
| Outlet Control Properties |                    |               |                       |                 |      |
| Outlet Control HW Elev.   | 206.25 m           | Upstr         | eam Velocity Head     | 0.28 m          | •    |
| Ke                        | 0.20               | Entrance Loss |                       | 0.06 m          |      |
| Inlet Control Properties  |                    |               |                       |                 |      |
| ·                         |                    |               |                       |                 |      |
| Inlet Control HW Elev.    | 206.30             | m             | Flow Control          | Unsubme<br>rged |      |
| Inlet Type                | 0° wingwall flares |               | Area Full             | 3.7             | m²   |
| K                         | 0.06100            |               | HDS 5 Chart           | 8               |      |
| M                         | 0.75000            |               | HDS 5 Scale           | 3               |      |
| С                         | 0.04230            |               | Equation Form         | 1               |      |
| Υ                         | 0.82000            |               |                       |                 |      |
|                           |                    |               |                       |                 |      |

# **APPENDIX**

D

Fluvial Geomorphology Report

# Langstaff Road Class Environmental Assessment, Fluvial Geomorphological Support Vaughan, Ontario

# Geomorphological Erosion and Meander Belt Width Assessment



Prepared for: WSP/MMM Group 610 Chartwell Rd, Suite 300 Oakville, ON

June 30, 2017 PN17032



Report Prepared by: GEO Morphix Ltd.

2800 High Point Drive

Suite 100A

Milton, ON L9T 6P4

Report Title: Langstaff Road Class Environmental Assessment,

Fluvial Geomorphological Support

Geomorphological Erosion and Meander Belt Width

i

Assessment Vaughan, Ontario

Project Number: PN17032

Status: Draft

Version: 0.1

First Submission Date: June 30, 2017

Revision Date N/A

Prepared by: Bryce Molder, M.Sc.

Approved by: Paul Villard, Ph.D., P.Geo.

Approval Date: June 30, 2017

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# 1 Introduction

This report outlines the geomorphological study completed to support the Environmental Assessment (EA) associated with improvements along Langstaff Road in Vaughan. Three watercourses were identified and assessed within the project limits, in the road right-of-way, located along Langstaff Road between Dufferin Street and the Highway 400 interchange. The assessed watercourses include Black Creek, the West Branch of the Don River, and Westminster Creek. In addition to the EA, an erosion hazard assessment was completed for the West Branch of the Don River to inform crossing requirements and the potential impact to aquatic habitat.

The geomorphological assessment included the following activities:

- A review of watershed characteristics that directly influence the local geomorphology;
- Field investigation to document channel conditions and determine the meander belt width and erosion hazards, where applicable;
- Rapid field assessments, including a Rapid Geomorphic Assessment to evaluate channel stability, and Rapid Stream Assessment Technique to determine stream 'health'; and
- Preliminary design recommendations for the proposed crossing structures, from a geomorphological perspective.

### 2 Field Assessment

Black Creek, the West Branch of Don River, and Westminster Creek each cross beneath Langstaff Road within the project limits and were therefore identified as part of the Environmental Assessment. Field observations and channel measurements were completed on April 21<sup>th</sup>, 2017 by GEO Morphix Ltd. staff to characterize channel conditions and potential erosion issues to assist with informing crossing sizing. As part of the assessment, rapid stream assessment applications were completed to evaluate channel stability and stream health.

Channel instability was semi-quantified through the application of the Ontario Ministry of the Environment's (2003) Rapid Geomorphic Assessment (RGA). Observations were quantified using an index that identifies channel sensitivity based on evidence of aggradation, degradation, channel widening, and planimetric (planform) adjustment. The index produces values that indicate whether the channel is stable/in regime (score <0.20), stressed/transitional (score 0.21-0.40) or adjusting (score >0.41). The Rapid Stream Assessment Technique (RSAT) was also employed to provide a broader view of the system and consider the ecological functioning of the watercourse (Galli, 1996). Observations were made of channel stability, channel scouring or sediment deposition, instream and riparian habitats, and water quality. The RSAT score ranks the channel as maintaining a poor (<13), fair (13-24), good (25-34) or excellent (35-42) degree of stream health.

The field assessment findings are outlined for each stream below. Additionally, site photographs are provided in **Appendix A** and fieldnotes are provided in **Appendix B**.

# 2.1 West Branch of Don River Field Observations

Field observations for the West Branch of the Don River upstream of the Langstaff Road crossing revealed a meandering channel within an open grass-dominated field. A large meander with an amplitude of 30 m was documented 40 m north of Langstaff Road, with limited potential to impact the crossing. Portions of the channel bank were slumped into the stream along the outer bank of the channel bend. The Langstaff Road crossing consisted of an  $\sim 11$  m wide concrete box culvert. There was no riparian buffer within the culvert. Downstream of the crossing, stormwater drainage

outlets flanked the sides of the channel. The west outlet was elevated, located midway up the road embankment. Downstream of Langstaff Road, the channel was partially confined on one side by the valley slope, which extended southward to nearby commercial lots. A  $\sim$ 25 m riparian buffer, comprised mainly of large trees existed alongside the channel. A stand of recently planted coniferous trees were noted along the outside bend of the channel. One of the trees and its full root structure had slumped and fallen into the channel, indicative of channel widening processes. The average bankfull widths and depths of the channel were 8.63 m and 1.80 m, respectively. Local meander amplitudes upstream and downstream of the crossing at Langstaff Road were measured in the range of 16 - 30 m.

Rapid stream assessments for the West Branch of Don River were conducted within the vicinity of the Langstaff Road crossing. With a RGA score of 0.39, the study reach was assessed to be "in transition" primarily due to observations that support channel widening, such as bank slumping and fallen trees. Evidence of aggradation / degradation was also observed throughout the reach. With regards to the RSAT, stream health was assessed to be "fair" with a score of 15. Riparian conditions, water quality, and channel stability scored low, while habitat conditions scored relatively higher.

### 2.2 Black Creek Field Observations

The Black Creek study reach stemmed from a 14 m wide four-cell concrete culvert at Creditview Road, approximately 200 m west of the Highway 400. Downstream (east) of the culvert, the channel had been previously realigned to follow a meandering planimetric form. Arrangements of shrub plantings (e.g., red osier dogwood) were in-place along the channel overbank. At the time of inspection, the channel was at bankfull capacity, due to recent rainfall events. The average bankfull widths and depths of the realigned channel were 3.50 m and 0.75 m, respectively, and the designed meander amplitude measured approximately 10 m. Approximately 150 m east of the Creditview Road crossing, the realigned channel formed into a wide vegetated swale with riprap-reinforced banks. The reinforced swale extended ~100 m south, alongside the Highway 400, before crossing beneath it within a triple-cell concrete culvert. Each cell was 2.4 m in width, for a total opening of 7.2 m. The reinforced swale emerged on the east side of the Highway 400, where it continued south towards Langstaff Road. The Langstaff Road channel crossing consisted of a similar 2.4 m triple-cell concrete culvert (7.2 m total width). The channel was tapered into the crossing by gabion basket wingwalls, which were in good condition. Downstream of Langstaff Road, the swale feature persisted south between the Highway 400 and its interchange to Langstaff Road. The swale passed beneath another 2.4 m triple-cell concrete culvert (7.2 m total width), flanked by gabion basket wingwalls. The channel emerged on the east side of the interchange lane, adjoined by a storm sewer outlet. A concrete meshing in good condition lined the channel banks near the crossing. The vegetated swale continued south, alongside the Highway 400.

Rapid Assessments were not completed for the Black Creek due to channel armouring and stream realignment.

# 2.3 Westminster Creek Field Observations

The Westminster Creek study reach consisted of a straightened channel armoured with gabion basket. The channel was confined within a narrow valley between commercial lots. Upstream of the Langstaff Road crossing, the channel and valley corridor (including the valley slopes, the overbank, and the channel banks) were armoured with gabion basket. Grasses, shrubs, and trees grew from the gabion, which was partially buried in soil. The gabion baskets were generally in good condition. A few small breaches in the gabion wire meshing were noted along the channel toe. The average bankfull widths and depths of the upstream section of channel were 1.8 m and 0.50 m, respectively. The Langstaff Road crossing consisted of a double-cell concrete box culvert.

Each cell measured 3.4 m in width, for a total opening of 6.8 m. Piped roadside drainage features discharged directly within the culvert to the watercourse. South of Langstaff Road, the valley corridor was armoured with gabion basket from the channel overbanks to midway up the valley slope. The gabion baskets were arranged to form a terrace consisting of multiple courses of baskets. Near the crossing, the gabion basket armouring was offset from the channel by  $\sim 1-2$  m. This buffer between the channel and gabion baskets was vegetated with grasses, shrubs, and trees. The channel was wider, relative to upstream of Langstaff Road, with an average channel bankfull width and depth of 3.0 m and 0.70 m. Some undercutting of 0.05 – 0.10 m was noted along the channel banks, indicative of widening towards the gabion basket offset protection.  $\sim 70$  m downstream from the Langstaff Road crossing, the channel narrowed slightly, to a width of 2.2 m, thereby reducing the riparian buffer mentioned above and exposing gabion basket along the channel banks. The straight channel and valley corridor continued south beyond the area of study.

Rapid Assessments were not completed for the Westminster Creek study site due to substantive channel armouring.

# 3 Geomorphological Erosion Issues and Meander Belt Widths

An assessment of erosion issues and channel meander belt width provides insight into the lateral extent that a meandering channel has historically occupied and may likely occupy in the future. This information, along with estimates of bankfull channel characteristics, helps to inform crossing structure sizing, as the structure span should compensate for any future adjustment to channel planimetric form. However, as each assessed stream was constrained between local infrastructure the full extent of the channel meander belt width could not be realistically applied as a tool to inform crossing structure sizing. As such, the assessment was completed with these constraints in mind. A summary of the findings is outlined in **Table 1**.

Of the three watercourses assessed, only the West Branch of the Don River exhibited a naturally occurring meandering alignment and could be measured for the local meander amplitude. As mentioned previously, a meander bend with an amplitude of approximately 30 m was noted within this section of channel. However, the meander bend was located  $\sim\!40$  m from the roadside and angled such that the bend was not expected to progress towards the road. Downstream from the crossing, the channel was partially-confined on one side by commercial lots but did not pose any adjustment concerns within the vicinity of the crossing. As noted within the rapid assessments, the channel did exhibit signs of bank erosion and slumping throughout. Additionally, there was no riparian buffer under the crossing.

Meander amplitudes were not measured for Black Creek and Westminster Creek due to evidence of channel straightening and substantive channel armouring (e.g., gabion basket / concrete mesh reinforcement). Both Black Creek and Westminster Creek were therefore not expected to migrate laterally or pose any erosion issues.

**Table 1: Channel Characteristics and Meander Amplitudes** 

| Stream                   | Channel Characteristics  | Notes   |
|--------------------------|--|---|
| W Branch of<br>Don River | Max. Meander Amplitude: 30 m Bankfull Width: 8.6 m                     | <ul> <li>Valley wall contact along right (west) bank downstream of Langstaff Road crossing, constrained by commercial lots.</li> <li>Bank erosion along both sides of channel</li> <li>Existing crossing structure: 11 m box culvert</li> </ul> |
| Black Creek              | Max. Meander Amplitude: N/A<br>(straightened)<br>Bankfull Width: 3.5 m | <ul> <li>Unconfined, realigned channel / armoured swale</li> <li>Stable and vegetated channel banks</li> <li>Existing crossing structures: Triple-cell concrete box culvert. Cell width = 2.4 m, total width = 7.2 m</li> </ul>                 |
| Westminster<br>Creek     | Max. Meander Amplitude: N/A (straightened)  Bankfull width: 2.3 m      | <ul> <li>Confined, armoured corridor</li> <li>Straightened, armoured channel</li> <li>Existing crossing structure: Double-cell concrete box culvert. Cell width = 3.4 m, total width = 6.8 m</li> </ul>   |

# 4 Crossing Recommendations

Culvert crossings are evaluated in the context of limiting or mitigating impact to creek form and function. Crossings should achieve the following:

- Address potential channel migration;
- Maintain sediment transport processes for frequent storm events;
- Provide a span that is respectful of potential future channel erosion/migration;
- Maintain velocity differentials through the culvert for frequent storm events;
- Be placed away from actively migrating meanders; and
- Be placed along a stable and straight length of channel at a perpendicular angle to the watercourse.

Given these considerations, for Black Creek and Westminster Creek we recommend the existing crossing spans of 7.2 m and 6.8 m, respectively, be maintained at minimum. The current crossing sizes are appropriate as both streams are straight and armoured with gabion baskets and/or concrete meshing, and therefore are not expected to migrate laterally. Furthermore, the crossings are in good condition and fully encompass the existing average channel bankfull widths.

With regards to the West Branch of Don River, present channel alignment did not suggest any further planimetric adjustment towards the road. We recommend the current crossing span of 11 m be improved upon to a minimum of 15 m in width. The additional 4 m would provide a buffer against any potential erosion issues to the crossing footings, as the channel currently contacts both walls of the existing crossing. The addition of an overbank buffer would also permit passage for terrestrial wildlife beneath Langstaff Road.

It is important to note that further amendment to the recommended crossing spans is possible. In the case where only a portion of the suggested width can be provided due to other design considerations (e.g., the presence of subsurface infrastructure or the shallowness of the road),

the incorporation of channel bioengineering may also help to reduce a given crossing span while maintaining channel form and function.

We trust this report meets your requirements. Should you have any questions please contact the undersigned.

Respectfully submitted,

Paul Villard Ph.D., P.Geo., CAN-CISEC Director, Senior Geomorphologist

Bryce Molder M.Sc., Earth Scientist in-Training

# 5 References

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# Appendix A Photographic Record



**Don River:** Downstream from the Langstaff Road crossing, the study reach followed a meandering planimetric form. In-channel woody debris was common.



**Don River:** Channel bank erosion and slumping due to undercutting was observed throughout the study reach.

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**Don River:** Fresh sand deposits and sand dominated point bars were noted throughout the study reach.



**Don River:** The channel spanned the entirety of the Langstaff Road crossing.

Project #: PN17032

Photo 3

**Don River:** A stormwater outlet was located adjacent to the Langstaff Road crossing at the downstream end.



**Don River:** A roadside drainage outlet was located midway up the road embankment adjacent to the Langstaff Road crossing.

Project #: PN17032

Photo 6



**Don River:** Upstream from the Langstaff Road crossing, the channel entered an open field. Erosion was generally observed along the outer banks.



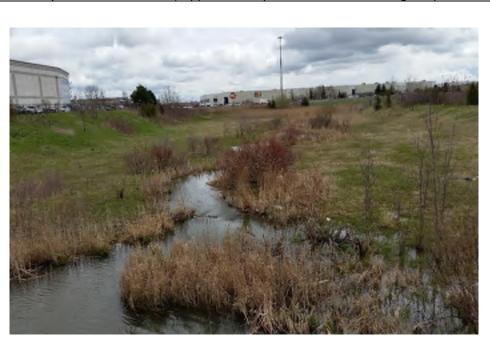
Photo 8

**Don River:** A meander amplitude of approximately 30 m was observed within the vicinity of the Langstaff Road crossing.



**Black Creek:** The studied reach stemmed from a concrete box culvert (~14 m in total width) at Creditview Road, approximately 200 m west of the Highway 400.





**Black Creek:** The channel was realigned directly downstream of the Creditview Road crossing.



**Black Creek:** The realigned channel design followed a sinuous planform. Flow conditions were at bankfull capacity during the time of assessment due to recent rainfall.





**Black Creek:** A stormwater management pond was located adjacent to the realigned channel, west of the Highway 400.



**Black Creek:** The channel formed into a wide vegetated swale near the Highway 400 crossing. The channel had been previously realigned and reinforced with riprap.



**Black Creek:** The reinforced swale feature persisted downstream of the Highway 400 crossing. The channel veered south towards Langstaff Road.

Project #: PN17032

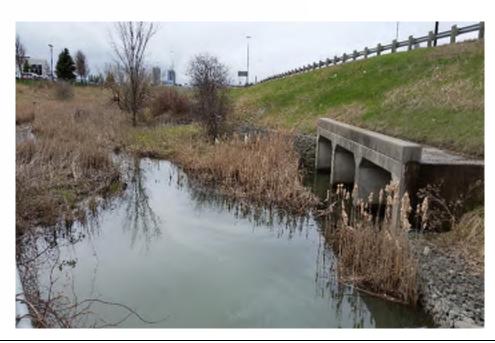


**Black Creek:** A wide vegetated swale was observed downstream from the Langstaff Road crossing.





**Black Creek:** A triple-cell concrete box culvert was observed at the highway interchange crossing, south of Langstaff Road.



**Black Creek:** Downstream of the Highway 400 interchange crossing, the reinforced swale continued south. A concrete meshing and gabion baskets lined the channel banks near the crossing.





**Black Creek:** The swale was well-vegetated downstream of the Highway 400 interchange crossing.



**Westminster Creek:** Upstream of the Langstaff Road crossing the channel and valley corridor were armoured with gabion basket. The channel was straight.





**Westminster Creek:** Some sections of the gabion basket wire meshing were eroded and missing stone.



**Westminster Creek:** The Langstaff Road crossing consisted of a double-cell concrete box culvert. The gabion baskets near the crossing were in good condition.



**Westminster Creek:** Downstream (south) of the Langstaff Road crossing, there was a  $\sim 1-2$  m riparian buffer on either side of the channel.



**Westminster Creek:** The channel corridor was armoured with gabion basket. The corridor was constrained between commercial lots.



**Westminster Creek:** Vegetation, including grasses and trees, grew from the gabion baskets. The gabion baskets were in good condition.

