

4. ASSESSMENT OF EFFECTS OF OPTIMIZED DESIGN ON ENVIRONMENT

4.1 ASSESSMENT METHODOLOGY

An impact analysis was undertaken to identify and mitigate the potential effects, both positive and negative of the pre-construction, construction and operational activities required for implementation of the optimized subway design. Generally, the evaluation criteria and indicators established during the alternatives evaluation process for the original Highway 7 & VNSL EA Report surface rapid transit components were used as the basis for assessing the environmental effects of the preferred design.

As in the previous assessment professional experience, analysis, simulation and judgement formed the basis for identifying environmental effects and mitigation measures. The analysis was based primarily on comparing the existing environment condition with the anticipated future environment, prior to, during, and after construction.

4.1.1 Project Related Effects and Mitigation

Using the methodology described in **Chapters 10 and 12 of York Region's Highway 7 & VNSL EA Report**, the evaluation of project-related effects was performed using the primary Rapid Transit Plan objectives and related goals developed for the evaluation of alternatives in selecting the preferred alignment. These objectives are:

- To improve mobility by providing a fast, convenient, reliable and efficient rapid transit service
- To protect and enhance the social environment in the corridor
- To protect and enhance the natural environment in the corridor
- To promote smart growth and economic development in the corridor

Goals defined by professionals in the study team are subsets of these objectives and refer to an environmental value or criterion. The effect of the proposed undertaking in terms of each environmental value was rated using a qualitative scale ranging from a positive or beneficial effect through negligible to a potentially significant negative effect as described in the above methodology.

4.1.2 Assessment Results

An environmental effect requires consideration of all project activities and their interaction with the environment. Pre-construction, construction and operational activities were assessed. This section describes the project activities for the subway components of the rapid transit undertaking and

their interaction with the environment, their location, the potential effects, mitigation measures, residual effects and their significance, and monitoring recommendations.

4.1.3 Assessment Categories

The assessment that is summarized below is organized according the following main headings:

Environmental Value/Criterion: The objective that is being addressed by the project activity.

Project Activity/Issue: Any potential issues associated with the physical work, any proposed construction, operation, modification, or other undertaking in relation to the proposed project.

Project Phase: Project stages are coded as follows:

- P – Pre-construction
- C – Construction
- O – Operation

Location: A description of the location where the project activity/issue has impact.

Assessment of Effect on the Environment: A description of any change that the project may cause in the environment, health and socio-economic conditions, physical and cultural heritage, the current use of lands and resources for traditional purposes by aboriginal persons, or any structure, site or thing that is of historical, archaeological, paleontological or architectural significance, or any change to the project that may be caused by the environment.

Built-in Positive Attributes and/or Mitigations: In respect of the project, the elimination, reduction or control of the adverse environmental effects of the project, that includes restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means.

Potential Residual Effects: Residual effects that may occur even with the mitigations described above.

Further Mitigation: Additional mitigation measures that may be deemed necessary in order to mitigate the environmental effect.

Level of Significance after Mitigation: The level of impact to the project, as a result of the undertaking, after mitigation activities have taken place.

Monitoring and Recommendation: Recommendations and suggestions for future activities to monitor and track on-going or potential future impacts. These activities may be conducted by the project proponent or by other stakeholders who are impacted by the undertaking.

Sections 4.1.4 to 4.1.7 describe the environmental assessment for four objectives: to improve mobility by providing a fast, convenient, reliable and efficient rapid transit system; to protect and enhance the social environment in the corridor; to protect and enhance the natural environment in the corridor; and to promote smart growth and economic development in the corridor.

4.1.4 OBJECTIVE A: To improve mobility by providing a fast, convenient, reliable and efficient rapid transit service

The effects analysis for Objective A is tabulated in **Table 4-1**. Generally, a subway extension from York University to the Vaughan Corporate Centre (VCC), has the ability to significantly improve mobility within the western portion of the Highway 7 corridor and provide good connectivity with all inter- and intra-regional transit services. It provides a direct connection to the City of Toronto subway network via York University and it also provides a direct connection to the future Highway 407 transitway near Jane Street. From this point of view, the optimized subway service will have an overall positive effect on transit ridership in the region. The planned alignment characteristics and geometry will provide a fast, convenient and reliable service in all respects. Station locations will support near- and long term development in the Vaughan Corporate Centre and the Steeles Avenue Corridor area where high residential density, high employment numbers or a combination of the two will capitalize on the effectiveness of implementing the subway system extension. The strategic locations of stations generally achieve the goal of increasing the attractiveness of the rapid transit service and make a positive contribution to maximizing ridership. In order for all members of society to have access to the system, all stations, ancillary facilities and the transit system itself will be accessible for the mobility impaired providing ramps, elevators, etc. Attractiveness of the rapid transit service is implicit in the design of both sub-surface and surface components of the undertaking, by achieving the desired transit speed, providing efficient, convenient transfer facilities and a implementing a key link between a designated major Regional Centre (VCC) and the future expanded GTA transit network.

**Table 4-1
Effects and Mitigation for Improved Mobility**

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase ¹			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE A: To improve mobility by providing a fast, convenient, reliable and efficient rapid transit service												
A1	Maximize Inter-regional and local transit connectivity	Connections to inter-regional services and future gateways	✓	✓	✓	407 Station Facility	Opportunity to connect to MTO's future (407) transitway and other local and regional transit services such as YRT/Viva, Brampton Transit and GO Transit.	407 Station is proposed to be a multimodal facility to serve transfer and layover needs for all user transit authorities. .	Some potential for infill commercial development around this transfer point.	Transit transfer facility must recognize proximity to Black Creek	Positive effect	MTO will review Hwy 407 transitway needs as part of their future EA study.
		Connections to inter-regional services and future gateways	✓	✓	✓	VCC Station Facility	Opportunity to connect to various YRT local routes as well as two Viva routes.	VCC Station Facility will provide bus bays for pick-up/drop-off of transferring passengers and short layovers in the station area.	High potential for mixed-use development around this transfer point.	None	Positive effect	Monitor the ridership and VCC land use and road network development.
		Connections to inter-regional services and future gateways	✓		✓	York University	Opportunity to connect to the City of Toronto and improve ridership on these transit services.	Vaughan North-South Link will provide a direct connection to the York University and to the TTC rapid transit system via the Spadina subway extension.	High potential for infill mixed-use development around this transfer point.	None	Positive effect	Monitor the ridership and the performance of the connection to Toronto.
		Compatibility with proposed local network	✓		✓	Entire Corridor	Inconvenient transfer between local transit and Highway 7 Rapid Transit may discourage growth in transit ridership.	Steeles Avenue and VCC Stations will be served by local YRT and TTC transit routes ensuring convenient transfers between services. Integrated fare system proposed.	Project will require a change to the configuration of local transit.	Review effectiveness and adjustment to local service routes	Positive effect	Ongoing review of effectiveness of local service plans.
A2	Maximize speed and ride comfort and minimize safety risks and maintenance costs	Alignment geometry	✓		✓	Entire Corridor	Minimum geometric standards would limit service speed, increase travel time and reduce ride comfort and system safety.	Alignment for subway extension was designed to TTC standards (operational speed of 80 km/h)	Minimum travel time will attract ridership at frequent headways.	None	Positive effect	None required.
A5	Locate stations to maximize ridership potential and convenience of access for all users	Residents/Employees within walking distance of station locations. Accessibility of stations/transit system.			✓	VCC Station Facility	Station at location with automobile-oriented land use could discourage rapid transit use.	Station location will serve supportive land use. Facilities and access can be integrated into future high density developments adjacent to the station. Facilities will be weather protected, barrier-free attractive designed streetscapes within surrounding mixed-use neighbourhoods. VCC urban design will promote a pedestrian and transit-user friendly environment,.	Continued dependence on automobile if land use objectives not achieved	Greater emphasis on supportive land use particularly in VCC. Future high density development at VCC can be built around transit based transportation infrastructure (instead of automobile)	Positive effect	Regular review of land use and new or infill development potential during detailed design phases for subway extension.
					✓	407 Station facility	Station at location with automobile-oriented land use could discourage rapid transit use.	This station is intended to serve mainly inter-regional park-and-ride passengers and GO Transit, YRT/Viva, Brampton Transit users, with few local residents. Promote transit use.			Positive Effect	None required