Project #: PN17032

# Appendix B Field Observations В

### **General Site Characteristics** Project Code: 17032 Date: Stream/Reach: W beauch Weather: Location: Field Staff: Watershed/Subwatershed: Features Site Sketch: Reach break MA = 30 m 53 Cross-section WE Flow direction Field Riffle Pool 8 Medial bar ANNUAL Eroded bank ---- Undercut bank Rip rap/stabilization/gabion -> Leaning tree 113 D m x-x-x Fence Culvert/outfall Swamp/wetland ₩₩W Grasses Tree Instream log/tree DARK \* \* \* Woody debris 只 Station location TO Vegetated Island Flow Type H1 Standing water H2 Scarcely perceptible flow Smooth surface flow нз **H4** Upwelling H5 Rippled Unbroken standing wave **H6** Na = 25m H7 Broken standing wave Chute Free fall H9 Substrate Sillt Small boulder S1 **S2** Sand Large boulder **S3** Gravel Bimodal TOS 54 Small cobble Bedrock/till **S**5 Large cobble Other Railroad BM Benchmark EP Erosion pin BS Backsight Rebar DS Downstream US Upstream Building WDJ Woody debris jam TR Terrace vwc Valley wall contact FC Flood chute Scale: BOS Bottom of slope Flood plain FP Additional Notes: Leonsits noted throughout RESOUR

TOS

Top of slope

KP

Knick point

Reach Characteristics

Project Code/Phase: PN 7-532

| Date:                           | April 21/2017  | 1                              |                               | Stream/Reach:           |                             | Jan                      | 8                                   |              |               |  |                       |          |
|---------------------------------|--|--------------------------------|-------------------------------|-------------------------|-----------------------------|--------------------------|-------------------------------------|--------------|---------------|--|-----------------------|----------|
| Weather:                        | Overcast 1   | 0,0                            |                               | Location:               |                             | Longstaff                | Rd.                                 | / Keele      |               | Jameshan                               |                       |          |
| Field staff:                    | AM BM  |                                |                               | Watershed/Subwatershed: | bwatershed:                 | Dan R                    |                                     |              | ,             | )                                      |                       |          |
| UTM (Upstream)                  |  |                                |                               | UTM (Downstream)        | eam)                        |                          |                                     |              |               |  |                       |          |
| Land Use (Table 1)              | Valley Type (Table 2)  | Channel Type (Table 3)         | Channel Zone<br>(Table 4)     | one (4)                 | Flow Type<br>(Table S)      | Grou                     | Groundwater                         | Evio         | Evidence: N   | NA                                     |                       |          |
| Riparian Vegetation             |  |                                |                               | Aqua                    | Aquatic/Instream Vegetation | ation                    |                                     |              | Water Quality | ity                                    |                       |          |
| Dominant Type: Cove (Table 6) 1 | Coverage: during the state of t | Age Class (yrs): 18 4          | Encroachment: (Table 7)       |                         | Type (Table8) 1 O           | Coverage of Reach (%)  > | Reach (%)  > S <br>FWD:<br>WDJ/50m: |              |               | Odour (Table 16)  Turbidity (Table 17) | sble 16)<br>Fable 17) |          |
| Channel Characteristics         |  |                                |                               |                         |                             |                          |                                     |              |               |  |                       |          |
| Sinuosity (Type)                | Sinuosity (Degree)   | ree) Gradient                  | Numb                          | Number of Channels      |                             | Clay/Silt                | Sand                                | Gravel       | Cobble        | Boulder                                | Parent                | Rootlets |
| (Table 9)                       | (Table 10)   | 3 (Table 11)                   | (Table 12)                    | 12)                     | Riffle Substrate            |                          |                                     | d            | 40            |  |                       |          |
| Entrenchment                    | Type of Bank Failure   | Failure Downs's Classification | sification                    |                         | Pool Substrate              | Ø                        |                                     |              |               |  |                       |          |
| (Table 13)                      | (Table 14)   | 1/2 (Table 15)                 |                               |                         | Bank Material               | Ø                        | 囟                                   |              |               |  |                       |          |
| Bankfull Width (m)              | 85.<br>B.S.  | 2 46 Wett                      | Wetted Width (m)              | S.S. 8.                 | 37                          | Ba                       | Bank Angle                          | Bank Erosion |               | Notes:                                 |                       |          |
| Bankfull Depth (m)              | 6  |                                | Wetted Depth (m)              | 1 St.º                  | 4.5                         | 3 25 C                   | 09-00                               | 5-30%        | . 3           |  |                       |          |
| Riffle/Pool Spacing (m)         | 089-   | % Riffles: 30 %                | % Pools: Sb                   | Meander Amplitude:      | nplitude: 28 -              |                          | Undercut                            | G 60 - 100%  | %0            |  |                       |          |
| Pool Depth (m)                  | 1~ RITHE   | Riffle Length (m)              | Undercuts (m)                 | 0.05 com                | Comments:                   |                          |                                     |              |               |  |                       |          |
| Veloctity (m/s)                 | 1m/05030048  |                                | Wiffle ball / ADV / Estimated | Estimated               |                             |                          |                                     |              |               |  |                       |          |
|                                 |  |                                |                               |                         |                             |                          |                                     |              |               |  |                       |          |

Completed by: AM

Checked by:

Rapid Geomorphic Assessment Project Code: Date: Stream/Reach: an R. W Branch. Weather: Location: Field Staff: Watershed/Subwatershed: Geomorphic Indicator Present? Factor Process Value No. Description Yes No 1 Lobate bar 2 Coarse materials in riffles embedded 3 Siltation in pools Evidence of Aggradation Medial bars 4 (AI) 5 Accretion on point bars 6 Poor longitudinal sorting of bed materials Deposition in the overbank zone 5 0.29 Sum of indices = 2 1 Exposed bridge footing(s) 2 Exposed sanitary / storm sewer / pipeline / etc. 3 Elevated storm sewer outfall(s) 4 Undermined gabion baskets / concrete aprons / etc. NA Evidence of 5 Scour pools downstream of culverts / storm sewer outlets Degradation 6 Cut face on bar forms (DI) 7 Head cutting due to knick point migration 8 Terrace cut through older bar material 9 Suspended armour layer visible in bank 10 Channel worn into undisturbed overburden / bedrock Sum of indices = 0.25 1 Fallen / leaning trees / fence posts / etc. 2 Occurrence of large organic debris 3 Exposed tree roots Basal scour on inside meander bends Evidence of 5 Basal scour on both sides of channel through riffle Widening 6 Outflanked gabion baskets / concrete walls / etc. (WI) 7 Length of basal scour >50% through subject reach Exposed length of previously buried pipe / cable / etc. NA 8 9 Fracture lines along top of bank 10 Exposed building foundation Sum of Indices = 1 Formation of chute(s) 2 Single thread channel to multiple channel Evidence of 3 Evolution of pool-riffle form to low bed relief form Planimetric Form 4 Cut-off channel(s) Adjustment 5 Formation of island(s) (PI) 6 Thalweg alignment out of phase with meander form Bar forms poorly formed / reworked / removed 0 . 14 Sum of indices =

| Additional notes: |            | Stability I   | Stability Index (SI) = (AI+DI+WI+PI)/4 = ೦ನ್ನ್ |               |  |  |  |  |
|-------------------|------------|---------------|--|---------------|--|--|--|--|
|                   | Condition  | In Regime     | In Transition/Stress                           | In Adjustment |  |  |  |  |
|                   | SI score = | □ 0.00 - 0.20 | □ 0.21 - 0.40                                  | □ 0.41        |  |  |  |  |

| Completed | w.em.  | Checked by: |   |
|-----------|--------|-------------|---|
| completed | U) . = |             | - |

Rapid Stream Assessment Technique

Project Code: 17020

| Date:        | April 21, 2017 | Stream/Reach:           | On R.            |
|--------------|----------------|-------------------------|------------------|
| Weather:     | 12° C clouds   | Location:               | Langetal / Keele |
| Field Staff: | Am 8m          | Watershed/Subwatershed: | Don R            |

| Evaluation<br>Category                         | Poor   | Fair  | Good   | Excellent  |
|--|--|---|--|--|
| Channel<br>Stability                           | < 50% of bank network stable     Recent bank sloughing, slumping or failure frequently observed  | 50-70% of bank network<br>stable     Recent signs of bank<br>sloughing, slumping or<br>failure fairly common  | 71-80% of bank network<br>stable     Infrequent signs of bank<br>sloughing, slumping or<br>failure   | > 80% of bank network<br>stable    No evidence of bank<br>sloughing, slumping or<br>failure  |
|  | Stream bend areas highly unstable     Outer bank height 1.2 m above stream bank (2.1 m above stream bank for large mainstem areas)     Bank overhang > 0.8-1.0 m | Stream bend areas unstable Outer bank height 0.9- 1.2 m above stream bank (1.5-2.1 m above stream bank for large mainstem areas) Bank overhang 0.8-0.9m | Stream bend areas stable Outer bank height 0.6-0.9 m above stream bank (1.2- 1.5 m above stream bank for large mainstem areas) Bank overhang 0.6-0.8 m | Stream bend areas very stable Height < 0.6 m above stream (< 1.2 m above stream bank for large mainstem areas) Bank overhang < 0.6 m           |
|  | Young exposed tree roots abundant     > 6 recent large tree falls per stream mile  | Young exposed tree roots<br>common     4-5 recent large tree falls<br>per stream mile   | Exposed tree roots<br>predominantly old and<br>large, smaller young roots<br>scarce     2-3 recent large tree falls<br>per stream mile                 | Exposed tree roots old,<br>large and woody     Generally 0-1 recent large<br>tree falls per stream mile  |
|  | Bottom 1/3 of bank is<br>highly erodible material     Plant/soil matrix severely<br>compromised  | Bottom 1/3 of bank is<br>generally highly erodible<br>material     Plant/soil matrix<br>compromised   | Bottom 1/3 of bank is<br>generally highly resistant<br>plant/soil matrix or material   | Bottom 1/3 of bank is<br>generally highly resistant<br>plant/soil matrix or<br>material  |
|  | Channel cross-section is<br>generally trapezoidally-<br>shaped   | <ul> <li>Channel cross-section is<br/>generally trapezoidally-<br/>shaped.</li> </ul>   | Channel cross-section is<br>generally V- or U-shaped   | Channel cross-section is<br>generally V- or U-shaped   |
| Point range                                    | □ 0 □ 1 □ 2  | 10/3 0 4 0 5  | □ 6 □ 7 □ 8  | □ 9 □ 10 □ 11  |
| Channel<br>Scouring/<br>Sediment<br>Deposition | > 75% embedded (><br>85% embedded for large<br>mainstem areas)   | 50-75% embedded (60-<br>85% embedded for large<br>mainstem areas)   | 25-49% embedded (35-<br>59% embedded for large<br>mainstern areas)   | Riffle embeddedness < 25% sand-silt (< 35% embedded for large mainstem areas)  |
|  | Few, if any, deep pools     Pool substrate     composition >81% sand- silt   | Low to moderate number of deep pools     Pool substrate composition 60-80% sand-silt  | Moderate number of deep pools     Pool substrate composition 30-59% sand-silt  | High number of deep pool     (> 61 cm deep)     (> 122 cm deep for large     mainstem areas)     Pool substrate composition     <30% sand-silt |
|  | Streambed streak marks<br>and/or "banana"-shaped<br>sediment deposits<br>common  | <ul> <li>Streambed streak marks<br/>and/or "banana"-shaped<br/>sediment deposits<br/>common</li> </ul>  | Streambed streak marks<br>and/or "banana"-shaped<br>sediment deposits<br>uncommon  | Streambed streak marks<br>and/or "banana"-shaped<br>sediment deposits absent   |
|  | Fresh, large sand<br>deposits very common in<br>channel     Moderate to heavy sand<br>deposition along major<br>portion of overbank area.                        | Fresh, large sand<br>deposits common in<br>channel     Small localized areas of<br>fresh sand deposits along<br>top of low banks                        | Fresh, large sand deposits<br>uncommon in channel     Small localized areas of<br>fresh sand deposits along<br>top of low banks                        | Fresh, large sand deposits<br>rare or absent from<br>channel     No evidence of fresh<br>sediment deposition on<br>overbank                    |
|  | Point bars present at<br>most stream bends,<br>moderate to large and<br>unstable with high<br>amount of fresh sand   | Point bars common,<br>moderate to large and<br>unstable with high<br>amount of fresh sand   | Point bars small and stable,<br>well-vegetated and/or<br>armoured with little or no<br>fresh sand  | Point bars few, small and<br>stable, well-vegetated<br>and/or armoured with little<br>or no fresh sand   |
| Point range                                    | 0 0 1 0 2  | E 3 □ 4   | □ 5 □ 6  | □ 7 □ 8  |

| Date:                  | 2017 April 21  | Reach:   | Don R  |         |  | Project Code:                                | 170  | 30   |  |
|------------------------|--|--|--|---------|--|--|--|--|--|
| Evaluation<br>Category | Poor   | Fa   | ir   |         | Go   | ood  |  | Excellent  |  |
|                        | <ul> <li>Wetted perimeter &lt; 40%<br/>of bottom channel width<br/>(&lt; 45% for large<br/>mainstem areas)</li> </ul>  | Wetted perin<br>60% of bott<br>width (45-6)<br>mainstern and   | om channel<br>5% for large                           | ()      | of bottom ch<br>66-90% for<br>nainstem ar                                | large<br>eas)                                | of botto   | perimeter > 85%<br>om channel width (><br>r large mainstem                               |  |
|                        | <ul> <li>Dominated by one habitat<br/>type (usually runs) and<br/>by one velocity and depth<br/>condition (slow and<br/>shallow) (for large<br/>mainstem areas, few<br/>riffles present, runs and<br/>pools dominant, velocity<br/>and depth diversity low)</li> </ul> | Few pools p<br>and runs do     Velocity and<br>generally sk<br>shallow (for<br>mainstem a<br>and pools do<br>velocity and<br>diversity interests.) | minant. depth ow and large reas, runs ominant, depth |         | uns and poo  | verse velocity                               | habitat<br>• Diverse<br>of flow  | runs and pool<br>present<br>velocity and depth<br>present (i.e., slow,<br>allow and deep |  |
| Physical<br>Instream   | Riffle substrate<br>composition:<br>predominantly gravel<br>with high amount of sand     < 5% cobble   | <ul> <li>Riffle substr<br/>composition<br/>predominan<br/>cobble, grav</li> <li>5-24% cobb</li> </ul>  | :<br>tly small<br>rel and sand                       | (       | Riffle substra<br>composition:<br>gravel, cobb<br>naterial<br>25-49% cob | good mix of<br>le, and rubble                | gravel,  | sition: cobble,<br>rubble, boulder mix<br>tle sand                                       |  |
| Habitat                | Riffle depth < 10 cm for<br>large mainstem areas   | Riffle depth<br>large mains  |  |         | Riffle depth arge mainst   | 15-20 cm for<br>em areas                     | Riffle depth > 20 cm for<br>large mainstern areas                                    |  |  |
|                        | Large pools generally < 30 cm deep (< 61 cm for large mainstem areas) and devoid of overhead cover/structure   | Large pools<br>46 cm deep<br>for large ma<br>areas) with<br>overhead co  | (61-91 cm<br>instem                                  | 1       | cm deep (91  |  | cm deep (> 122 cm for<br>large mainstem areas) w<br>good overhead<br>cover/structure |  |  |
|                        | Extensive channel<br>alteration and/or point<br>bar<br>formation/enlargement   | Moderate ar<br>channel alte<br>moderate in<br>point bar<br>formation/e   | eration and/or<br>ocrease in                         | 1       | Slight amous<br>alteration ar<br>increase in p<br>formation/er           | oint bar                                     | signific   | nnel alteration or<br>ant point bar<br>ion/enlargement                                   |  |
|                        | <ul> <li>Riffle/Pool ratio 0.49:1;</li> <li>≥1.51:1</li> </ul>   | • Riffle/Pool ratio 0.5-<br>0.69:1 ; 1.31-1.5:1  |  |         | 1.11-1.3:1   |  | Riffle/F   | ool ratio 0.9-1.1:1  |  |
|                        | Summer afternoon water<br>temperature > 27°C   | Summer aft<br>temperature  |  |         | Summer aft<br>temperature  | ernoon water<br>20-24°C                      | Summer afternoon water<br>temperature < 20°C   |  |  |
| Point range            | □ 0 □ 1 □ 2  | □ 3  | □ 4  |         | 0 5  | □ 6  | 1  | 7 0 8  |  |
|                        | Substrate fouling level:<br>High (> 50%)   | Substrate for<br>Moderate (2   |  |         | Substrate fo<br>Very light (1  |  |  | ate fouling level:<br>nderside (0-10%)   |  |
|                        | Brown colour     TDS: > 150 mg/L   | Grey colour     TDS: 101-1   |  |         | Slightly grey<br>TDS: 50-10  |  | Clear f     TDS: <   | low<br>: 50 mg/L   |  |
| Water Quality          | Objects visible to depth   | Objects visi     0.15-0.5m   | ble to depth<br>below surface                        |         | Objects visit<br>0.5-1.0m be   | ole to depth<br>slow surface                 |  | s visible to depth<br>n below surface  |  |
|                        | Moderate to strong<br>organic odour  | Slight to me<br>organic odd  |  |         | Slight organ   | ic odour                                     | • No odd   | our  |  |
| Point range            | 00010/2  | □ 3  | □ 4  |         | □ 5  | □ 6  |  | 0708   |  |
| Riparian               | Narrow riparian area of<br>mostly non-woody<br>vegetation  | Riparian area<br>predominantly wooded<br>but with major localized<br>gaps  |  |         |  | ffer generally<br>e along major<br>oth banks | Wide (> 60 m) mature<br>forested buffer along be<br>banks                            |  |  |
| Habitat<br>Conditions  | Canopy coverage:<br><50% shading (30% for<br>large mainstem areas)   | Canopy coverage: 50-   |  |         |  | erage:<br>eding (45-59%<br>sinstem areas)    |  |  |  |
| Point range            | □ 0 □ 1  | 5 2  | □ 3  | 0 4 0 5 |  |  | □ 6 □ 7  |  |  |
| Total overall          | score (0-42) = \5  | Poor (<  | 13)  | Fali    | (13-24)  | Good (25-                                    | -34) Excellent (>35)   |  |  |

Completed by: 60 Checked by:

# **General Site Characteristics**

TOS Top of slope

KP Knick point

Project Code: 17032

| Date:   | Man 31   | Stream/Reach:           | Westmingter cle                                |                        |
|---|--|-------------------------|--|------------------------|
| Weather:  | 80°C .   | Location:               | Langetall + Outlerin                           |                        |
| Field Staff:  | em   | Watershed/Subwatershed: | Den B.   |                        |
| Reach break  Cross-section Flow direction Riffle Pool Medial bar Eroded bank Undercut ban Rip rap/stabil Leaning tree Fence Culvert/outfa Swamp/wetla VVVV Grasses Tree Instream log. XXX Woody debris Station locati         | n<br>nk<br>lization/gabion<br>ill<br>and<br>/tree<br>3 |                         | Compared N N S S S S S S S S S S S S S S S S S | XS<br>Pieces<br>gabers |
| Flow Type  H1 Standing wat  H2 Scarcely perc  H3 Smooth surfa  H4 Upwelling  H5 Rippled  H6 Unbroken stand  H7 Broken stand  H8 Chute  H9 Free fall  Substrate  S1 Silt  S2 Sand  S3 Gravel  S4 Small cobble  S5 Large cobble | per<br>ceptible flow<br>see flow<br>anding wave        | man. L                  | aun E3E33 Commercial                           | 0.1 s                  |
| Other  BM Benchmark  BS Backsight  DS Downstream  WDJ Woody debris  VWC Valley wall co  BOS Bottom of slo   | ontact FC Flood chute                                  | Additional Notes:       | Scale:   |                        |

Reach Characteristics

Project Code/Phase: 13082

| Date:                                 | Man Bl Zoll   | Stream/Reach:                      | Washmangher de                            |                   |                      |                 |
|---------------------------------------|---|------------------------------------|---|-------------------|----------------------|-----------------|
| Weather:                              | -   | Location:                          | Knewal Rd.                                |                   |                      |                 |
| Field staff:                          | Rm  | Watershed/Subwatershed:            | 00 00                                     |                   |                      |                 |
| UTM (Upstream)                        |   | UTM (Downstream)                   |   |                   |                      |                 |
| (Table 1)                             | Valley Type Channel Type Channel Zone (Table 2) (Table 3) | (Table 4) Slow Type (Table 5)      | ☐ Groundwater AJ\$                        | Evidence:         |                      |                 |
| Riparian Vegetation                   |   | Aquatic/Instream Vegetation        | getation                                  | Water Quality     | ality                | 4               |
| Dominant Type: Coverage (Table 6)   / | Coverage: Course Age Class (yrs): Encroachment:           | nt: Type (Table8) (7) Woody Debris | Coverage of Reach (%) S<br>Density of WD: |                   | Odour (Table 16)     | 16)             |
|                                       | rented   4-10   | Present in Cutbank                 | Er Low WDJ/50m:  D Moderate               |                   | Turbidity (Table 17) | e 17)           |
| Channel Characteristics               |   |                                    |   | *                 |                      |                 |
| Sinuosity (Type)                      | Sinuosity (Degree) Gradient Nun                           | Number of Channels                 | Clay/Silt Sand Gra                        | Gravel Cobble     | Boulder Pa           | Parent Rootlets |
| (Table 9)                             | (Table 10) [ (Table 11) 2 (Tal                            | (Table 12) Riffle Substrate        | o 0 0 0                                   | 0                 | 0                    | 0 0             |
| Entrenchment                          | Type of Bank Failure Downs's Classification               | Pool Substrate                     | nte 0 0 0                                 | 0 0               | 0                    | 0               |
| (Table 13)                            | (Table 14) 2 (Table 15)                                   | Bank Material                      |   |                   | 0                    | 0               |
| Bankfull Width (m)                    | 1,35 2.2 8.0 Wetted Width (m)                             | 1.70                               | Bank Angle Ba                             | Bank Erosion      | Notes:               |                 |
| Bankfull Depth (m)                    | 0.5 0.5 Wetted Depth (m)                                  | 0.10 0.15 0.30                     | - 6                                       | 305 OS 0          |                      |                 |
| Riffle/Pool Spacing (m)               | NA % Riffles: NA % Pools: NA                              | Meander Amplitude:                 |   | 0 60-100%         |                      |                 |
| Pool Depth (m)                        | Ni Riffle Length (m) Ni Undercuts (m)                     | 3.05 Comments: Carbona             | in the day                                | Carin             |                      |                 |
| Veloctity (m/s)                       | 0.6 0.3 0.1 WITTE BAIL ADV                                | Ball / ADV / Estimated             | por book US, soud frip                    | sand fipagianel D |                      |                 |

Completed by: BM.

Checked by:

| Weather:    Color   Co | Date:                                 |   | 2017, Apr21   | Stream/Reach:  | Black CK     |
|--|---------------------------------------|---|---|--|--------------|
| Features  Reach break  Cross-section Flow direction Riffle Pool Medial bar Ferded bank Undercut bank Rigrap/stabilization/gabion Leaning tree  Leaning tree  Samp/wetland  VYV Grasses  Tree Instream log/tree  X X Woody debris Station location Vegetated island Flow Type H1 Standing water H2 Scarcely perceptible flow H3 Smooth surface flow H4 Upwelling H5 Rippled H6 Unbroken standing wave H7 Broken standing wave H8 Chute H9 Free fall  Substrate S1 Silt S6 Small boulder S2 Sand S7 Large boulder S3 Gravel S8 Bimodal S4 Small cobble S9 Bedrock/till S5 Large cobble  Other  | Weathe                                | er:   | 10°6. aux   | Location:  | 400/Langraff |
| Reach break  Cross-section Flow direction Riffle Pool Medial bar Ereded bank Undercut bank Rip rap/stabilization/gabion Leaning tree Culvert/outfall Swamp/wetland VVV Grasses Instream log/tree X X Woody debris R Station location Vegetated island Flow Type H1 Standing water H2 Scarcely perceptible flow H3 Smooth surface flow H4 Upwelling H5 Rippled H6 Unbroken standing wave H7 Broken standing wave H7 Broken standing wave H8 Chute H9 Free fall Substrate S1 Silt S6 Small boulder S2 Sand S7 Large boulder S3 Gravel S8 Bimodal S4 Small cobble S9 Bedrock/till S5 Large cobble Other   | Field St                              | taff:   |   |  | Black Cla    |
| Reach reak  Cross-section Flow direction Ruffle Pool Medial bar Eroded bank Undercut bank Rip rap/stabilization/gabion Leaning tree  X-X-X- Fence Culvert/outfall Swamp/wetland YVV Grasses Tree Instream log/tree X-X-X- Woody debris R Station location Y- Vegetated island Flow Type H1 Standing water H2 Scarcely perceptible flow H3 Smooth surface flow H4 Upwelling H5 Rippled H6 Unbroken standing wave H7 Broken standing wave H7 Broken standing wave H8 Chute H9 Free fall Substrate S1 Silt S6 Small boulder S2 Sand S7 Large boulder S3 Gravel S8 Bimodal S4 Small cobble S9 Bedrock/till S5 Large cobble Other   |                                       | es  |   | Site Sketch:   |              |
| BS Backsight RB Rebar DS Downstream US Upstream WDJ Woody debris jam TR Terrace  | X   X   X   X   X   X   X   X   X   X | Reach break Cross-section Flow direction Riffle Pool Medial bar Eroded bank Undercut bank Rip rap/stabilization Leaning tree Fence Culvert/outfall Swamp/wetland Grasses Tree Instream log/tree Woody debris Station location Vegetated island ype Standing water Scarcely perceptible Smooth surface flor Upwelling Rippled Unbroken standing water Scarcely berceptible Smooth surface flor Upwelling Rippled Unbroken standing water Scarcely berceptible Smooth surface flor Upwelling Rippled Unbroken standing water Scarcely perceptible Smooth surface flor Upwelling Rippled Unbroken standing Broken standing water Scarcely berceptible Smooth surface flor Upwelling Rippled Unbroken standing Broken standing water Salt Sand Gravel Small cobble Large cobble Benchmark Backsight Downstream Woody debris jam | e flow wave nve  S6 Small boulder S7 Large boulder S8 Bimodal S9 Bedrock/till  EP Erosion pin RB Rebar US Upstream TR Terrace | Constitute of the second of th | Sunde State  |

TOS

Top of slope

KP Knick point

Completed by: \_\_\_\_\_ Checked by: \_\_\_\_\_

# **APPENDIX**

E

Stormwater Management

### Stage-Storage-Discharge Summary - Pipe Storage HSP-1

# Storage Facility # HSP-1A

| Stage  | Discharge           |                   |                   |        |      | 1 01                  | ebays                 | 1416 | uni i ooi (Excida     | ing Forebay)          | Stora             | gc                | Estimated         |
|--------|---------------------|-------------------|-------------------|--------|------|-----------------------|-----------------------|------|-----------------------|-----------------------|-------------------|-------------------|-------------------|
|        |                     | Active            | Total             | Stage  | Area | Incremental<br>Volume | Accumulated<br>Volume | Area | Incremental<br>Volume | Accumulated<br>Volume | Sediment          | Total             | Detention<br>Time |
| (m)    | (m <sup>3</sup> /s) | (m <sup>3</sup> ) | (m <sup>3</sup> ) | (m)    | (m²) | (m³)                  | (m³)                  | (m²) | (m³)                  | (m³)                  | (m <sup>3</sup> ) | (m <sup>3</sup> ) | (hrs)             |
| 204.12 | 0.0000              | 0                 | 0                 | 204.12 |      |                       |                       |      | 0                     | 0                     | 0                 | 0                 |                   |
| 204.32 | 0.0081              | 31                | 31                | 204.32 |      |                       |                       |      | 0                     | 31                    | 0                 | 31                |                   |
| 204.52 | 0.0123              | 74                | 74                | 204.52 |      |                       |                       |      | 0                     | 74                    | 0                 | 74                |                   |
| 204.72 | 0.0155              | 118               | 118               | 204.72 |      |                       |                       |      | 0                     | 118                   | 0                 | 118               |                   |
| 204.92 | 0.0181              | 161               | 161               | 204.92 |      |                       |                       |      | 0                     | 161                   | 0                 | 161               |                   |
| 205.12 | 0.0584              | 204               | 204               | 205.12 |      |                       |                       |      | 0                     | 204                   | 0                 | 204               |                   |
| 205.32 | 0.0920              | 259               | 259               | 205.32 |      |                       |                       |      | 0                     | 259                   | 0                 | 259               |                   |
|        |                     |                   |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |

### 3216079 Langstaff Road EA

**Detailed Outlet Structure Discharge Calculations** 

|        |  |   | D   | ischarge   | (m³/s)   |  |  |           |   |            | Parameters            |                                    |  |  |
|--------|--|---|---|--|--|--|--|-----------|---|------------|-----------------------|------------------------------------|--|--|
|        | Spillway   |   |   | 0  | utlet Riser  |  | DICE   | Total     | Overflow We   | ir 1       | Ori                   | fice 1                             |  |  |
| Weir 1 | Weir 2   | Total   | Orifice 1   | Weir 1   | Orifice 2  | Total  | DICB   | Discharge | Crest Elevati   | ion        | Orifice Centre        | Perimeter                          |  |  |
| 0.000  | 0.000  | 0.000   | 0.00000   | 0.000  | 0.000  | 0.000  | 0.000  | 0.0000    | 9999.00 r   | m          | 204.17 m              | 314 mm                             |  |  |
| 0.000  | 0.000  | 0.000   | 0.00808   | 0.000  | 0.000  | 0.008  | 0.000  | 0.0081    |   |            |                       |                                    |  |  |
| 0.000  | 0.000  | 0.000   | 0.01235   | 0.000  | 0.000  | 0.012  | 0.000  | 0.0123    | Crest Width   | h          | Orifice Invert        | Area                               |  |  |
| 0.000  | 0.000  | 0.000   | 0.01548   | 0.000  | 0.000  | 0.015  | 0.000  | 0.0155    | 1 r   | m          | 204.12 m              | 7,854 mm <sup>2</sup>              |  |  |
| 0.000  | 0.000  | 0.000   | 0.01808   | 0.000  | 0.000  | 0.018  | 0.000  | 0.0181    | Slope (x:1)   | 5          | Orifice Diameter      | Orifice Coeff.                     |  |  |
| 0.000  | 0.000  | 0.000   | 0.02034   | 0.000  | 0.038  | 0.058  | 0.000  | 0.0584    | Weir Coeff.   | 1.670      | 100 mm                | 0.6                                |  |  |
| 0.000  | 0.000  | 0.000   | 0.02238   | 0.000  | 0.070  | 0.092  | 0.000  | 0.0920    | Weir Top Width (m)  | -97935.8   | Orientation           |                                    |  |  |
|        |  |   |   |  |  |  |  |           | Overflow Weir 2   |            | Vertical              |                                    |  |  |
|        |  |   |   |  |  |  |  |           | Crest Elevation   |            | W                     | eir 1                              |  |  |
|        |  |   |   |  |  |  |  |           | 9999.00 m   |            | Top of Weir Structure | Max Perimeter                      |  |  |
|        |  |   |   |  |  |  |  |           | Crest Width   |            | 9999.30 m             | 1,400 mm                           |  |  |
|        |  |   |   |  |  |  |  |           | 3 m   |            | Weir Crest Invert     | Max Open Area                      |  |  |
|        |  |   |   |  |  |  |  |           | Slope (x:1)   | 3          | 9999.00 m             | 240,000 mm <sup>2</sup>            |  |  |
|        |  |   |   |  |  |  |  |           | Weir Coeff.   | 1.670      | Weir Dimension        | s (Height x Length)                |  |  |
|        |  |   |   |  |  |  |  |           | Weir Top Width (m)  | -58941.000 | 300 mm Height         | 800 mm L                           |  |  |
|        |  |   |   |  |  |  |  |           | DICB  |            | Side Walls            | Weir Coeff.                        |  |  |
|        |  |   |   |  |  |  |  |           | T/G Invert  |            | Vertical              | 1.670                              |  |  |
|        |  |   |   |  |  |  |  |           | 9999.00 r   | m          | Ori                   | fice 2                             |  |  |
|        |  |   |   |  |  |  |  |           | CB Size   |            | Orifice Centre        | Perimeter                          |  |  |
|        |  |   |   |  |  |  |  |           | 1200 r  | mm         | 205.03 m              | 785 mm                             |  |  |
|        |  |   |   |  |  |  |  |           | by  |            | Orifice Invert        | Area                               |  |  |
|        |  |   |   |  |  |  |  |           | 600 r   | mm         | 204.91 m              | 49,087 mm <sup>2</sup>             |  |  |
|        |  |   |   |  |  |  |  |           | Grate Slope   | е          | Orifice Diameter      | Orifice Coeff.                     |  |  |
|        |  |   |   |  |  |  |  |           | 4 :1  |            | 250 mm                | 0.6                                |  |  |
|        |  |   |   |  |  |  |  |           | Area (m <sup>2</sup> )  |            |                       | Operates Above (m)                 |  |  |
|        |  |   |   |  |  |  |  |           | Perimeter (m)   | 3.600      | Vertical              | 205.03                             |  |  |
|        |  |   |   |  |  |  |  |           | 0 01 2 1 1  | D )        |                       |                                    |  |  |
|        |  |   |   |  |  |  |  |           | $Q = CA \sqrt{2g \left( h_2 - h_1 \right)}$   | 2000       | $ Q = CL(h_2 - h_1)$  | $^{1.5} + 1.268z(h_2 - h_1)^{2.5}$ |  |  |
|        | 0.000<br>0.000<br>0.000<br>0.000<br>0.000<br>0.000 | Weir 1         Weir 2           0.000         0.000           0.000         0.000           0.000         0.000           0.000         0.000           0.000         0.000           0.000         0.000           0.000         0.000           0.000         0.000 | Weir 1         Weir 2         Total           0.000         0.000         0.000           0.000         0.000         0.000           0.000         0.000         0.000           0.000         0.000         0.000           0.000         0.000         0.000           0.000         0.000         0.000           0.000         0.000         0.000           0.000         0.000         0.000 | Spillway           Weir 1         Weir 2         Total         Orifice 1           0.000         0.000         0.000         0.00000           0.000         0.000         0.000         0.00808           0.000         0.000         0.000         0.01235           0.000         0.000         0.01548           0.000         0.000         0.01808           0.000         0.000         0.01808           0.000         0.000         0.02034 | Spillway         O           Weir 1         Weir 2         Total         Orifice 1         Weir 1           0.000         0.000         0.000         0.0000         0.000           0.000         0.000         0.000         0.00808         0.000           0.000         0.000         0.001         0.01235         0.000           0.000         0.000         0.01548         0.000           0.000         0.000         0.01808         0.000           0.000         0.000         0.00234         0.000 | Spillway         Outlet Riser           Weir 1         Weir 2         Total         Orifice 1         Weir 1         Orifice 2           0.000         0.000         0.000         0.0000         0.000         0.000           0.000         0.000         0.000         0.00080         0.000         0.000           0.000         0.000         0.001235         0.000         0.000           0.000         0.000         0.01548         0.000         0.000           0.000         0.000         0.01808         0.000         0.000           0.000         0.000         0.02034         0.000         0.038 | Spillway         Outlet Riser           Weir 1         Weir 2         Total         Orifice 1         Weir 1         Orifice 2         Total           0.000         0.000         0.000         0.0000         0.000         0.000         0.000           0.000         0.000         0.000         0.00808         0.000         0.000         0.008           0.000         0.000         0.000         0.01235         0.000         0.000         0.012           0.000         0.000         0.000         0.01548         0.000         0.000         0.015           0.000         0.000         0.000         0.01808         0.000         0.000         0.018           0.000         0.000         0.000         0.0234         0.000         0.038         0.058 | Spillway  | Note   Note | Spillway   | Spillway              | Spillway                           |  |  |

Where, h2 = elevation at stage 2 (m)
h1 = elevation at stage 1 (m)
D = orifice diameter (mm)
C = orifice coefficient

A = orifice open area (m<sup>2</sup>)

h2 = elevation at stage 2 (m) h1 = elevation at stage 1 (m) L = weir crest length (m) C = weir coefficient

### Stage-Storage-Discharge Summary - Pipe Storage HSP-1

# Storage Facility # HSP-1B

|        |           | Sto    | rage              |        |      | For                   | ebays                 | М    | ain Pool (Exclud      | ing Forebay)          | Stora             | ge                | Estimated         |
|--------|-----------|--------|-------------------|--------|------|-----------------------|-----------------------|------|-----------------------|-----------------------|-------------------|-------------------|-------------------|
| Stage  | Discharge | Active | Total             | Stage  | Area | Incremental<br>Volume | Accumulated<br>Volume | Area | Incremental<br>Volume | Accumulated<br>Volume | Sediment          | Total             | Detention<br>Time |
| (m)    | (m³/s)    | (m³)   | (m <sup>3</sup> ) | (m)    | (m²) | (m <sup>3</sup> )     | (m³)                  | (m²) | (m³)                  | (m <sup>3</sup> )     | (m <sup>3</sup> ) | (m <sup>3</sup> ) | (hrs)             |
| 205.35 | 0.0000    | 0      | 0                 | 205.35 |      |                       |                       |      | 0                     | 0                     | 0                 | 0                 |                   |
| 205.55 | 0.0081    | 31     | 31                | 205.55 |      |                       |                       |      | 0                     | 31                    | 0                 | 31                |                   |
| 205.75 | 0.0123    | 74     | 74                | 205.75 |      |                       |                       |      | 0                     | 74                    | 0                 | 74                |                   |
| 205.95 | 0.0155    | 118    | 118               | 205.95 |      |                       |                       |      | 0                     | 118                   | 0                 | 118               |                   |
| 206.15 | 0.0181    | 161    | 161               | 206.15 |      |                       |                       |      | 0                     | 161                   | 0                 | 161               |                   |
| 206.35 | 0.0584    | 204    | 204               | 206.35 |      |                       |                       |      | 0                     | 204                   | 0                 | 204               |                   |
| 206.55 | 0.0920    | 259    | 259               | 206.55 |      |                       |                       |      | 0                     | 259                   | 0                 | 259               |                   |
|        |           |        |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |           |        |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |           |        |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |           |        |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |           |        |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |           |        |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |           |        |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |           |        |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |           |        |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |           |        |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |           |        |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |           |        |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |           |        |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |           |        |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |           |        |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |           |        |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |           |        |                   |        |      |                       |                       |      |                       |                       | 1                 |                   |                   |
|        |           |        |                   |        |      |                       |                       |      |                       | _                     |                   |                   |                   |
|        |           |        |                   |        |      |                       |                       |      |                       |                       | 1                 |                   |                   |
|        |           |        |                   |        |      |                       |                       |      |                       | _                     |                   |                   |                   |
|        |           |        |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |           |        |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |           |        |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |
|        |           |        |                   |        |      |                       |                       |      |                       |                       |                   |                   |                   |

### 3216079 Langstaff Road EA

**Detailed Outlet Structure Discharge Calculations** 

| Elevation |        |          |       | D         | ischarge | (m <sup>3</sup> /s) |       |       |           |   | Parameters            |   |
|-----------|--------|----------|-------|-----------|----------|---------------------|-------|-------|-----------|---|-----------------------|---|
| Lievation |        | Spillway |       |           | 0        | utlet Riser         |       | DICB  | Total     | Overflow Weir 1   | Or                    | ifice 1                                 |
| (m)       | Weir 1 | Weir 2   | Total | Orifice 1 | Weir 1   | Orifice 2           | Total | DICB  | Discharge | Crest Elevation   | Orifice Centre        | Perimeter                               |
| 205.35    | 0.000  | 0.000    | 0.000 | 0.00000   | 0.000    | 0.000               | 0.000 | 0.000 | 0.0000    | 9999.00 m   | 205.40 m              | 314 mm                                  |
| 205.55    | 0.000  | 0.000    | 0.000 | 0.00808   | 0.000    | 0.000               | 800.0 | 0.000 | 0.0081    |   |                       |   |
| 205.75    | 0.000  | 0.000    | 0.000 | 0.01235   | 0.000    | 0.000               | 0.012 | 0.000 | 0.0123    | Crest Width   | Orifice Invert        | Area                                    |
| 205.95    | 0.000  | 0.000    | 0.000 | 0.01548   | 0.000    | 0.000               | 0.015 | 0.000 | 0.0155    | 1 m   | 205.35 m              | 7,854 mm <sup>2</sup>                   |
| 206.15    | 0.000  | 0.000    | 0.000 | 0.01808   | 0.000    | 0.000               | 0.018 | 0.000 | 0.0181    | Slope (x:1) 5   | Orifice Diameter      | Orifice Coeff.                          |
| 206.35    | 0.000  | 0.000    | 0.000 | 0.02034   | 0.000    | 0.038               | 0.058 | 0.000 | 0.0584    | Weir Coeff. 1.670   | 100 mm                | 0.6                                     |
| 206.55    | 0.000  | 0.000    | 0.000 | 0.02238   | 0.000    | 0.070               | 0.092 | 0.000 | 0.0920    | Weir Top Width (m) -97923.                                    | Orientation           |   |
|           |        |          |       |           |          |                     |       |       |           | Overflow Weir 2   | Vertical              |   |
|           |        |          |       |           |          |                     |       |       |           | Crest Elevation   | W                     | eir 1                                   |
|           |        |          |       |           |          |                     |       |       |           | 9999.00 m   | Top of Weir Structure | Max Perimeter                           |
|           |        |          |       |           |          |                     |       |       |           | Crest Width   | 9999.30 m             | 1,400 mm                                |
|           |        |          |       |           |          |                     |       |       |           | 3 m   | Weir Crest Invert     | Max Open Area                           |
|           |        |          |       |           |          |                     |       |       |           | Slope (x:1) 3   | 9999.00 m             | 240,000 mm <sup>2</sup>                 |
|           |        |          |       |           |          |                     |       |       |           | Weir Coeff. 1.670   | Weir Dimension        | s (Height x Length)                     |
|           |        |          |       |           |          |                     |       |       |           | Weir Top Width (m) -58941.0                                   |                       | 800 mm L                                |
|           |        |          |       |           |          |                     |       |       |           | DICB  | Side Walls            | Weir Coeff.                             |
|           |        |          |       |           |          |                     |       |       |           | T/G Invert  | Vertical              | 1.670                                   |
|           |        |          |       |           |          |                     |       |       |           | 9999.00 m   |                       | ifice 2                                 |
|           |        |          |       |           |          |                     |       |       |           | CB Size   | Orifice Centre        | Perimeter                               |
|           |        |          |       |           |          |                     |       |       |           | 1200 mm   | 206.26 m              | 785 mm                                  |
|           |        |          |       |           |          |                     |       |       |           | by  | Orifice Invert        | Area                                    |
|           |        |          |       |           |          |                     |       |       |           | 600 mm  | 206.14 m              | 49,087 mm <sup>2</sup>                  |
|           |        |          |       |           |          |                     |       |       |           | Grate Slope   | Orifice Diameter      | Orifice Coeff.                          |
|           |        |          |       |           |          |                     |       |       |           | 4 :1  | 250 mm                | 0.6                                     |
|           |        |          |       |           |          |                     |       |       |           | Area (m <sup>2</sup> ) 0.7                                    |                       | Operates Above (m)                      |
|           |        |          |       |           |          |                     |       |       |           | Perimeter (m) 3.6   | 00 Vertical           | 206.26                                  |
|           |        |          |       |           |          |                     |       |       |           | 0 - C1 22(1 1 D)  |                       | 115 ( )25                               |
|           |        |          |       |           |          |                     |       |       |           | $Q = CA \sqrt{2 g \left( h_2 - h_1 + \frac{D}{2000} \right)}$ | $Q = CL(h_2 - h)$     | $(h_1)^{1.5} + 1.268z(h_2 - h_1)^{2.5}$ |