**Table 4-1
Effects and Mitigation for Improved Mobility**

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase ¹			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE A: To improve mobility by providing a fast, convenient, reliable and efficient rapid transit service												
							Draw commuters out of automobiles and into transit					

Notes: P – Pre construction, C – Construction, O – Operation

4.1.5 OBJECTIVE B: To protect and enhance the social environment in the corridor

Overall, the various goals set to protect and enhance the social environment can be achieved. The assessment, in terms of the related environmental values, indicates that most adverse effects are generally mitigated by the built-in attributes of the design and benefits for the existing and future communities served by the route can be maximized. The assessment for Objective B is tabulated in **Table 4-2**.

In general, the subway extension will improve community mobility, in particular, access to commercial and community facilities planned at the end of the extension, the VCC and Steeles Avenue Corridor environs. The effect on the current road capacity and traffic operation will be mitigated by the Region undertaking the widening of Jane Street from four to six lanes as planned. Additionally the Region is planning early implementation of the East-West Collector road running parallel to the Hydro Corridor from Jane Street to Keele St. The planned road system improvement will address the vehicular traffic operational and capacity needs associated with accessing the station facilities. Additional traffic generated from the future land development at VCC, will be addressed as part of the road network improvements planned by the City of Vaughan as part of the Vaughan Corporate Centre infrastructure. Also, a reduction in north-south vehicular demand is anticipated when the subway extension is placed into service. In summary, the impact on traffic is not expected to be significant; however, further analysis will be carried out using up-dated volumes and ridership figures during the design phase to confirm the effectiveness of the associated, planned road improvements.

Preserving and improving public safety and security along the route was an important consideration in development of the design concept. While fulfilling its role as a major transit interchange node in VCC, the features of the VCC Station are compatible with a pedestrian-friendly environment as planned in the recently-completed VCC Streetscaping Study. In addition, noise and vibration studies at representative sensitive receptors (performed as part of the original Highway 7 and VNSL EA study) have demonstrated that the use of the TTC's standard floating slab track support system will mitigate any noticeable increase in noise or vibration levels for residents of future developments that may be implemented along the route. Cultural heritage work will be completed at detailed design in order to assess the impact of the proposed works including the construction of Steeles West Station and the subway alignment on TRCA buildings at Black Creek Pioneer Village, and at the northwest corner of Jane Street and the railway tracks. In particular the affects of noise, vibration, dust, and traffic flow on these buildings and the operation of the village both during construction and operation of the subway will need to be considered.

A Stage 1 Archaeological Assessment, conducted during the study, indicated the absence of archaeological sites within the project impact area. As is usually the case, a Stage 2 archaeological study will be conducted during the design/construction phase for the subway extension. Finally, the predominantly underground subway infrastructure, even in a highly developed urban context, will have no effect on the visual aesthetics of the route. In consultation with the municipalities and the public, a concerted effort will be made to incorporate landscaping and streetscaping principles developed for the VCC in the station area design.