Where, h2 = elevation at stage 2 (m)
h1 = elevation at stage 1 (m)
D = orifice diameter (mm)
C = orifice coefficient

A = orifice open area (m<sup>2</sup>)

h2 = elevation at stage 2 (m) h1 = elevation at stage 1 (m) L = weir crest length (m) C = weir coefficient

### Stage-Storage-Discharge Summary - Pipe Storage HSP-2

### Facility # HSP-2

|        |           | Sto    | rage  |        |      | Fore                  | ebays                 | Mai  | n Pool (Excludii      | ng Forebay)           | Stora    | ge    | Estimated         |
|--------|-----------|--------|-------|--------|------|-----------------------|-----------------------|------|-----------------------|-----------------------|----------|-------|-------------------|
| Stage  | Discharge | Active | Total | Stage  | Area | Incremental<br>Volume | Accumulated<br>Volume | Area | Incremental<br>Volume | Accumulated<br>Volume | Sediment | Total | Detention<br>Time |
| (m)    | (m³/s)    | (m³)   | (m³)  | (m)    | (m²) | (m³)                  | (m³)                  | (m²) | (m³)                  | (m³)                  | (m³)     | (m³)  | (hrs)             |
| 204.44 | 0.0000    | 0      | 0     | 204.44 |      |                       |                       |      | 0                     | 0                     | 0        | 0     |                   |
| 204.64 | 0.0264    | 24     | 24    | 204.64 |      |                       |                       |      | 0                     | 24                    | 0        | 24    |                   |
| 204.84 | 0.0457    | 99     | 99    | 204.84 |      |                       |                       |      | 0                     | 99                    | 0        | 99    |                   |
| 205.04 | 0.0590    | 204    | 204   | 205.04 |      |                       |                       |      | 0                     | 204                   | 0        | 204   |                   |
| 205.24 | 0.0699    | 309    | 309   | 205.24 |      |                       |                       |      | 0                     | 309                   | 0        | 309   |                   |
| 205.44 | 0.0792    | 414    | 414   | 205.44 |      |                       |                       |      | 0                     | 414                   | 0        | 414   |                   |
| 205.64 | 0.0876    | 666    | 666   | 205.64 |      |                       |                       |      | 0                     | 666                   | 0        | 666   |                   |
|        |           |        |       |        |      |                       |                       |      |                       |                       |          |       |                   |
|        |           |        |       |        |      |                       |                       |      |                       |                       |          |       |                   |
|        |           |        |       |        |      |                       |                       |      |                       |                       |          |       |                   |
|        |           |        |       |        |      |                       |                       |      |                       |                       |          |       |                   |
|        |           |        |       |        |      |                       |                       |      |                       |                       |          |       |                   |
|        |           |        |       |        |      |                       |                       |      |                       |                       |          |       |                   |
|        |           |        |       |        |      |                       |                       |      |                       |                       |          |       |                   |
|        |           |        |       |        |      |                       |                       |      |                       |                       |          |       |                   |
|        |           |        |       |        |      |                       |                       |      |                       |                       |          |       |                   |
|        |           |        |       |        |      |                       |                       |      |                       |                       |          |       |                   |
|        |           |        |       |        |      |                       |                       |      |                       |                       |          |       |                   |
|        |           |        |       |        |      |                       |                       |      |                       |                       |          |       |                   |
|        |           |        |       |        |      |                       |                       |      |                       |                       |          |       |                   |
| 1      |           |        |       |        |      |                       |                       |      |                       |                       |          |       |                   |
| 1      |           |        |       |        |      |                       |                       |      |                       |                       |          |       |                   |
| -      |           |        |       |        |      |                       |                       |      |                       |                       |          |       | <b> </b>          |
|        |           |        |       |        |      |                       |                       |      |                       |                       |          |       |                   |
| 1      |           |        |       |        |      |                       |                       |      |                       |                       |          |       |                   |
|        |           |        |       |        |      |                       |                       |      |                       |                       |          |       |                   |
|        |           |        |       |        |      |                       |                       |      |                       |                       |          |       |                   |
|        |           |        |       |        |      |                       |                       |      |                       |                       |          |       |                   |
|        |           |        |       |        |      |                       |                       |      |                       |                       |          |       |                   |
|        |           |        |       |        |      |                       |                       |      |                       |                       |          |       |                   |
|        |           |        |       |        |      |                       |                       |      |                       |                       |          |       |                   |
|        |           |        |       |        |      |                       |                       |      |                       |                       |          |       |                   |

3216079 Langstaff Road EA
Detailed Outlet Structure Discharge Calculations

| Elevation |        |          |       | D         | ischarge | (m <sup>3</sup> /s) |       |       |           |  | Parameters  |                         |
|-----------|--------|----------|-------|-----------|----------|---------------------|-------|-------|-----------|--|---|-------------------------|
| Lievation |        | Spillway |       |           | 0        | utlet Riser         |       | DICB  | Total     | Overflow Weir 1  | Or  | ifice 1                 |
| (m)       | Weir 1 | Weir 2   | Total | Orifice 1 | Weir 1   | Orifice 2           | Total | DICE  | Discharge | Crest Elevation  | Orifice Centre                                      | Perimeter               |
| 204.44    | 0.000  | 0.000    | 0.000 | 0.00000   | 0.000    | 0.000               | 0.000 | 0.000 | 0.0000    | 9999.00 m  | 204.54 m  | 628 mm                  |
| 204.64    | 0.000  | 0.000    | 0.000 | 0.02640   | 0.000    | 0.000               | 0.026 | 0.000 | 0.0264    |  |   |                         |
| 204.84    | 0.000  | 0.000    | 0.000 | 0.04573   | 0.000    | 0.000               | 0.046 | 0.000 | 0.0457    | Crest Width  | Orifice Invert                                      | Area                    |
| 205.04    | 0.000  | 0.000    | 0.000 | 0.05904   | 0.000    | 0.000               | 0.059 | 0.000 | 0.0590    | 1 m  | 204.44 m  | 31,416 mm <sup>2</sup>  |
| 205.24    | 0.000  | 0.000    | 0.000 | 0.06986   | 0.000    | 0.000               | 0.070 | 0.000 | 0.0699    | Slope (x:1) 5  | Orifice Diameter                                    | Orifice Coeff.          |
| 205.44    | 0.000  | 0.000    | 0.000 | 0.07921   | 0.000    | 0.000               | 0.079 | 0.000 | 0.0792    | Weir Coeff. 1.670  | 200 mm  | 0.6                     |
| 205.64    | 0.000  | 0.000    | 0.000 | 0.08757   | 0.000    | 0.000               | 0.088 | 0.000 | 0.0876    | Weir Top Width (m) -97932.6  | Orientation   |                         |
|           |        |          |       |           |          |                     |       |       |           | Overflow Weir 2  | Overflow Weir 2 Vertical                            |                         |
|           |        |          |       |           |          |                     |       |       |           | Crest Elevation  | W   | /eir 1                  |
|           |        |          |       |           |          |                     |       |       |           | 9999.00 m  | Top of Weir Structure                               | Max Perimeter           |
|           |        |          |       |           |          |                     |       |       |           | Crest Width  | 9999.30 m   | 1,400 mm                |
|           |        |          |       |           |          |                     |       |       |           | 3 m  | Weir Crest Invert                                   | Max Open Area           |
|           |        |          |       |           |          |                     |       |       |           | Slope (x:1) 3  | 9999.00 m   | 240,000 mm <sup>2</sup> |
|           |        |          |       |           |          |                     |       |       |           | Weir Coeff. 1.670  | Weir Dimension                                      | s (Height x Length)     |
|           |        |          |       |           |          |                     |       |       |           | Weir Top Width (m) -58941.000  | 300 mm Height                                       | 800 mm L                |
|           |        |          |       |           |          |                     |       |       |           | DICB   | Side Walls  | Weir Coeff.             |
|           |        |          |       |           |          |                     |       |       |           | T/G Invert   | Vertical  | 1.670                   |
|           |        |          |       |           |          |                     |       |       |           | 9999.00 m  | Or  | ifice 2                 |
|           |        |          |       |           |          |                     |       |       |           | CB Size  | Orifice Centre                                      | Perimeter               |
|           |        |          |       |           |          |                     |       |       |           | 1200 mm  | 205.67 m  | 974 mm                  |
|           |        |          |       |           |          |                     |       |       |           | by   | Orifice Invert                                      | Area                    |
|           |        |          |       |           |          |                     |       |       |           | 600 mm   | 205.51 m  | 75,477 mm <sup>2</sup>  |
|           |        |          |       |           |          |                     |       |       |           | Grate Slope  | Orifice Diameter                                    | Orifice Coeff.          |
|           |        |          |       |           |          |                     |       |       |           | 4 :1   | 310 mm  | 0.6                     |
|           |        |          |       |           |          |                     |       |       |           | Area (m <sup>2</sup> ) 0.720   |   | Operates Above (m)      |
|           |        |          |       |           |          |                     |       |       |           | Perimeter (m) 3.600  | Vertical  | 205.67                  |
|           |        |          | -     |           |          |                     |       |       |           | $Q = CA \sqrt{2g\left(h_1 - h_1 + \frac{D}{M}\right)}$   |   |                         |
|           |        |          |       |           |          |                     |       |       |           | $\frac{1}{2} - \frac{1}{2} \sqrt{\frac{1}{2} \left( \frac{1}{2} - \frac{1}{2} + \frac{1}{2000} \right)}$ | $Q = CL(h_2 - h_1)^{1.5} + 1.268z(h_2 - h_2)^{1.5}$ |                         |
| -         | 1      | 1        | 1     | 1         |          |                     |       | 1     |           | <u> </u>   |   |                         |

Where, h2 = elevation at stage 2 (m)
h1 = elevation at stage 1 (m)
D = orifice diameter (mm)
C = orifice coefficient

A = orifice open area  $(m^2)$ 

h2 = elevation at stage 2 (m) h1 = elevation at stage 1 (m) L = weir crest length (m) C = weir coefficient

### Stage-Storage-Discharge Summary - Pipe Storage HSP-3

# Facility # HSP-3

|        |           | Sto               | rage     |        |      | For                   | ebays                 | M    | ain Pool (Exclud      | ling Forebay)         | Stora             | ge    | Estimated         |
|--------|-----------|-------------------|----------|--------|------|-----------------------|-----------------------|------|-----------------------|-----------------------|-------------------|-------|-------------------|
| Stage  | Discharge | Active            | Total    | Stage  | Area | Incremental<br>Volume | Accumulated<br>Volume | Area | Incremental<br>Volume | Accumulated<br>Volume | Sediment          | Total | Detention<br>Time |
| (m)    | (m³/s)    | (m <sup>3</sup> ) | (m³)     | (m)    | (m²) | (m <sup>3</sup> )     | (m³)                  | (m²) | (m³)                  | (m³)                  | (m <sup>3</sup> ) | (m³)  | (hrs)             |
| 204.00 | 0.0000    | 0                 | 0        | 204.00 |      |                       |                       |      | 0                     | 0                     | 0                 | 0     |                   |
| 204.20 | 0.0185    | 30                | 30       | 204.20 |      |                       |                       |      | 0                     | 30                    | 0                 | 30    |                   |
| 204.40 | 0.0302    | 120               | 120      | 204.40 |      |                       |                       |      | 0                     | 120                   | 0                 | 120   |                   |
| 204.60 | 0.1132    | 251               | 251      | 204.60 |      |                       |                       |      | 0                     | 251                   | 0                 | 251   |                   |
| 204.80 | 0.2123    | 383               | 383      | 204.80 |      |                       |                       |      | 0                     | 383                   | 0                 | 383   |                   |
| 205.00 | 0.2753    | 515               | 515      | 205.00 |      |                       |                       |      | 0                     | 515                   | 0                 | 515   |                   |
| 205.20 | 0.3258    | 792               | 792      | 205.20 |      |                       |                       |      | 0                     | 792                   | 0                 | 792   |                   |
|        |           |                   |          |        |      |                       |                       |      |                       |                       |                   |       |                   |
|        |           |                   |          |        |      |                       |                       |      |                       |                       |                   |       |                   |
|        |           |                   |          |        |      |                       |                       |      |                       |                       |                   |       |                   |
|        |           |                   |          |        |      |                       |                       |      |                       |                       |                   |       |                   |
|        |           |                   |          |        |      |                       |                       |      |                       |                       |                   |       |                   |
|        |           |                   |          |        |      |                       |                       |      |                       |                       |                   |       |                   |
|        |           |                   |          |        |      |                       |                       |      |                       |                       |                   |       |                   |
|        |           |                   |          |        |      |                       |                       |      |                       |                       |                   |       |                   |
|        |           |                   |          |        |      |                       |                       |      |                       |                       |                   |       |                   |
|        |           |                   |          |        |      |                       |                       |      |                       |                       |                   |       |                   |
|        |           |                   |          |        |      |                       |                       |      |                       |                       |                   |       |                   |
|        |           |                   |          |        |      |                       |                       |      |                       |                       |                   |       |                   |
|        |           |                   |          |        |      |                       |                       |      |                       |                       |                   |       |                   |
|        |           |                   |          |        |      |                       |                       |      |                       |                       |                   |       |                   |
|        |           |                   |          |        |      |                       |                       |      |                       |                       |                   |       |                   |
|        |           |                   |          |        |      |                       |                       |      |                       |                       |                   |       |                   |
| -      |           |                   |          |        |      |                       |                       |      | -                     |                       | -                 |       | <b> </b>          |
| -      |           |                   |          |        |      |                       |                       |      | -                     |                       | -                 |       | <b> </b>          |
|        |           |                   |          |        | -    |                       |                       |      |                       |                       |                   |       | <b> </b>          |
|        |           |                   |          |        |      |                       |                       |      |                       |                       |                   |       |                   |
|        |           | <b> </b>          | <b> </b> |        |      |                       |                       |      |                       |                       |                   |       |                   |
|        |           |                   |          |        |      |                       |                       |      |                       |                       |                   |       |                   |
|        |           |                   |          |        |      |                       |                       |      |                       |                       |                   |       |                   |
|        |           |                   |          |        |      |                       |                       |      |                       |                       |                   |       |                   |
|        |           |                   |          |        |      |                       |                       |      |                       |                       |                   |       |                   |

3216079 Langstaff Road EA
Detailed Outlet Structure Discharge Calculations

| Elevation |        |          |       | D         | ischarge | (m³/s)      |       |       |           |                              | Parameters            |                         |
|-----------|--------|----------|-------|-----------|----------|-------------|-------|-------|-----------|------------------------------|-----------------------|-------------------------|
| Lievation |        | Spillway |       |           | 0        | utlet Riser |       | DICB  | Total     | Overflow Weir 1              | Ori                   | fice 1                  |
| (m)       | Weir 1 | Weir 2   | Total | Orifice 1 | Weir 1   | Orifice 2   | Total | DICE  | Discharge | Crest Elevation              | Orifice Centre        | Perimeter               |
| 204.00    | 0.000  | 0.000    | 0.000 | 0.00000   | 0.000    | 0.000       | 0.000 | 0.000 | 0.0000    | 9999.00 m                    | 204.08 m              | 503 mm                  |
| 204.20    | 0.000  | 0.000    | 0.000 | 0.01851   | 0.000    | 0.000       | 0.019 | 0.000 | 0.0185    |                              |                       |                         |
| 204.40    | 0.000  | 0.000    | 0.000 | 0.03023   | 0.000    | 0.000       | 0.030 | 0.000 | 0.0302    | Crest Width                  | Orifice Invert        | Area                    |
| 204.60    | 0.000  | 0.000    | 0.000 | 0.03853   | 0.000    | 0.075       | 0.113 | 0.000 | 0.1132    | 1 m                          | 204.00 m              | 20,106 mm <sup>2</sup>  |
| 204.80    | 0.000  | 0.000    | 0.000 | 0.04534   | 0.000    | 0.167       | 0.212 | 0.000 | 0.2123    | Slope (x:1) 5                | Orifice Diameter      | Orifice Coeff.          |
| 205.00    | 0.000  | 0.000    | 0.000 | 0.05125   | 0.000    | 0.224       | 0.275 | 0.000 | 0.2753    | Weir Coeff. 1.670            | 160 mm                | 0.6                     |
| 205.20    | 0.000  | 0.000    | 0.000 | 0.05655   | 0.000    | 0.269       | 0.326 | 0.000 | 0.3258    | Weir Top Width (m) -97937.0  | Orientation           |                         |
|           |        |          |       |           |          |             |       |       |           | Overflow Weir 2              | Vertical              |                         |
|           |        |          |       |           |          |             |       |       |           | Crest Elevation              | W                     | eir 1                   |
|           |        |          |       |           |          |             |       |       |           | 9999.00 m                    | Top of Weir Structure | Max Perimeter           |
|           |        |          |       |           |          |             |       |       |           | Crest Width                  | 9999.30 m             | 1,400 mm                |
|           |        |          |       |           |          |             |       |       |           | 3 m                          | Weir Crest Invert     | Max Open Area           |
|           |        |          |       |           |          |             |       |       |           | Slope (x:1) 3                | 9999.00 m             | 240,000 mm <sup>2</sup> |
|           |        |          |       |           |          |             |       |       |           | Weir Coeff. 1.670            | Weir Dimensions       | s (Height x Length)     |
|           |        |          |       |           |          |             |       |       |           | Weir Top Width (m) -58941.00 | 0 300 mm Height       | 800 mm L                |
|           |        |          |       |           |          |             |       |       |           | DICB                         | Side Walls            | Weir Coeff.             |
|           |        |          |       |           |          |             |       |       |           | T/G Invert                   | Vertical              | 1.670                   |
|           |        |          |       |           |          |             |       |       |           | 9999.00 m                    | Ori                   | fice 2                  |
|           |        |          |       |           |          |             |       |       |           | CB Size                      | Orifice Centre        | Perimeter               |
|           |        |          |       |           |          |             |       |       |           | 1200 mm                      | 204.55 m              | 1,257 mm                |
|           |        |          |       |           |          |             |       |       |           | by                           | Orifice Invert        | Area                    |
|           |        |          |       |           |          |             |       |       |           | 600 mm                       | 204.35 m              | 125,664 mm <sup>2</sup> |
|           |        |          |       |           |          |             |       |       |           | Grate Slope                  | Orifice Diameter      | Orifice Coeff.          |
|           |        |          |       |           |          |             |       |       |           | 4 :1                         | 400 mm                | 0.6                     |
|           |        |          |       |           |          |             |       |       |           | Area (m <sup>2</sup> ) 0.72  |                       | Operates Above (m       |
|           |        |          |       |           |          |             |       |       |           | Perimeter (m) 3.60           | 0 Vertical            | 204.55                  |