**Table 4-2
Effects and Mitigation for Social Environment**

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase ¹			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE B: To protect and enhance the social environment in the corridor												
B1	Minimize adverse effects on, and maximize benefits for, communities in corridor	Potential displacement of community features.		✓	✓	Entire route	Potential displacement or loss of unique features.	Avoids known distinct community features. To minimize impact; incorporate landscaping and furniture into streetscape to enhance corridor community environment.	None expected	None expected	Negligible	Future municipality and VCC community consultation
		Potential displacement of community features.		✓	✓	VCC planned Transit Square urban park at Millway Ave.	Potential displacement or loss of planned unique features by transit infrastructure (passenger pick-up/drop-off (PPUDO)).	PPUDO will be incorporated into a future urban park (Transit Square) that will include significant landscaping.	None	None expected	Negligible	Future municipality and VCC community consultation
		Community facility utilization			✓	VCC area	Improved transit access could increase demand on facilities and services within the VCC.	Municipality can expand services and facilities and recoup cost from development charges	None expected	None expected	Positive effect	Monitoring of activity levels at the various facilities.
B2	Maintain or improve road traffic and pedestrian circulation	Reduction in overall road capacity			✓	407 Station Facility	Reduced capacity at Jane Street/Access Road Intersections.	Jane St./Main Access Road Intersection improvements will be built in advance of the subway construction when Jane Street is widened to six lanes. The new intersection will be controlled by a traffic signal.	None expected	None expected	Impact on traffic will be limited to Jane Street widening construction phase.	Monitor traffic volumes and intersections operation to confirm assumptions

**Table 4-2
Effects and Mitigation for Social Environment**

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase ¹			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE B: To protect and enhance the social environment in the corridor												
				✓		Reduced capacity at Jane Street	After widening to six lanes, Jane Street will have the capacity to support traffic generated by the subway extension. New intersection will operate at acceptable levels of service. Implementation of subway should reduce north-south traffic volumes.	None expected	None expected	Positive effect	Monitor traffic volumes to confirm assumptions	
				✓	VCC Station Facility	Reduced road capacity in the area of influence.	In preparation for the VCC development, the City of Vaughan has prepared a plan to address the needs of the VCC including road network expansion.	Potential for delays in the construction of portions of the road network expansion.	Local transit routes in VCC may need to be re-routed.	Neutral	Vaughan should construct the minimum road links (part of City's road network expansion plans) indicated in Chapter 3 prior to commencement of the subway operations.	
				✓		Traffic impact on road network resulting from the operation of the Passenger Pick-Up and Drop-off.	To be further examined during the design stage – potential mitigation measures could include changes to entrance/exit locations or road improvements.	None expected	None expected			
			✓			Traffic congestion during construction	A Comprehensive traffic management plan will be prepared during the detail design phase addressing the needs to manage and maintain traffic movements and access during construction..	None expected	None expected	Moderate effect during construction		
				✓	Northwest Gate (Steeles Avenue)	Under 2021 considerations, the intersection will operate at capacity during the AM peak hour.	None required.	Intersection will continue to operate at capacity.	None expected	Moderately Significant	None required.	
		Pedestrian Crossings		✓	Jane St./ Hwy 7;	Due to the width of the proposed "main street" at the intersection, pedestrians may not be able to cross the intersection in one signal phase based on the standard pedestrian walking speed.	These intersections may require two-stage crossing in the future to accommodate heavy main street traffic. The decision to implement these special provisions should be deferred until post-operation conditions are monitored and the need is identified.	None Expected	None Expected	Moderately Significant	Monitoring is required to determine if the implementation of two-stage is a necessity.	
B4	Minimize adverse noise and vibration effects	Noise effects due to construction and operation of subway extension		✓	Portions of route where alignment is in the proximity of future development.	Subway may result in increased noise levels	Control of noise during construction by use of: soundproof enclosures for any noise producing machinery; use of exhaust mufflers and silencers on combustion engines and air equipment, lining material on hoppers and storage bins. Abide by local noise by-laws.	None expected	None necessary	Insignificant	For all noise effects, undertake confirmation monitoring to verify compliance once the subway extension is fully operational.	
				✓			Ambient noise level increase due to future subway operations will not exceed the 5dB threshold with TTC floating slab track support and double tie (used in sections of straight track) systems	None expected	None necessary	Insignificant		
				✓	Electrical substations	Noise level produced by transformers	Proper enclosure and orientation of the transformers will mitigate the effect.	None expected	None necessary	Insignificant		