Where, h2 = elevation at stage 2 (m) h1 = elevation at stage 1 (m) D = orifice diameter (mm) C = orifice coefficient

A = orifice open area (m<sup>2</sup>)

 $Q = CL(h_2 - h_1)^{1.5} + 1.268z(h_2 - h_1)^{2.5}$ 

h2 = elevation at stage 2 (m) h1 = elevation at stage 1 (m) L = weir crest length (m) C = weir coefficient

### Stage-Storage-Discharge Summary - Pipe Storage DSP-1

### Facility # DSP-1

|        |                     | Sto               | rage              |        |                   | For                   | ebays                 | Ma                | in Pool (Excludi      | ing Forebay)          | Stora             | ge                | Estimated         |
|--------|---------------------|-------------------|-------------------|--------|-------------------|-----------------------|-----------------------|-------------------|-----------------------|-----------------------|-------------------|-------------------|-------------------|
| Stage  | Discharge           | Active            | Total             | Stage  | Area              | Incremental<br>Volume | Accumulated<br>Volume | Area              | Incremental<br>Volume | Accumulated<br>Volume | Sediment          | Total             | Detention<br>Time |
| (m)    | (m <sup>3</sup> /s) | (m <sup>3</sup> ) | (m <sup>3</sup> ) | (m)    | (m <sup>2</sup> ) | (m <sup>3</sup> )     | (m <sup>3</sup> )     | (m <sup>2</sup> ) | (m <sup>3</sup> )     | (m <sup>3</sup> )     | (m <sup>3</sup> ) | (m <sup>3</sup> ) | (hrs)             |
| 207.98 | 0.0000              | 0                 | 0                 | 207.98 |                   |                       |                       |                   | 0                     | 0                     | 0                 | 0                 |                   |
| 208.18 | 0.0056              | 72                | 72                | 208.18 |                   |                       |                       |                   | 0                     | 72                    | 0                 | 72                |                   |
| 208.38 | 0.0084              | 283               | 283               | 208.38 |                   |                       |                       |                   | 0                     | 283                   | 0                 | 283               |                   |
| 208.58 | 0.0105              | 553               | 553               | 208.58 |                   |                       |                       |                   | 0                     | 553                   | 0                 | 553               |                   |
| 208.78 | 0.0122              | 823               | 823               | 208.78 |                   |                       |                       |                   | 0                     | 823                   | 0                 | 823               |                   |
| 208.98 | 0.0382              | 1,093             | 1,093             | 208.98 |                   |                       |                       |                   | 0                     | 1,093                 | 0                 | 1,093             |                   |
| 209.18 | 0.0516              | 1,598             | 1,598             | 209.18 |                   |                       |                       |                   | 0                     | 1,598                 | 0                 | 1,598             |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        | 1                   | 1                 |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        | 1                   | 1                 |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        | l                   | 1                 | l                 |        |                   | l                     | l                     |                   |                       | l                     |                   |                   |                   |

3216079 Langstaff Road EA
Detailed Outlet Structure Discharge Calculations

| Elevation |        |          |       | D         | ischarge | (m <sup>3</sup> /s) |       |       |           |  | Parameters            |                              |
|-----------|--------|----------|-------|-----------|----------|---------------------|-------|-------|-----------|--|-----------------------|------------------------------|
| Lievation |        | Spillway |       |           | 0        | utlet Riser         |       | DICB  | Total     | Overflow Weir 1  | Ori                   | fice 1                       |
| (m)       | Weir 1 | Weir 2   | Total | Orifice 1 | Weir 1   | Orifice 2           | Total | DICE  | Discharge | Crest Elevation  | Orifice Centre        | Perimeter                    |
| 207.98    | 0.000  | 0.000    | 0.000 | 0.00000   | 0.000    | 0.000               | 0.000 | 0.000 | 0.0000    | 9999.00 m  | 208.02 m              | 258 mm                       |
| 208.18    | 0.000  | 0.000    | 0.000 | 0.00560   | 0.000    | 0.000               | 0.006 | 0.000 | 0.0056    |  |                       |                              |
| 208.38    | 0.000  | 0.000    | 0.000 | 0.00841   | 0.000    | 0.000               | 0.008 | 0.000 | 0.0084    | Crest Width  | Orifice Invert        | Area                         |
| 208.58    | 0.000  | 0.000    | 0.000 | 0.01049   | 0.000    | 0.000               | 0.010 | 0.000 | 0.0105    | 1 m  | 207.98 m              | 5,281 mm <sup>2</sup>        |
| 208.78    | 0.000  | 0.000    | 0.000 | 0.01223   | 0.000    | 0.000               | 0.012 | 0.000 | 0.0122    | Slope (x:1) 5  | Orifice Diameter      | Orifice Coeff.               |
| 208.98    | 0.000  | 0.000    | 0.000 | 0.01374   | 0.000    | 0.025               | 0.038 | 0.000 | 0.0382    | Weir Coeff. 1.670  | 82 mm                 | 0.6                          |
| 209.18    | 0.000  | 0.000    | 0.000 | 0.01511   | 0.000    | 0.036               | 0.052 | 0.000 | 0.0516    | Weir Top Width (m) -97897.2  | Orientation           |                              |
|           |        |          |       |           |          |                     |       |       |           | Overflow Weir 2  | Vertical              |                              |
|           |        |          |       |           |          |                     |       |       |           | Crest Elevation  | W                     | eir 1                        |
|           |        |          |       |           |          |                     |       |       |           | 9999.00 m  | Top of Weir Structure | Max Perimeter                |
|           |        |          |       |           |          |                     |       |       |           | Crest Width  | 9999.30 m             | 1,400 mm                     |
|           |        |          |       |           |          |                     |       |       |           | 3 m  | Weir Crest Invert     | Max Open Area                |
|           |        |          |       |           |          |                     |       |       |           | Slope (x:1) 3  | 9999.00 m             | 240,000 mm <sup>2</sup>      |
|           |        |          |       |           |          |                     |       |       |           | Weir Coeff. 1.670  | Weir Dimension        | s (Height x Length)          |
|           |        |          |       |           |          |                     |       |       |           | Weir Top Width (m) -58941.000                                      | 300 mm Height         | 800 mm L                     |
|           |        |          |       |           |          |                     |       |       |           | DICB   | Side Walls            | Weir Coeff.                  |
|           |        |          |       |           |          |                     |       |       |           | T/G Invert   | Vertical              | 1.670                        |
|           |        |          |       |           |          |                     |       |       |           | 9999.00 m  | Ori                   | fice 2                       |
|           |        |          |       |           |          |                     |       |       |           | CB Size  | Orifice Centre        | Perimeter                    |
|           |        |          |       |           |          |                     |       |       |           | 1200 mm  | 208.81 m              | 534 mm                       |
|           |        |          |       |           |          |                     |       |       |           | by   | Orifice Invert        | Area                         |
|           |        |          |       |           |          |                     |       |       |           | 600 mm   | 208.73 m              | 22,698 mm <sup>2</sup>       |
|           |        |          |       |           |          |                     |       |       |           | Grate Slope  | Orifice Diameter      | Orifice Coeff.               |
|           |        |          |       |           |          |                     |       |       |           | 4 :1   | 170 mm                | 0.6                          |
|           |        |          |       |           |          |                     |       |       |           | Area (m <sup>2</sup> ) 0.720                                       | Orientation           | Operates Above (m            |
|           |        |          |       |           |          |                     |       |       |           | Perimeter (m) 3.600  | Vertical              | 208.81                       |
|           |        |          |       |           |          |                     |       |       |           | $\left(\begin{array}{cccc} & & & \\ & & \\ & & \end{array}\right)$ |                       |                              |
|           |        |          |       |           |          |                     |       |       |           | $Q = CA \sqrt{2g \left[ h_2 - h_1 + \frac{D}{2000} \right]}$       | $Q = CL(h_1 - h_2)$   | $^{1.5} + 1.268z(h_2 - h_1)$ |

Where, h2 = elevation at stage 2 (m)
h1 = elevation at stage 1 (m)
D = orifice diameter (mm)
C = orifice coefficient

A = orifice open area (m<sup>2</sup>)

h2 = elevation at stage 2 (m)

h1 = elevation at stage 1 (m) L = weir crest length (m) C = weir coefficient

### 3211026 I3216079 Langstaff Road EA

### Stage-Storage-Discharge Summary - Dry Pond DDP-1

# Dry Pond # DDP-1

|          |                     | Sto               | rage              |        |                   | Fore                  | ebays                 | Ma                | in Pool (Excludi      | ing Forebay)          | Stora             | ge                | Estimated         |
|----------|---------------------|-------------------|-------------------|--------|-------------------|-----------------------|-----------------------|-------------------|-----------------------|-----------------------|-------------------|-------------------|-------------------|
| Stage    | Discharge           | Active            | Total             | Stage  | Area              | Incremental<br>Volume | Accumulated<br>Volume | Area              | Incremental<br>Volume | Accumulated<br>Volume | Sediment          | Total             | Detention<br>Time |
| (m)      | (m <sup>3</sup> /s) | (m <sup>3</sup> ) | (m <sup>3</sup> ) | (m)    | (m <sup>2</sup> ) | (m <sup>3</sup> )     | (m <sup>3</sup> )     | (m <sup>2</sup> ) | (m <sup>3</sup> )     | (m <sup>3</sup> )     | (m <sup>3</sup> ) | (m <sup>3</sup> ) | (hrs)             |
| 205.60   | 0.0000              | 0                 | 0                 | 205.60 |                   |                       |                       | 447               | 0                     | 0                     |                   | 0                 | 0.0               |
| 205.92   | 0.0071              | 165               | 165               | 205.92 |                   |                       |                       | 584               | 165                   | 165                   | 0                 | 165               | 6.5               |
| 206.18   | 0.0098              | 331               | 331               | 206.18 |                   |                       |                       | 694               | 166                   | 331                   | 0                 | 331               | 11.2              |
| 206.44   | 0.0119              | 526               | 526               | 206.44 |                   |                       |                       | 805               | 195                   | 526                   | 0                 | 526               | 15.7              |
| 206.70   | 0.0138              | 750               | 750               | 206.70 |                   |                       |                       | 916               | 224                   | 750                   | 0                 | 750               | 20.2              |
| 206.96   | 0.0471              | 1,003             | 1,003             | 206.96 |                   |                       |                       | 1,027             | 253                   | 1,003                 | 0                 | 1,003             | 21.7              |
| 207.22   | 0.0636              | 1,284             | 1,284             | 207.22 |                   |                       |                       | 1,138             | 282                   | 1,284                 | 0                 | 1,284             | 23.0              |
| 207.48   | 0.0763              | 1,594             | 1,594             | 207.48 |                   |                       |                       | 1,249             | 310                   | 1,594                 | 0                 | 1,594             | 24.1              |
| 207.74   | 0.0870              | 1,934             | 1,934             | 207.74 |                   |                       |                       | 1,365             | 340                   | 1,934                 | 0                 | 1,934             | 25.2              |
| 208.00   | 0.0964              | 2,308             | 2,308             | 208.00 |                   |                       |                       | 1,511             | 374                   | 2,308                 | 0                 | 2,308             | 26.2              |
|          |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|          |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|          |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|          |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|          |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|          |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|          |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|          |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|          |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|          |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|          |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|          |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|          |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|          |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|          | 1                   |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   | 1 1               |
|          |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|          |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   | 1                 |
|          |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   | 1                 |
|          |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|          |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|          |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   | 1                 |
| <u> </u> | I                   | l                 | l                 |        |                   | 1                     |                       |                   | l                     | l                     |                   |                   |                   |

### 3211026 Fifth Line EA

**Detailed Outlet Structure Discharge Calculations** 

| Elevation |        |          |       | D         | ischarge | (m <sup>3</sup> /s) |       |       |           |   | Parameters            |   |  |
|-----------|--------|----------|-------|-----------|----------|---------------------|-------|-------|-----------|---|-----------------------|---|--|
| Lievation |        | Spillway |       |           | 0        | utlet Riser         |       | DICB  | Total     | Overflow Weir 1   | Or                    | ifice 1                                       |  |
| (m)       | Weir 1 | Weir 2   | Total | Orifice 1 | Weir 1   | Orifice 2           | Total | DICE  | Discharge | Crest Elevation   | Orifice Centre        | Perimeter                                     |  |
| 205.60    | 0.000  | 0.000    | 0.000 | 0.00000   | 0.000    | 0.000               | 0.000 | 0.000 | 0.0000    | 208.00 m  | 205.64 m              | 251 mm  |  |
| 205.92    | 0.000  | 0.000    | 0.000 | 0.00707   | 0.000    | 0.000               | 0.007 | 0.000 | 0.0071    |   |                       |   |  |
| 206.18    | 0.000  | 0.000    | 0.000 | 0.00982   | 0.000    | 0.000               | 0.010 | 0.000 | 0.0098    | Crest Width   | Orifice Invert        | Area  |  |
| 206.44    | 0.000  | 0.000    | 0.000 | 0.01195   | 0.000    | 0.000               | 0.012 | 0.000 | 0.0119    | 1.2 m   | 205.60 m              | 5,027 mm <sup>2</sup>                         |  |
| 206.70    | 0.000  | 0.000    | 0.000 | 0.01375   | 0.000    | 0.000               | 0.014 | 0.000 | 0.0138    | Slope (x:1) 5   | Orifice Diameter      | Orifice Coeff.                                |  |
| 206.96    | 0.000  | 0.000    | 0.000 | 0.01535   | 0.000    | 0.032               | 0.047 | 0.000 | 0.0471    | Weir Coeff. 1.670   | 80 mm                 | 0.6   |  |
| 207.22    | 0.000  | 0.000    | 0.000 | 0.01679   | 0.000    | 0.047               | 0.064 | 0.000 | 0.0636    | Weir Top Width (m) 1.2                                      | Orientation           |   |  |
| 207.48    | 0.000  | 0.000    | 0.000 | 0.01812   | 0.000    | 0.058               | 0.076 | 0.000 | 0.0763    | Overflow Weir 2   | Vertical              |   |  |
| 207.74    | 0.000  | 0.000    | 0.000 | 0.01936   | 0.000    | 0.068               | 0.087 | 0.000 | 0.0870    | Crest Elevation   | W                     | eir 1   |  |
| 208.00    | 0.000  | 0.000    | 0.000 | 0.02052   | 0.000    | 0.076               | 0.096 | 0.000 | 0.0964    | 9999.00 m   | Top of Weir Structure | Max Perimeter                                 |  |
|           |        |          |       |           |          |                     |       |       |           | Crest Width   | 9999.3 m              | 2,600 mm                                      |  |
|           |        |          |       |           |          |                     |       |       |           | 3 m   | Weir Crest Invert     | Max Open Area                                 |  |
|           |        |          |       |           |          |                     |       |       |           | Slope (x:1) 3   | 9999.0 m              | 600,000 mm <sup>2</sup>                       |  |
|           |        |          |       |           |          |                     |       |       |           | Weir Coeff. 1.670   | Weir Dimension        | s (Height x Length)                           |  |
|           |        |          |       |           |          |                     |       |       |           | Weir Top Width (m) -58941.000                               | 300 mm Height         | 2000 mm L                                     |  |
|           |        |          |       |           |          |                     |       |       |           | DICB  | Side Walls            | Weir Coeff.                                   |  |
|           |        |          |       |           |          |                     |       |       |           | T/G Invert  | Vertical              | 1.670   |  |
|           |        |          |       |           |          |                     |       |       |           | 9999.00 m   | Or                    | ifice 2                                       |  |
|           |        |          |       |           |          |                     |       |       |           | CB Size   | Orifice Centre        | Perimeter                                     |  |
|           |        |          |       |           |          |                     |       |       |           | 1200 mm   | 206.74 m              | 565 mm  |  |
|           |        |          |       |           |          |                     |       |       |           | by  | Orifice Invert        | Area  |  |
|           |        |          |       |           |          |                     |       |       |           | 600 mm  | 206.65 m              | 25,447 mm <sup>2</sup>                        |  |
|           |        |          |       |           |          |                     |       |       |           | Grate Slope   | Orifice Diameter      | Orifice Coeff.                                |  |
|           |        |          |       |           |          |                     |       |       |           | 4 :1  | 180 mm                | 0.6   |  |
|           |        |          |       |           |          |                     |       |       |           | Area (m²) 0.720   | Orientation           | Operates Above (r                             |  |
|           |        |          |       |           |          |                     |       |       |           | Perimeter (m) 3.600   | Vertical              | 206.74  |  |
|           |        |          |       |           |          |                     |       |       |           |   |                       |   |  |
|           |        |          |       |           |          |                     |       |       |           | $Q = CA \sqrt{2g \left( h_2 - h_1 + \frac{2}{200} \right)}$ | $Q = CL(h_2 - h_2)$   | $(h_2 - h_1)^{1.5} + 1.268z(h_2 - h_1)^{1.5}$ |  |

Where, h2 = elevation at stage 2 (m) h1 = elevation at stage 1 (m) D = orifice diameter (mm) C = orifice coefficient

A = orifice open area (m<sup>2</sup>)

h2 = elevation at stage 2 (m) h1 = elevation at stage 1 (m) L = weir crest length (m) C = weir coefficient

Stage-Storage-Discharge Summary - Wet Pond DWP-1

# Wet Pond DWP-1

| (m) (m<br>206.40 0.0<br>206.45 0.0<br>206.50 0.0<br>206.55 0.0<br>206.60 0.0 | m³/s) 0000 0013 0033 0044    | Active<br>(m³)<br>0<br>157<br>320<br>487 | Total (m³) 0 157 320 | (m)<br>206.40<br>206.45<br>206.50 | Area<br>(m²)      | Incremental<br>Volume<br>(m³) | Accumulated<br>Volume<br>(m³) | Area<br>(m²)<br>3,098 | Volume<br>(m³) | Accumulated<br>Volume<br>(m³) | Sediment (m³)     | Total<br>(m³)     | Detention Time |
|--|------------------------------|--|----------------------|-----------------------------------|-------------------|-------------------------------|-------------------------------|-----------------------|----------------|-------------------------------|-------------------|-------------------|----------------|
| 206.40 0.0<br>206.45 0.0<br>206.50 0.0<br>206.55 0.0<br>206.60 0.0           | 0000<br>0013<br>0033<br>0044 | 0<br>157<br>320                          | 0<br>157<br>320      | 206.40<br>206.45                  | (m <sup>2</sup> ) | (m³)                          | (m³)                          | ` '                   | ` '            |                               | (m <sup>3</sup> ) | (m <sup>3</sup> ) | (hre)          |
| 206.45 0.0<br>206.50 0.0<br>206.55 0.0<br>206.60 0.0                         | 0013<br>0033<br>0044         | 157<br>320                               | 157<br>320           | 206.45                            |                   |                               |                               | 3,098                 | •              |                               |                   |                   | (1113)         |
| 206.50 0.0<br>206.55 0.0<br>206.60 0.0                                       | 0033<br>0044                 | 320                                      | 320                  |                                   |                   |                               |                               |                       | U              | 0                             |                   | 0                 | 0.000          |
| 206.55 0.0<br>206.60 0.0   | 0044                         |  |                      | 206.50                            |                   |                               |                               | 3,197                 | 157            | 157                           | 0                 | 157               | 0.000          |
| 206.60 0.0   |                              | 487                                      |                      |                                   |                   |                               |                               | 3,297                 | 162            | 320                           | 0                 | 320               | 13.781         |
|  | 0050                         |  | 487                  | 206.55                            |                   |                               |                               | 3,396                 | 167            | 487                           | 0                 | 487               | 24.271         |
|  | ひしつづ                         | 659                                      | 659                  | 206.60                            |                   |                               |                               | 3,495                 | 172            | 659                           | 0                 | 659               | 33.226         |
|  | 0061                         | 837                                      | 837                  | 206.65                            |                   |                               |                               | 3,594                 | 177            | 837                           | 0                 | 837               | 41.268         |
|  | 0068                         | 1,019                                    | 1,019                | 206.70                            |                   |                               |                               | 3,694                 | 182            | 1,019                         | 0                 | 1,019             | 48.698         |
|  | 0074                         | 1,206                                    | 1,206                | 206.75                            |                   |                               |                               | 3,793                 | 187            | 1,206                         | 0                 | 1,206             | 55.688         |
|  | 0800                         | 1,398                                    | 1,398                | 206.80                            |                   |                               |                               | 3,892                 | 192            | 1,398                         | 0                 | 1,398             | 62.347         |
|  | 0086                         | 1,595                                    | 1,595                | 206.85                            |                   |                               |                               | 3,992                 | 197            | 1,595                         | 0                 | 1,595             | 68.747         |
|  | 0091                         | 1,797                                    | 1,797                | 206.90                            |                   |                               |                               | 4,091                 | 202            | 1,797                         | 0                 | 1,797             | 74.942         |
|  | .0095                        | 2,004                                    | 2,004                | 206.95                            |                   |                               |                               | 4,190                 | 207            | 2,004                         | 0                 | 2,004             | 80.970         |
|  | 0100                         | 2,216                                    | 2,216                | 207.00                            |                   |                               |                               | 4,289                 | 212            | 2,216                         | 0                 | 2,216             | 86.860         |
|  | 0104                         | 2,433                                    | 2,433                | 207.05                            |                   |                               |                               | 4,389                 | 217            | 2,433                         | 0                 | 2,433             | 92.636         |
|  | 0109                         | 2,655                                    | 2,655                | 207.10                            |                   |                               |                               | 4,488                 | 222            | 2,655                         | 0                 | 2,655             | 98.316         |
|  | 0113                         | 2,882                                    | 2,882                | 207.15                            |                   |                               |                               | 4,587                 | 227            | 2,882                         | 0                 | 2,882             | 103.914        |
| 207.20 0.0   | 0116                         | 3,114                                    | 3,114                | 207.20                            |                   |                               |                               | 4,686                 | 232            | 3,114                         | 0                 | 3,114             | 109.444        |
| 207.30 0.1   | 1520                         | 3,592                                    | 3,592                | 207.30                            |                   |                               |                               | 4,885                 | 479            | 3,592                         | 0                 | 3,592             | 110.318        |
| 207.45 0.5   | 5654                         | 4,336                                    | 4,336                | 207.45                            |                   |                               |                               | 5,026                 | 743            | 4,336                         | 0                 | 4,336             | 110.684        |
| 207.60 1.1   | 1316                         | 5.100                                    | 5.100                | 207.60                            |                   |                               |                               | 5.167                 | 764            | 5.100                         | 0                 | 5.100             | 110.871        |

3216079 Langstaff Road EA
Detailed Outlet Structure Discharge Calculations

| Elevation |        |          |       | D         | ischarge ( | m <sup>3</sup> /s)                      |       |       |           |                              | Parameters                 |                         |
|-----------|--------|----------|-------|-----------|------------|---|-------|-------|-----------|------------------------------|----------------------------|-------------------------|
| Lievation |        | Spillway |       |           | Out        | tlet Riser                              |       | DICB  | Total     | Overflow Weir 1              | Orific                     | e 1                     |
| (m)       | Weir 1 | Weir 2   | Total | Orifice 1 | Weir 1     | Orifice 2                               | Total | DICE  | Discharge | Crest Elevation              | Orifice Centre             | Perimeter               |
| 206.40    | 0.000  | 0.000    | 0.000 | 0.00000   | 0.000      | 0.000                                   | 0.000 | 0.000 | 0.0000    | 207.64 m                     | 206.44 m                   | 251 mm                  |
| 206.45    | 0.000  | 0.000    | 0.000 | 0.00134   | 0.000      | 0.000                                   | 0.001 | 0.000 | 0.0013    |                              |                            |                         |
| 206.50    | 0.000  | 0.000    | 0.000 | 0.00327   | 0.000      | 0.000                                   | 0.003 | 0.000 | 0.0033    | Crest Width                  | Orifice Invert             | Area                    |
| 206.55    | 0.000  | 0.000    | 0.000 | 0.00443   | 0.000      | 0.000                                   | 0.004 | 0.000 | 0.0044    | 1.2 m                        | 206.40 m                   | 5,027 mm <sup>2</sup>   |
| 206.60    | 0.000  | 0.000    | 0.000 | 0.00534   | 0.000      | 0.000                                   | 0.005 | 0.000 | 0.0053    | Slope (x:1) 12.5             | Orifice Diameter           | Orifice Coeff.          |
| 206.65    | 0.000  | 0.000    | 0.000 | 0.00612   | 0.000      | 0.000                                   | 0.006 | 0.000 | 0.0061    | Weir Coeff. 1.670            | 80 mm                      | 0.6                     |
| 206.70    | 0.000  | 0.000    | 0.000 | 0.00681   | 0.000      | 0.000                                   | 0.007 | 0.000 | 0.0068    | Weir Top Width (m) 0.2       | Orientation                | Obvert                  |
| 206.75    | 0.000  | 0.000    | 0.000 | 0.00744   | 0.000      | 0.000                                   | 0.007 | 0.000 | 0.0074    | Overflow Weir 2              | Vertical                   | 206.48 m                |
| 206.80    | 0.000  | 0.000    | 0.000 | 0.00802   | 0.000      | 0.000                                   | 0.008 | 0.000 | 0.0080    | Crest Elevation              | Rectangula                 | ar Weir 1               |
| 206.85    | 0.000  | 0.000    | 0.000 | 0.00855   | 0.000      | 0.000                                   | 0.009 | 0.000 | 0.0086    | 9999.00 m                    | Bottom Weir Crest Invert   | Top Weir Width Invert   |
| 206.90    | 0.000  | 0.000    | 0.000 | 0.00906   | 0.000      | 0.000                                   | 0.009 | 0.000 | 0.0091    | Crest Width                  | 207.20 m                   | 207.20 m                |
| 206.95    | 0.000  | 0.000    | 0.000 | 0.00954   | 0.000      | 0.000                                   | 0.010 | 0.000 | 0.0095    | 3 m                          | Bottom Weir Crest Width, L | Top Weir Crest Width, B |
| 207.00    | 0.000  | 0.000    | 0.000 | 0.01000   | 0.000      | 0.000                                   | 0.010 | 0.000 | 0.0100    | Slope (x:1) 3                | 0.00 m                     | 2.40 m                  |
| 207.05    | 0.000  | 0.000    | 0.000 | 0.01043   | 0.000      | 0.000                                   | 0.010 | 0.000 | 0.0104    | Weir Coeff. 1.670            | Bottom Weir Crest Height   | Weir Coeff.             |
| 207.10    | 0.000  | 0.000    | 0.000 | 0.01085   | 0.000      | 0.000                                   | 0.011 | 0.000 | 0.0109    | Weir Top Width (m) -58941.0  | 0.00 m High                | 1.84                    |
| 207.15    | 0.000  | 0.000    | 0.000 | 0.01126   | 0.000      | 0.000                                   | 0.011 | 0.000 | 0.0113    | DICB                         |                            |                         |
| 207.20    | 0.000  | 0.000    | 0.000 | 0.01165   | 0.000      | 0.000                                   | 0.012 | 0.000 | 0.0116    | T/G Invert                   |                            |                         |
| 207.30    | 0.000  | 0.000    | 0.000 | 0.01239   | 0.140      | 0.000                                   | 0.152 | 0.000 | 0.1520    | 99999.00 m                   | Orific                     | e 2                     |
| 207.45    | 0.000  | 0.000    | 0.000 | 0.01343   | 0.552      | 0.000                                   | 0.565 | 0.000 | 0.5654    | CB Size                      | Orifice Centre             | Perimeter               |
| 207.60    | 0.000  | 0.000    | 0.000 | 0.01439   | 1.117      | 0.000                                   | 1.132 | 0.000 | 1.1316    | 600 mm                       | 99999.00 m                 | 0 mm                    |
|           |        |          |       |           |            |   |       |       |           | by                           | Orifice Invert             | Area                    |
|           |        |          |       |           |            |   |       |       |           | 600 mm                       | 99999.00 m                 | 0 mm <sup>2</sup>       |
|           |        |          |       |           |            |   |       |       |           | Grate Slope                  | Orifice Diameter           | Orifice Coeff.          |
|           |        |          |       |           |            |   |       |       |           | 4 :1                         | 0 mm                       | 0.60                    |
|           |        |          |       |           |            |   |       |       |           | Area (m <sup>2</sup> ) 0.360 | Orientation                | Obvert                  |
|           |        |          |       |           |            | *************************************** |       |       |           | Perimeter (m) 2.400          | Vertical                   | 99999.00 m              |

### Stage-Storage-Discharge Summary - Pipe Storage DSP-2

### Facility # DSP-2

|        |                     | Sto               | rage              |        |                   | For                   | ebays                 | Ma                | in Pool (Excludi      | ing Forebay)          | Stora             | ige               | Estimated  |
|--------|---------------------|-------------------|-------------------|--------|-------------------|-----------------------|-----------------------|-------------------|-----------------------|-----------------------|-------------------|-------------------|--|
| Stage  | Discharge           | Active            | Total             | Stage  | Area              | Incremental<br>Volume | Accumulated<br>Volume | Area              | Incremental<br>Volume | Accumulated<br>Volume | Sediment          | Total             | Detention<br>Time                                |
| (m)    | (m <sup>3</sup> /s) | (m <sup>3</sup> ) | (m <sup>3</sup> ) | (m)    | (m <sup>2</sup> ) | (m <sup>3</sup> )     | (m <sup>3</sup> )     | (m <sup>2</sup> ) | (m <sup>3</sup> )     | (m <sup>3</sup> )     | (m <sup>3</sup> ) | (m <sup>3</sup> ) | (hrs)  |
| 197.58 | 0.0000              | 0                 | 0                 | 197.58 |                   |                       |                       |                   | 0                     | 0                     | 0                 | 0                 |  |
| 197.78 | 0.0081              | 48                | 48                | 197.78 |                   |                       |                       |                   | 0                     | 48                    | 0                 | 48                |  |
| 197.98 | 0.0123              | 192               | 192               | 197.98 |                   |                       |                       |                   | 0                     | 192                   | 0                 | 192               |  |
| 198.18 | 0.0155              | 372               | 372               | 198.18 |                   |                       |                       |                   | 0                     | 372                   | 0                 | 372               |  |
| 198.38 | 0.0181              | 552               | 552               | 198.38 |                   |                       |                       |                   | 0                     | 552                   | 0                 | 552               |  |
| 198.58 | 0.0203              | 732               | 732               | 198.58 |                   |                       |                       |                   | 0                     | 732                   | 0                 | 732               |  |
| 198.78 | 0.0224              | 1,152             | 1,152             | 198.78 |                   |                       |                       |                   | 0                     | 1,152                 | 0                 | 1,152             |  |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |  |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |  |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |  |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |  |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |  |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |  |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |  |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |  |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |  |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |  |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |  |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |  |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |  |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |  |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |  |
|        | 1                   |                   |                   |        |                   |                       |                       |                   |                       |                       | i e               |                   |  |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |  |
|        | 1                   |                   |                   |        |                   |                       |                       |                   |                       |                       | i e               |                   |  |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |  |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |  |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |  |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |                   |  |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       | 1                 |                   |  |
| 1      | 1                   |                   |                   |        | l                 | 1                     |                       |                   | 1                     |                       | 1                 | l                 | <del>                                     </del> |
|        | l                   |                   |                   |        |                   |                       |                       |                   |                       | l                     |                   |                   |  |

3216079 Langstaff Road EA
Detailed Outlet Structure Discharge Calculations

| Elevation |        |          |       | D         | ischarge | (m <sup>3</sup> /s) |       |       |           |  | Parameters                    |                                     |
|-----------|--------|----------|-------|-----------|----------|---------------------|-------|-------|-----------|--|-------------------------------|-------------------------------------|
| Lievation |        | Spillway |       |           | 0        | utlet Riser         |       | DICB  | Total     | Overflow Weir 1  | Ori                           | fice 1                              |
| (m)       | Weir 1 | Weir 2   | Total | Orifice 1 | Weir 1   | Orifice 2           | Total | DICB  | Discharge | Crest Elevation  | Orifice Centre                | Perimeter                           |
| 197.58    | 0.000  | 0.000    | 0.000 | 0.00000   | 0.000    | 0.000               | 0.000 | 0.000 | 0.0000    | 9999.00 m  | 197.63 m                      | 314 mm                              |
| 197.78    | 0.000  | 0.000    | 0.000 | 0.00808   | 0.000    | 0.000               | 0.008 | 0.000 | 0.0081    |  |                               |                                     |
| 197.98    | 0.000  | 0.000    | 0.000 | 0.01235   | 0.000    | 0.000               | 0.012 | 0.000 | 0.0123    | Crest Width  | Orifice Invert                | Area                                |
| 198.18    | 0.000  | 0.000    | 0.000 | 0.01548   | 0.000    | 0.000               | 0.015 | 0.000 | 0.0155    | 1 m  | 197.58 m                      | 7,854 mm <sup>2</sup>               |
| 198.38    | 0.000  | 0.000    | 0.000 | 0.01808   | 0.000    | 0.000               | 0.018 | 0.000 | 0.0181    | Slope (x:1) 5  | Orifice Diameter              | Orifice Coeff.                      |
| 198.58    | 0.000  | 0.000    | 0.000 | 0.02034   | 0.000    | 0.000               | 0.020 | 0.000 | 0.0203    | Weir Coeff. 1.670  | 100 mm                        | 0.6                                 |
| 198.78    | 0.000  | 0.000    | 0.000 | 0.02238   | 0.000    | 0.000               | 0.022 | 0.000 | 0.0224    | Weir Top Width (m) -98001.2                                  | Orientation                   |                                     |
|           |        |          |       |           |          |                     |       |       |           | Overflow Weir 2  | Vertical                      |                                     |
|           |        |          |       |           |          |                     |       |       |           | Crest Elevation  | W                             | eir 1                               |
|           |        |          |       |           |          |                     |       |       |           | 9999.00 m  | Top of Weir Structure         | Max Perimeter                       |
|           |        |          |       |           |          |                     |       |       |           | Crest Width  | 9999.30 m                     | 1,400 mm                            |
|           |        |          |       |           |          |                     |       |       |           | 3 m  | Weir Crest Invert             | Max Open Area                       |
|           |        |          |       |           |          |                     |       |       |           | Slope (x:1) 3  | 9999.00 m                     | 240,000 mm <sup>2</sup>             |
|           |        |          |       |           |          |                     |       |       |           | Weir Coeff. 1.670  | Weir Dimension                | s (Height x Length)                 |
|           |        |          |       |           |          |                     |       |       |           | Weir Top Width (m) -58941.000                                | 300 mm Height                 | 800 mm L                            |
|           |        |          |       |           |          |                     |       |       |           | DICB   | Side Walls                    | Weir Coeff.                         |
|           |        |          |       |           |          |                     |       |       |           | T/G Invert   | Vertical                      | 1.670                               |
|           |        |          |       |           |          |                     |       |       |           | 9999.00 m  | Ori                           | fice 2                              |
|           |        |          |       |           |          |                     |       |       |           | CB Size  | Orifice Centre                | Perimeter                           |
|           |        |          |       |           |          |                     |       |       |           | 1200 mm  | 198.90 m                      | 1,257 mm                            |
|           |        |          |       |           |          |                     |       |       |           | by   | Orifice Invert                | Area                                |
|           |        |          |       |           |          |                     |       |       |           | 600 mm   | 198.70 m                      | 125,664 mm <sup>2</sup>             |
|           |        |          |       |           |          |                     |       |       |           | Grate Slope  | Orifice Diameter              | Orifice Coeff.                      |
|           |        |          |       |           |          |                     |       |       |           | 4 :1   | 400 mm                        | 0.6                                 |
|           |        |          |       |           |          |                     |       |       |           | Area (m <sup>2</sup> ) 0.720                                 |                               | Operates Above (m)                  |
|           |        |          |       |           |          |                     |       |       |           | Perimeter (m) 3.600  | Vertical                      | 198.90                              |
|           |        |          |       |           |          |                     |       |       |           | D  |                               |                                     |
|           |        |          |       |           |          |                     |       |       |           | $Q = CA \sqrt{2g \left[ h_2 - h_1 + \frac{D}{2000} \right]}$ | Q = CL(h, -h,                 | $(h_1)^{1.5} + 1.268z(h_2 - h_1)^2$ |
|           |        |          |       |           |          |                     |       |       |           |  | $\mathcal{L} = CE(n_2 - n_1)$ | 1 112002 (112                       |

Where, h2 = elevation at stage 2 (m)
h1 = elevation at stage 1 (m)
D = orifice diameter (mm)
C = orifice coefficient

A = orifice open area (m<sup>2</sup>)z = weir side slope (z:1)

h2 = elevation at stage 2 (m)

h1 = elevation at stage 1 (m) L = weir crest length (m) C = weir coefficient

### Stage-Storage-Discharge Summary - Pipe Storage DSP-3

# Storage Facility # DSP-3A

| Stage   Discharge   Ractive   Total   Stage   Area   Incremental Volume   Volume |        |           | Sto               | rage              |        |      | For               | ebays             | M    | ain Pool (Exclud  | ing Forebay)      | Stora             | ge                | Estimated |
|--|--------|-----------|-------------------|-------------------|--------|------|-------------------|-------------------|------|-------------------|-------------------|-------------------|-------------------|-----------|
| 201.76         0.0000         0         0         201.76         0         24         0         24         0         24         0         24         0         24         0         24         0         24         0         24         0         24         0         24         0         24         0         24         0         24         0         79         0         79         0         79         0         79         0         79         0         79         0         79         0         79         0         79         0         139         0         139         0         139         0         139         0         139         0         139         0         139         0         199         0         199         0         199         0         199         0         259         0         259         0         259         0         259         0         259   | Stage  | Discharge | Active            | Total             | Stage  | Area |                   |                   | Area |                   |                   | Sediment          | Total             |           |
| 201.96     0.0104     24     24     201.96     0     24     0     24       202.16     0.0162     79     79     202.16     0     79     0     79       202.36     0.0203     139     139     202.36     0     139     0     139       202.56     0.0238     199     199     202.56     0     199     0     199       202.76     0.0268     259     259     202.76     0     259     0     259   |        |           | (m <sup>3</sup> ) | (m <sup>3</sup> ) |        | (m²) | (m <sup>3</sup> ) | (m <sup>3</sup> ) | (m²) | (m <sup>3</sup> ) | (m <sup>3</sup> ) | (m <sup>3</sup> ) | (m <sup>3</sup> ) | (hrs)     |
| 202.16         0.0162         79         79         202.16         0         79         0         79           202.36         0.0203         139         139         202.36         0         139         0         139           202.56         0.0238         199         199         202.56         0         199         0         199           202.76         0.0268         259         259         202.76         0         259         0         259  |        |           |                   |                   |        |      |                   |                   |      | 0                 |                   | 0                 |                   |           |
| 202.36     0.0203     139     139     202.36     0     139     0     139       202.56     0.0238     199     199     202.56     0     199     0     199       202.76     0.0268     259     259     202.76     0     259     0     259   | 201.96 |           |                   |                   | 201.96 |      |                   |                   |      | 0                 |                   | 0                 |                   |           |
| 202.56         0.0238         199         199         202.56         0         199         0         199           202.76         0.0268         259         259         202.76         0         259         0         259  | 202.16 | 0.0162    | 79                | 79                | 202.16 |      |                   |                   |      | 0                 | 79                | 0                 | 79                |           |
| 202.76 0.0268 259 259 202.76 0 259 0 259   | 202.36 | 0.0203    | 139               | 139               | 202.36 |      |                   |                   |      | 0                 | 139               | 0                 | 139               |           |
|  | 202.56 | 0.0238    | 199               | 199               | 202.56 |      |                   |                   |      | 0                 | 199               | 0                 | 199               |           |
| 202.96       0.0825       346       0       346       0       346         1  | 202.76 | 0.0268    | 259               | 259               | 202.76 |      |                   |                   |      | 0                 | 259               | 0                 | 259               |           |
|  | 202.96 | 0.0825    | 346               | 346               | 202.96 |      |                   |                   |      | 0                 | 346               | 0                 | 346               |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   | 1                 |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   | 1                 |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |

3216079 Langstaff Road EA
Detailed Outlet Structure Discharge Calculations

|        |  |   | D   | ischarge                                       | (m <sup>3</sup> /s)   |   |   |  |   |            | Parameters            |                                    |
|--------|--|---|---|--|---|---|---|--|---|------------|-----------------------|------------------------------------|
|        | Spillway   |   |   | 0  | utlet Riser   |   | DIOD  | Total  | Overflow We                                 | eir 1      | Ori                   | fice 1                             |
| Weir 1 | Weir 2   | Total   | Orifice 1   | Weir 1   | Orifice 2   | Total   | DICE  | Discharge  | Crest Elevati                               | ion        | Orifice Centre        | Perimeter                          |
| 0.000  | 0.000  | 0.000   | 0.00000   | 0.000  | 0.000   | 0.000   | 0.000   | 0.0000   | 9999.00 г                                   | m          | 201.82 m              | 361 mm                             |
| 0.000  | 0.000  | 0.000   | 0.01042   | 0.000  | 0.000   | 0.010   | 0.000   | 0.0104   |   |            |                       |                                    |
| 0.000  | 0.000  | 0.000   | 0.01616   | 0.000  | 0.000   | 0.016   | 0.000   | 0.0162   | Crest Widt                                  | h          | Orifice Invert        | Area                               |
| 0.000  | 0.000  | 0.000   | 0.02033   | 0.000  | 0.000   | 0.020   | 0.000   | 0.0203   | 1 r   | m          | 201.76 m              | 10,387 mm <sup>2</sup>             |
| 0.000  | 0.000  | 0.000   | 0.02379   | 0.000  | 0.000   | 0.024   | 0.000   | 0.0238   | Slope (x:1)                                 | 5          | Orifice Diameter      | Orifice Coeff.                     |
| 0.000  | 0.000  | 0.000   | 0.02680   | 0.000  | 0.000   | 0.027   | 0.000   | 0.0268   | Weir Coeff.                                 | 1.670      | 115 mm                | 0.6                                |
| 0.000  | 0.000  | 0.000   | 0.02951   | 0.000  | 0.053   | 0.082   | 0.000   | 0.0825   | Weir Top Width (m)                          | -97959.4   | Orientation           |                                    |
|        |  |   |   |  |   |   |   |  | Overflow We                                 | eir 2      | Vertical              |                                    |
|        |  |   |   |  |   |   |   |  | Crest Elevati                               | ion        | W                     | eir 1                              |
|        |  |   |   |  |   |   |   |  | 9999.00 r                                   | m          | Top of Weir Structure | Max Perimeter                      |
|        |  |   |   |  |   |   |   |  | Crest Widt                                  | h          | 9999.27 m             | 1,340 mm                           |
|        |  |   |   |  |   |   |   |  | 1 8   | m          | Weir Crest Invert     | Max Open Area                      |
|        |  |   |   |  |   |   |   |  | Slope (x:1)                                 | 3          | 9999.00 m             | 216,000 mm <sup>2</sup>            |
|        |  |   |   |  |   |   |   |  | Weir Coeff.                                 | 1.670      | Weir Dimension        | s (Height x Length)                |
|        |  |   |   |  |   |   |   |  | Weir Top Width (m)                          | -58941.000 | 270 mm Height         | 800 mm L                           |
|        |  |   |   |  |   |   |   |  | DICB  |            | Side Walls            | Weir Coeff.                        |
|        |  |   |   |  |   |   |   |  | T/G Invert                                  | t          | Vertical              | 1.670                              |
|        |  |   |   |  |   |   |   |  | 1 00.000                                    | m          | Ori                   | fice 2                             |
|        |  |   |   |  |   |   |   |  | CB Size                                     |            | Orifice Centre        | Perimeter                          |
|        |  |   |   |  |   |   |   |  | 1200 r                                      | mm         | 202.80 m              | 785 mm                             |
|        |  |   |   |  |   |   |   |  | by  |            | Orifice Invert        | Area                               |
|        |  |   |   |  |   |   |   |  |   |            |                       | 49,087 mm <sup>2</sup>             |
|        |  |   |   |  |   |   |   |  | -   |            | Orifice Diameter      | Orifice Coeff.                     |
|        |  |   |   |  |   |   |   |  |   |            | 250 mm                | 0.6                                |
|        |  |   |   |  |   |   |   |  | ` '   |            |                       | Operates Above (m)                 |
|        |  |   |   |  |   |   |   |  | Perimeter (m)                               | 3.600      | Vertical              | 202.80                             |
|        |  |   |   |  |   |   | 1   |  | 0 - 01 20(1 1                               | D )        |                       | N                                  |
|        |  |   |   |  |   |   |   |  | $Q = CA \sqrt{2g} \left( n_2 - n_1 \right)$ | 2000       | $Q = CL(h_2 - h_1)$   | $^{1.5} + 1.268z(h_2 - h_1)^{2.5}$ |
|        | 0.000<br>0.000<br>0.000<br>0.000<br>0.000<br>0.000 | Weir 1         Weir 2           0.000         0.000           0.000         0.000           0.000         0.000           0.000         0.000           0.000         0.000           0.000         0.000           0.000         0.000           0.000         0.000 | Weir 1         Weir 2         Total           0.000         0.000         0.000           0.000         0.000         0.000           0.000         0.000         0.000           0.000         0.000         0.000           0.000         0.000         0.000           0.000         0.000         0.000           0.000         0.000         0.000           0.000         0.000         0.000 | Spillway   Weir 1   Weir 2   Total   Orifice 1 | Spillway         O           Weir 1         Weir 2         Total         Orifice 1         Weir 1           0.000         0.000         0.000         0.00000         0.000           0.000         0.000         0.000         0.01042         0.000           0.000         0.000         0.01616         0.000           0.000         0.000         0.02033         0.000           0.000         0.000         0.02379         0.000           0.000         0.000         0.02680         0.000 | Weir 1         Weir 2         Total         Orifice 1         Weir 1         Orifice 2           0.000         0.000         0.000         0.0000         0.000         0.000           0.000         0.000         0.000         0.01042         0.000         0.000           0.000         0.000         0.01616         0.000         0.000           0.000         0.000         0.02033         0.000         0.000           0.000         0.000         0.02379         0.000         0.000           0.000         0.000         0.02680         0.000         0.000 | Spillway         Outlet Riser           Weir 1         Weir 2         Total         Orifice 1         Weir 1         Orifice 2         Total           0.000         0.000         0.000         0.0000         0.000         0.000         0.000           0.000         0.000         0.01042         0.000         0.000         0.010           0.000         0.000         0.01616         0.000         0.000         0.016           0.000         0.000         0.02033         0.000         0.000         0.020           0.000         0.000         0.02379         0.000         0.000         0.024           0.000         0.000         0.02680         0.000         0.000         0.027 | Spillway         Outlet Riser         DICB           Weir 1         Weir 2         Total         Orifice 1         Weir 1         Orifice 2         Total           0.000         0.000         0.000         0.0000         0.000         0.000         0.000         0.000           0.000         0.000         0.01042         0.000         0.000         0.010         0.000           0.000         0.000         0.01616         0.000         0.000         0.016         0.000           0.000         0.000         0.000         0.02033         0.000         0.000         0.020         0.000           0.000         0.000         0.000         0.02379         0.000         0.000         0.024         0.000           0.000         0.000         0.000         0.02680         0.000         0.000         0.027         0.000 | Note  | Spillway   | Spillway              | Spillway                           |

Where, h2 = elevation at stage 2 (m)
h1 = elevation at stage 1 (m)
D = orifice diameter (mm)
C = orifice coefficient

A = orifice open area (m<sup>2</sup>)

h2 = elevation at stage 2 (m) h1 = elevation at stage 1 (m) L = weir crest length (m) C = weir coefficient z = weir side slope (z:1)

### Stage-Storage-Discharge Summary - Pipe Storage DSP-3

# Storage Facility # DSP-3B

| Stage   Discharge   Active   Total   Stage   Mrea   Incremental Volume   Area   Volume   Vo |        |           | Sto               | rage              |        |      | For               | ebays             | M    | ain Pool (Exclud  | ing Forebay)      | Stora             | ge                | Estimated |
|--|--------|-----------|-------------------|-------------------|--------|------|-------------------|-------------------|------|-------------------|-------------------|-------------------|-------------------|-----------|
| 202.50         0.0000         0         0         202.50         0         0         0         0         0           202.70         0.0274         26         26         202.70         0         26         0         26           202.90         0.0478         84         84         202.90         0         84         0         84           203.10         0.0619         149         149         203.10         0         149         0         149           203.30         0.0733         214         214         203.30         0         214         0         214           203.50         0.0831         278         278         203.50         0         278         0         278  | Stage  | Discharge | Active            | Total             | Stage  | Area |                   |                   | Area |                   |                   | Sediment          | Total             |           |
| 202.70     0.0274     26     26     202.70     0     26     0     26       202.90     0.0478     84     84     202.90     0     84     0     84       203.10     0.0619     149     149     203.10     0     149     0     149       203.30     0.0733     214     214     203.30     0     214     0     214       203.50     0.0831     278     278     203.50     0     278     0     278   |        |           | (m <sup>3</sup> ) | (m <sup>3</sup> ) |        | (m²) | (m <sup>3</sup> ) | (m <sup>3</sup> ) | (m²) | (m <sup>3</sup> ) | (m <sup>3</sup> ) | (m <sup>3</sup> ) | (m <sup>3</sup> ) | (hrs)     |
| 202.90     0.0478     84     84     202.90     0     84     0     84       203.10     0.0619     149     149     203.10     0     149     0     149       203.30     0.0733     214     214     203.50     0     214     0     214       203.50     0.0831     278     278     203.50     0     278     0     278  |        |           |                   |                   |        |      |                   |                   |      | 0                 |                   | 0                 |                   |           |
| 203.10     0.0619     149     149     203.10     0     149     0     149       203.30     0.0733     214     214     203.30     0     214     0     214       203.50     0.0831     278     278     203.50     0     278     0     278   | 202.70 |           |                   | 26                | 202.70 |      |                   |                   |      | 0                 |                   | 0                 |                   |           |
| 203.30         0.0733         214         214         203.30         0         214         0         214           203.50         0.0831         278         278         203.50         0         278         0         278  | 202.90 | 0.0478    | 84                | 84                | 202.90 |      |                   |                   |      | 0                 | 84                | 0                 | 84                |           |
| 203.50 0.0831 278 278 203.50 0 278 0 278   | 203.10 | 0.0619    | 149               | 149               | 203.10 |      |                   |                   |      | 0                 | 149               | 0                 | 149               |           |
|  | 203.30 | 0.0733    | 214               | 214               | 203.30 |      |                   |                   |      | 0                 | 214               | 0                 | 214               |           |
| 203.70   | 203.50 | 0.0831    | 278               | 278               | 203.50 |      |                   |                   |      | 0                 | 278               | 0                 | 278               |           |
|  | 203.70 | 0.1449    | 374               | 374               | 203.70 |      |                   |                   |      | 0                 | 374               | 0                 | 374               |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   | 1                 |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   | 1                 |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |
|  |        |           |                   |                   |        |      |                   |                   |      |                   |                   |                   |                   |           |

3216079 Langstaff Road EA
Detailed Outlet Structure Discharge Calculations

| SWeir 1 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 | Spillway Weir 2 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 | Total 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 | Orifice 1<br>0.00000<br>0.02739<br>0.04785<br>0.06187<br>0.07326<br>0.08310 | O Weir 1 0.000 0.000 0.000 0.000 0.000 0.000 0.000 | Utlet Riser Orifice 2 0.000 0.000 0.000 0.000 0.000 0.000 | Total<br>0.000<br>0.027<br>0.048<br>0.062 | 0.000<br>0.000<br>0.000 | Total Discharge 0.0000 0.0274 | Overflow W<br>Crest Eleva<br>9999.00        | tion<br>m   | Orifice Centre<br>202.60 m   | Perimeter<br>644 mm                |
|---|---|---|---|--|---|---|-------------------------|-------------------------------|---|-------------|--|------------------------------------|
| 0.000<br>0.000<br>0.000<br>0.000<br>0.000<br>0.000            | 0.000<br>0.000<br>0.000<br>0.000<br>0.000<br>0.000                    | 0.000<br>0.000<br>0.000<br>0.000<br>0.000<br>0.000          | 0.00000<br>0.02739<br>0.04785<br>0.06187<br>0.07326<br>0.08310              | 0.000<br>0.000<br>0.000<br>0.000<br>0.000          | 0.000<br>0.000<br>0.000<br>0.000                          | 0.000<br>0.027<br>0.048                   | 0.000<br>0.000<br>0.000 | 0.0000<br>0.0274              | 9999.00                                     | m           | 202.60 m   |                                    |
| 0.000<br>0.000<br>0.000<br>0.000<br>0.000                     | 0.000<br>0.000<br>0.000<br>0.000<br>0.000                             | 0.000<br>0.000<br>0.000<br>0.000<br>0.000                   | 0.02739<br>0.04785<br>0.06187<br>0.07326<br>0.08310                         | 0.000<br>0.000<br>0.000<br>0.000                   | 0.000<br>0.000<br>0.000                                   | 0.027<br>0.048                            | 0.000                   | 0.0274                        |   |             |  | 644 mm                             |
| 0.000<br>0.000<br>0.000<br>0.000                              | 0.000<br>0.000<br>0.000<br>0.000                                      | 0.000<br>0.000<br>0.000<br>0.000                            | 0.04785<br>0.06187<br>0.07326<br>0.08310                                    | 0.000<br>0.000<br>0.000                            | 0.000   | 0.048                                     | 0.000                   |                               | 0 1147                                      |             |  |                                    |
| 0.000<br>0.000<br>0.000                                       | 0.000<br>0.000<br>0.000   | 0.000<br>0.000<br>0.000                                     | 0.06187<br>0.07326<br>0.08310   | 0.000  | 0.000   |   |                         | 0.0470                        | 0   |             |  |                                    |
| 0.000<br>0.000  | 0.000   | 0.000<br>0.000  | 0.07326<br>0.08310  | 0.000  |   | 0.062                                     | 0.000                   | 0.0478                        | Crest Wid                                   | th          | Orifice Invert   | Area                               |
| 0.000   | 0.000   | 0.000   | 0.08310   |  | 0.000   |   | 0.000                   | 0.0619                        | 1   | m           | 202.50 m   | 33,006 mm <sup>2</sup>             |
|   |   |   |   | 0.000  |   | 0.073                                     | 0.000                   | 0.0733                        | Slope (x:1)                                 | 5           | Orifice Diameter   | Orifice Coeff.                     |
| 0.000   | 0.000   | 0.000   |   | 0.000  | 0.000   | 0.083                                     | 0.000                   | 0.0831                        | Weir Coeff.                                 | 1.670       | 205 mm   | 0.6                                |
|   |   |   | 0.09190   | 0.000  | 0.053   | 0.145                                     | 0.000                   | 0.1449                        | Weir Top Width (m)                          | -97952.0    | Orientation  |                                    |
|   |   |   |   |  |   |   |                         |                               | Overflow W                                  | eir 2       | Vertical   |                                    |
|   |   |   |   |  |   |   |                         |                               | Crest Eleva                                 | tion        | W  | eir 1                              |
|   |   |   |   |  |   |   |                         |                               | 9999.00                                     | m           | Top of Weir Structure  | Max Perimeter                      |
|   |   |   |   |  |   |   |                         |                               | Crest Wid                                   | th          | 9999.27 m  | 1,340 mm                           |
|   |   |   |   |  |   |   |                         |                               | 3   | m           | Weir Crest Invert  | Max Open Area                      |
|   |   |   |   |  |   |   |                         |                               | Slope (x:1)                                 | 3           | 9999.00 m  | 216,000 mm <sup>2</sup>            |
|   |   |   |   |  |   |   |                         |                               | Weir Coeff.                                 | 1.670       | Weir Dimensions  | (Height x Length)                  |
|   |   |   |   |  |   |   |                         |                               | Weir Top Width (m)                          | -58941.000  | 270 mm Height  | 800 mm L                           |
|   |   |   |   |  |   |   |                         |                               | DICB  |             | Side Walls   | Weir Coeff.                        |
|   |   |   |   |  |   |   |                         |                               | T/G Inver                                   | t           | Vertical   | 1.670                              |
|   |   |   |   |  |   |   |                         |                               | 9999.00                                     | m           | Ori  | fice 2                             |
|   |   |   |   |  |   |   |                         |                               | CB Size                                     |             | Orifice Centre   | Perimeter                          |
|   |   |   |   |  |   |   |                         |                               | 1200  | mm          | 203.54 m   | 785 mm                             |
|   |   |   |   |  |   |   |                         |                               | by  |             | Orifice Invert   | Area                               |
|   |   |   |   |  |   |   |                         |                               | 600   | mm          | 203.41 m   | 49,087 mm <sup>2</sup>             |
|   |   |   |   |  |   |   |                         |                               | Grate Slop                                  | oe          | Orifice Diameter   | Orifice Coeff.                     |
|   |   |   |   |  |   |   |                         |                               |   | :1          | 250 mm   | 0.6                                |
|   |   |   |   |  |   |   |                         |                               |   | 0.720       | Orientation  | Operates Above (m)                 |
|   |   |   |   |  |   |   |                         |                               | Perimeter (m)                               | 3.600       | Vertical   | 203.54                             |
|   |   |   |   |  |   |   |                         |                               | 0 01 1                                      | D           |  |                                    |
|   |   |   |   |  |   |   |                         |                               | $Q = CA \sqrt{2g \left( n_2 - n_1 \right)}$ | + 2000      | $Q = CL(h_2 - h_1)$  | $^{1.5} + 1.268z(h_2 - h_1)^{2.5}$ |
|   |   |   |   |  |   | .000 0.000 0.000 0.09190 0.000 0.053      |                         |                               |   | Overflow W: | Overflow Weir 2   Crest Elevation   9999.00 m     Crest Width   3 m   Slope (x:1)   3   Weir Coeff.   1.670   Weir Top Width (m)   -58941.000   DICB   T/G Invert   9999.00 m   CB Size   1200 mm   by   600 mm   Grate Slope   4 :1   Area (m²)   0.720 | Overflow Weir 2   Vertical         |

Where, h2 = elevation at stage 2 (m)
h1 = elevation at stage 1 (m)
D = orifice diameter (mm)
C = orifice coefficient

h2 = elevation at stage 2 (m) h1 = elevation at stage 1 (m) L = weir crest length (m) C = weir coefficient z = weir side slope (z:1) A = orifice open area (m<sup>2</sup>)

### Stage-Storage-Discharge Summary - Pipe Storage DSP-4

### Facility # DSP-4

|        |                     | Sto               | rage              |          |                   | For                   | ebays                 | Ma                | in Pool (Excludi      | ng Forebay)           | Stora             | ge                | Estimated         |
|--------|---------------------|-------------------|-------------------|----------|-------------------|-----------------------|-----------------------|-------------------|-----------------------|-----------------------|-------------------|-------------------|-------------------|
| Stage  | Discharge           | Active            | Total             | Stage    | Area              | Incremental<br>Volume | Accumulated<br>Volume | Area              | Incremental<br>Volume | Accumulated<br>Volume | Sediment          | Total             | Detention<br>Time |
| (m)    | (m <sup>3</sup> /s) | (m <sup>3</sup> ) | (m <sup>3</sup> ) | (m)      | (m <sup>2</sup> ) | (m <sup>3</sup> )     | (m <sup>3</sup> )     | (m <sup>2</sup> ) | (m <sup>3</sup> )     | (m <sup>3</sup> )     | (m <sup>3</sup> ) | (m <sup>3</sup> ) | (hrs)             |
| 202.43 | 0.0000              | 0                 | 0                 | 202.43   |                   |                       |                       |                   | 0                     | 0                     | 0                 | 0                 |                   |
| 202.63 | 0.0053              | 48                | 48                | 202.63   |                   |                       |                       |                   | 0                     | 48                    | 0                 | 48                |                   |
| 202.83 | 0.0080              | 154               | 154               | 202.83   |                   |                       |                       |                   | 0                     | 154                   | 0                 | 154               |                   |
| 203.03 | 0.0100              | 261               | 261               | 203.03   |                   |                       |                       |                   | 0                     | 261                   | 0                 | 261               |                   |
| 203.23 | 0.0116              | 367               | 367               | 203.23   |                   |                       |                       |                   | 0                     | 367                   | 0                 | 367               |                   |
| 203.43 | 0.0131              | 474               | 474               | 203.43   |                   |                       |                       |                   | 0                     | 474                   | 0                 | 474               |                   |
| 203.63 | 0.0202              | 639               | 639               | 203.63   |                   |                       |                       |                   | 0                     | 639                   | 0                 | 639               |                   |
|        |                     |                   |                   |          |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |          |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |          |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |          |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |          |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |          |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |          |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |          |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |          |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |          |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |          |                   |                       |                       |                   |                       |                       |                   |                   | 1                 |
|        |                     |                   |                   |          |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |          |                   |                       |                       |                   |                       |                       |                   |                   | 1                 |
|        |                     |                   |                   |          |                   |                       |                       |                   |                       |                       |                   |                   | 1                 |
|        |                     |                   |                   |          |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |          |                   |                       |                       |                   |                       |                       |                   |                   | 1                 |
|        |                     |                   |                   |          |                   |                       |                       |                   |                       |                       |                   |                   | 1                 |
|        |                     |                   |                   |          |                   |                       |                       |                   |                       |                       |                   |                   | 1                 |
|        |                     |                   |                   |          |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |          |                   |                       |                       |                   |                       |                       |                   |                   | 1                 |
|        |                     |                   |                   |          |                   |                       |                       |                   |                       |                       |                   |                   | 1                 |
|        |                     |                   |                   |          |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |          |                   |                       |                       |                   |                       |                       | 1                 |                   | 1                 |
|        |                     |                   |                   | <b>l</b> |                   |                       |                       |                   |                       |                       |                   |                   |                   |
|        |                     |                   |                   |          |                   |                       |                       |                   |                       |                       |                   |                   |                   |

3216079 Langstaff Road EA
Detailed Outlet Structure Discharge Calculations

| Elevation |        |          |       | D         | ischarge | (m <sup>3</sup> /s) |       |          |           |  | Parameters            |                                    |
|-----------|--------|----------|-------|-----------|----------|---------------------|-------|----------|-----------|--|-----------------------|------------------------------------|
| Lievation |        | Spillway |       |           | 0        | utlet Riser         |       | DICB     | Total     | Overflow Weir 1  | Ori                   | ifice 1                            |
| (m)       | Weir 1 | Weir 2   | Total | Orifice 1 | Weir 1   | Orifice 2           | Total | DICE     | Discharge | Crest Elevation  | Orifice Centre        | Perimeter                          |
| 202.43    | 0.000  | 0.000    | 0.000 | 0.00000   | 0.000    | 0.000               | 0.000 | 0.000    | 0.0000    | 9999.00 m  | 202.47 m              | 251 mm                             |
| 202.63    | 0.000  | 0.000    | 0.000 | 0.00534   | 0.000    | 0.000               | 0.005 | 0.000    | 0.0053    |  |                       |                                    |
| 202.83    | 0.000  | 0.000    | 0.000 | 0.00802   | 0.000    | 0.000               | 0.008 | 0.000    | 0.0080    | Crest Width  | Orifice Invert        | Area                               |
| 203.03    | 0.000  | 0.000    | 0.000 | 0.01000   | 0.000    | 0.000               | 0.010 | 0.000    | 0.0100    | 1 m  | 202.43 m              | 5,027 mm <sup>2</sup>              |
| 203.23    | 0.000  | 0.000    | 0.000 | 0.01165   | 0.000    | 0.000               | 0.012 | 0.000    | 0.0116    | Slope (x:1) 5  | Orifice Diameter      | Orifice Coeff.                     |
| 203.43    | 0.000  | 0.000    | 0.000 | 0.01309   | 0.000    | 0.000               | 0.013 | 0.000    | 0.0131    | Weir Coeff. 1.670  | 80 mm                 | 0.6                                |
| 203.63    | 0.000  | 0.000    | 0.000 | 0.01439   | 0.000    | 0.006               | 0.020 | 0.000    | 0.0202    | Weir Top Width (m) -97952.7                                  | Orientation           |                                    |
|           |        |          |       |           |          |                     |       |          |           | Overflow Weir 2  | Vertical              |                                    |
|           |        |          |       |           |          |                     |       |          |           | Crest Elevation  | W                     | eir 1                              |
|           |        |          |       |           |          |                     |       |          |           | 9999.00 m  | Top of Weir Structure | Max Perimeter                      |
|           |        |          |       |           |          |                     |       |          |           | Crest Width  | 9999.30 m             | 1,400 mm                           |
|           |        |          |       |           |          |                     |       |          |           | 3 m  | Weir Crest Invert     | Max Open Area                      |
|           |        |          |       |           |          |                     |       |          |           | Slope (x:1) 3  | 9999.00 m             | 240,000 mm <sup>2</sup>            |
|           |        |          |       |           |          |                     |       |          |           | Weir Coeff. 1.670  | Weir Dimension        | s (Height x Length)                |
|           |        |          |       |           |          |                     |       |          |           | Weir Top Width (m) -58941.0                                  | 300 mm Height         | 800 mm L                           |
|           |        |          |       |           |          |                     |       |          |           | DICB   | Side Walls            | Weir Coeff.                        |
|           |        |          |       |           |          |                     |       |          |           | T/G Invert   | Vertical              | 1.670                              |
|           |        |          |       |           |          |                     |       |          |           | 9999.00 m  | Ori                   | ifice 2                            |
|           |        |          |       |           |          |                     |       |          |           | CB Size  | Orifice Centre        | Perimeter                          |
|           |        |          |       |           |          |                     |       |          |           | 1200 mm  | 203.61 m              | 440 mm                             |
|           |        |          |       |           |          |                     |       |          |           | by   | Orifice Invert        | Area                               |
|           |        |          |       |           |          |                     |       |          |           | 600 mm   | 203.54 m              | 15,394 mm <sup>2</sup>             |
|           |        |          |       |           |          |                     |       |          |           | Grate Slope  | Orifice Diameter      | Orifice Coeff.                     |
|           |        | <u> </u> |       |           |          |                     |       | <u> </u> |           | 4 :1   | 140 mm                | 0.6                                |
|           |        |          |       |           |          |                     |       |          |           | Area (m <sup>2</sup> ) 0.7                                   |                       | Operates Above (m)                 |
|           |        |          |       |           |          |                     |       |          |           | Perimeter (m) 3.6  | 00 Vertical           | 203.61                             |
|           |        |          |       |           |          |                     |       |          |           | ( D.)  | 1                     |                                    |
|           |        |          |       |           |          |                     |       |          |           | $Q = CA \sqrt{2g \left( h_2 - h_1 + \frac{D}{2000} \right)}$ | Q = CL(h, -h,         | $^{1.5} + 1.268z(h_2 - h_1)^{2.5}$ |
|           |        | 1        |       | 1         |          |                     | l     |          | l         |  | ~ (12 1               | , - ( 2 1)                         |

Where, h2 = elevation at stage 2 (m)
h1 = elevation at stage 1 (m)
D = orifice diameter (mm)
C = orifice coefficient

A = orifice open area (m<sup>2</sup>)

h2 = elevation at stage 2 (m) h1 = elevation at stage 1 (m) L = weir crest length (m) C = weir coefficient

### Stage-Storage-Discharge Summary - Pipe Storage DSP-5

Facility # DSP-5

|        |                     | Sto               | rage              |        |                   | For                   | ebays                 | Ma                | in Pool (Exclud       | ing Forebay)          | Stora             | ige  | Estimated         |
|--------|---------------------|-------------------|-------------------|--------|-------------------|-----------------------|-----------------------|-------------------|-----------------------|-----------------------|-------------------|--|-------------------|
| Stage  | Discharge           | Active            | Total             | Stage  | Area              | Incremental<br>Volume | Accumulated<br>Volume | Area              | Incremental<br>Volume | Accumulated<br>Volume | Sediment          | Total  | Detention<br>Time |
| (m)    | (m <sup>3</sup> /s) | (m <sup>3</sup> ) | (m <sup>3</sup> ) | (m)    | (m <sup>2</sup> ) | (m <sup>3</sup> )     | (m <sup>3</sup> )     | (m <sup>2</sup> ) | (m <sup>3</sup> )     | (m <sup>3</sup> )     | (m <sup>3</sup> ) | (m <sup>3</sup> )                                | (hrs)             |
| 202.05 | 0.0000              | 0                 | 0                 | 202.05 |                   |                       |                       |                   | 0                     | 0                     | 0                 | 0  |                   |
| 202.25 | 0.0118              | 48                | 48                | 202.25 |                   |                       |                       |                   | 0                     | 48                    | 0                 | 48   |                   |
| 202.45 | 0.0184              | 154               | 154               | 202.45 |                   |                       |                       |                   | 0                     | 154                   | 0                 | 154  |                   |
| 202.65 | 0.0232              | 261               | 261               | 202.65 |                   |                       |                       |                   | 0                     | 261                   | 0                 | 261  |                   |
| 202.85 | 0.0271              | 367               | 367               | 202.85 |                   |                       |                       |                   | 0                     | 367                   | 0                 | 367  |                   |
| 203.05 | 0.0306              | 474               | 474               | 203.05 |                   |                       |                       |                   | 0                     | 474                   | 0                 | 474  |                   |
| 203.25 | 0.0415              | 639               | 639               | 203.25 |                   |                       |                       |                   | 0                     | 639                   | 0                 | 639  |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |  |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |  |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |  |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |  |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |  |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |  |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |  |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |  |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |  |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |  |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |  |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |  |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |  |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |  |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |  |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |  | 1                 |
|        |                     |                   |                   |        |                   |                       | 1                     |                   | 1                     |                       | 1                 | <del>                                     </del> | 1                 |
|        |                     |                   |                   |        |                   |                       |                       |                   | 1                     |                       | 1                 | 1  | 1                 |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       | 1                 |  |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       | 1                 |  |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   | <b> </b>   | -                 |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   | <b> </b>   | -                 |
|        |                     |                   |                   |        |                   |                       |                       |                   | 1                     |                       | 1                 |  | <b>↓</b>          |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |  |                   |
|        |                     |                   |                   |        |                   |                       |                       |                   |                       |                       |                   |  |                   |

3216079 Langstaff Road EA
Detailed Outlet Structure Discharge Calculations

| Elevation |        |          |       | D         | ischarge | (m <sup>3</sup> /s) |       |       |           |   | Parameters            |                                     |
|-----------|--------|----------|-------|-----------|----------|---------------------|-------|-------|-----------|---|-----------------------|-------------------------------------|
| Lievation |        | Spillway |       |           | 0        | utlet Riser         |       | DICB  | Total     | Overflow Weir 1   | Or                    | ifice 1                             |
| (m)       | Weir 1 | Weir 2   | Total | Orifice 1 | Weir 1   | Orifice 2           | Total | DICE  | Discharge | Crest Elevation   | Orifice Centre        | Perimeter                           |
| 202.05    | 0.000  | 0.000    | 0.000 | 0.00000   | 0.000    | 0.000               | 0.000 | 0.000 | 0.0000    | 9999.00 m   | 202.11 m              | 386 mm                              |
| 202.25    | 0.000  | 0.000    | 0.000 | 0.01175   | 0.000    | 0.000               | 0.012 | 0.000 | 0.0118    |   |                       |                                     |
| 202.45    | 0.000  | 0.000    | 0.000 | 0.01837   | 0.000    | 0.000               | 0.018 | 0.000 | 0.0184    | Crest Width   | Orifice Invert        | Area                                |
| 202.65    | 0.000  | 0.000    | 0.000 | 0.02317   | 0.000    | 0.000               | 0.023 | 0.000 | 0.0232    | 1 m   | 202.05 m              | 11,882 mm <sup>2</sup>              |
| 202.85    | 0.000  | 0.000    | 0.000 | 0.02714   | 0.000    | 0.000               | 0.027 | 0.000 | 0.0271    | Slope (x:1) 5   | Orifice Diameter      | Orifice Coeff.                      |
| 203.05    | 0.000  | 0.000    | 0.000 | 0.03059   | 0.000    | 0.000               | 0.031 | 0.000 | 0.0306    | Weir Coeff. 1.670   | 123 mm                | 0.6                                 |
| 203.25    | 0.000  | 0.000    | 0.000 | 0.03370   | 0.000    | 0.008               | 0.042 | 0.000 | 0.0415    | Weir Top Width (m) -97956.5                                     | Orientation           |                                     |
|           |        |          |       |           |          |                     |       |       |           | Overflow Weir 2   | Vertical              |                                     |
|           |        |          |       |           |          |                     |       |       |           | Crest Elevation   | W                     | eir 1                               |
|           |        |          |       |           |          |                     |       |       |           | 9999.00 m   | Top of Weir Structure | Max Perimeter                       |
|           |        |          |       |           |          |                     |       |       |           | Crest Width   | 9999.30 m             | 1,400 mm                            |
|           |        |          |       |           |          |                     |       |       |           | 3 m   | Weir Crest Invert     | Max Open Area                       |
|           |        |          |       |           |          |                     |       |       |           | Slope (x:1) 3   | 9999.00 m             | 240,000 mm <sup>2</sup>             |
|           |        |          |       |           |          |                     |       |       |           | Weir Coeff. 1.670   | Weir Dimension        | s (Height x Length)                 |
|           |        |          |       |           |          |                     |       |       |           | Weir Top Width (m) -58941.000                                   | 300 mm Height         | 800 mm L                            |
|           |        |          |       |           |          |                     |       |       |           | DICB  | Side Walls            | Weir Coeff.                         |
|           |        |          |       |           |          |                     |       |       |           | T/G Invert  | Vertical              | 1.670                               |
|           |        |          |       |           |          |                     |       |       |           | 9999.00 m   | Or                    | ifice 2                             |
|           |        |          |       |           |          |                     |       |       |           | CB Size   | Orifice Centre        | Perimeter                           |
|           |        |          |       |           |          |                     |       |       |           | 1200 mm   | 203.24 m              | 723 mm                              |
|           |        |          |       |           |          |                     |       |       |           | by  | Orifice Invert        | Area                                |
|           |        |          |       |           |          |                     |       |       |           | 600 mm  | 203.13 m              | 41,548 mm <sup>2</sup>              |
|           |        |          |       |           |          |                     |       |       |           | Grate Slope   | Orifice Diameter      | Orifice Coeff.                      |
|           |        |          |       |           |          |                     |       |       |           | 4 :1  | 230 mm                | 0.6                                 |
|           |        |          |       |           |          |                     |       |       |           | Area (m <sup>2</sup> ) 0.720                                    |                       | Operates Above (m)                  |
|           |        |          |       |           |          |                     |       |       |           | Perimeter (m) 3.600   | Vertical              | 203.24                              |
|           |        |          |       |           |          |                     |       |       |           |   |                       |                                     |
|           |        |          |       |           |          |                     |       |       |           | $Q = CA \sqrt{2g \left[ h_2 - h_1 + \frac{2000}{2000} \right]}$ | Q = CL(h, -h)         | $(h_1)^{1.5} + 1.268z(h_2 - h_1)^2$ |
|           |        |          |       |           |          |                     |       |       |           | $Q = CA \sqrt{2g \left( h_2 - h_1 + \frac{D}{2000} \right)}$    | $Q = CL(h_2 - h_2)$   | 1)1.5 + 1.268                       |

Where, h2 = elevation at stage 2 (m)
h1 = elevation at stage 1 (m)
D = orifice diameter (mm)
C = orifice coefficient

A = orifice open area (m<sup>2</sup>)

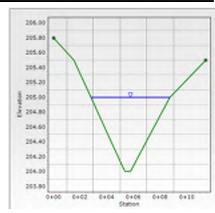
h2 = elevation at stage 2 (m) h1 = elevation at stage 1 (m) L = weir crest length (m) C = weir coefficient

# **Ditch Capacity Worksheet for Existing Channel Section**

| Project Description | Langstaff Road EA, York Region | North side of Langstaff Road between Westminster Creek  Dufferin Street |
|---------------------|--------------------------------|---|
| Friction Method     | Manning<br>Formula             |   |
| Solve For           | Discharge                      |   |
| Input Data          |                                |   |
| Channel Slope       | 0.007 m/m                      |   |
| Normal Depth        | 1,000.0 mm                     |   |

# **Section Definitions**

| Station<br>(m) | Elevation<br>(m) |
|----------------|------------------|
| 0+0.00         | 205.75           |
| 0+1.52         | 205.50           |
| 0+2.82         | 205.00           |
| 0+4.08         | 204.50           |
| 0+5.34         | 204.00           |
| 0+5.76         | 204.00           |
| 0+7.25         | 204.50           |
| 0+8.71         | 205.00           |
| 0+11.4         | 205.50           |



# **Roughness Segment Definitions**

| Start Station  | Ending Station | Roughness Coefficient |
|----------------|----------------|-----------------------|
| (0+00, 205.75) | (0+11, 205.50) | 0.030                 |

| Results               |                     |  |
|-----------------------|---------------------|--|
| Discharge             | 5,440.40 L/s        |  |
| Roughness Coefficient | 0.030               |  |
| Elevation Range       | 204.0 to<br>205.8 m |  |
| Flow Area             | 3.2 m <sup>2</sup>  |  |
| Wetted Perimeter      | 6.2 m               |  |
| Hydraulic Radius      | 506.3 mm            |  |
| Top Width             | 5.89 m              |  |
| Normal Depth          | 1,000.0 mm          |  |
| Critical Depth        | 883.4 mm            |  |
| Critical Slope        | 0.012 m/m           |  |
| Velocity              | 1.72 m/s            |  |
| Velocity Head         | 0.15 m              |  |
| Specific Energy       | 1.15 m              |  |
| Froude Number         | 0.750               |  |
| Flow Type             | Subcritical         |  |

# **Ditch Design Worksheet for Proposed Channel Section**

|                       | •                              | -   |
|-----------------------|--------------------------------|---|
| Project Description   | Langstaff Road EA, York Region | North side of Langstaff Road between Westminster<br>Dufferin Street |
| Friction Method       | Manning<br>Formula             |   |
| Solve For             | Discharge                      |   |
| nput Data             |                                |   |
| Roughness Coefficient | 0.030                          | <b></b>   |
| Channel Slope         | 0.007 m/m                      |   |
| Normal Depth          | 1,000.0 mm                     | 1,000.0 mm  |
| Left Side Slope       | 2.500 H:V                      |   |
| Right Side Slope      | 0.000 H:V                      | 4.75  |
| Bottom Width          | 1.75 m                         | 1.75 m  |
| Results               |                                |   |
| Discharge             | 5,461.55 L/s                   |   |
| Flow Area             | 3.0 m <sup>2</sup>             |   |
| Wetted Perimeter      | 5.4 m                          |   |
| Hydraulic Radius      | 551.2 mm                       |   |
| Top Width             | 4.25 m                         |   |
| Critical Depth        | 815.6 mm                       |   |
| Critical Slope        | 0.014 m/m                      |   |
| Velocity              | 1.82 m/s                       |   |
| Velocity Head         | 0.17 m                         |   |
| Specific Energy       | 1.17 m                         |   |
| Froude Number         | 0.692                          |   |
| Flow Type             | Subcritical                    |   |