**Table 4-2
Effects and Mitigation for Social Environment**

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase ¹			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation	
			P	C	O								
OBJECTIVE B: To protect and enhance the social environment in the corridor													
					✓	VCC Station Facility	Ventilation Shafts noise impact	The fans are not located in a noise-sensitive area and the noise effect will only be occasional. During the design phase the exact location of the fans will be defined and any necessary noise mitigation measure will be identified.	None expected, it will be re-addressed during design phase	Depending on the findings.	Very occasional		
					✓			In general, sound level increases in future adjacent developments can be limited to acceptable levels by conditions during site plan approvals;					
		Vibration effects due to construction and operation of subway extension			✓	✓	Tunnel sections of the subway where alignment is in the proximity of future development.	Subway operations may result in increased vibration levels particularly for an optics company located north of Highway 407.	The use of double ties and a floating slab track will mitigate any vibration effect. Modeling of future subway operations indicates that expected vibration increases will not exceed the protocol limit of 0.1 mm/sec.	None expected	None necessary	Negligible	Undertake confirmation monitoring to verify compliance once the subway extension is fully operational.
B5	Minimize adverse effects on stakeholders and property owners directly affected by the subway	Effects on structural integrity of existing or planned facilities			✓		Crossing under UPS facilities	Portion of the subway may be built under part of a future building	In the event that the expansion of the UPS plant occurs prior to subway construction, tunnelling under the finished building would be possible without major disruption to the UPS operations. The tunnelling could be undertaken using EPB-TBM's for each track as used for the main lines, or by using other proven tunnelling techniques, such as NATM, or Sequential Excavation Techniques (SEM). In either case, provision could be made in the design and construction of the building expansion footings and foundations to allow for the maximum potential settlement that may occur during the later tunnelling construction. Alternatively, pre-construction of the future subway structure walls could be undertaken during the building expansion construction, to allow for future top-down cut-and-cover subway construction under the new building. Extensive soils investigation, co-ordination of designs, a continuous monitoring program, and negotiations between UPS and the subway Program Manager would be undertaken to minimize disruption to either party during all construction phases. In case of tunnelling it is recommended that cover of 1.5 to 2 diameters be provided from the tunnel crown to the underside of the foundations; if this envelop is less than desirable, special settlement control measures will be taken to ensure stability of the building while building the tunnels.	Unexpected ground conditions	Use of special construction techniques if necessary, suitable to overcome unexpected ground conditions.	Rare	Depending on the ground conditions and construction techniques used.
					✓		Crossing under the Hydro Corridor.	Potential effects of tunnelling beneath or near transmission towers.	Tunneling with EPB-TBM's, in conjunction with continuous monitoring, can be successfully undertaken in close proximity to tower foundations, on either spread footings and/or on piles or caissons. The recommended clearance envelope from the tunnel crown to the underside of the foundations is 1.5 to 2 tunnel diameters (approximately 9m to 12m in this situation). Not being able to meet this desirable envelope in one 540 KV tower, special settlement control measures will be taken to ensure stability of the tower during the construction of the tunnels. Depending on the results of detailed soils investigation in the vicinity of the tower foundations, ground improvement techniques may also be undertaken in advance of tunnelling to prevent potential ground	Unexpected ground conditions	Use of special construction techniques if necessary, suitable to overcome unexpected ground conditions.	Rare	Depending on the ground conditions and construction techniques used.

**Table 4-2
Effects and Mitigation for Social Environment**

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase ¹			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE B: To protect and enhance the social environment in the corridor												
							loss and subsidence.					
				✓		Crossing under CN Halton Subdivision tracks.	Potential effects of tunnelling under the tracks	The depth of cover from top of tunnel excavation to top of rail is approximately 13.5m. Tunnelling with EPB-TBM's in conjunction with continuous monitoring should not produce settlement of the rail bed beyond acceptable limits for continued operation over the rail lines during tunnel construction.	Unexpected ground conditions	Use of special construction techniques if necessary, suitable to overcome unexpected ground conditions.	Rare	Depending on the ground conditions and construction techniques used.
				✓		Crossing under Toromont light equipment maintenance building	Cut and cover special track section is sited at the location of the existing building.	The Region will negotiate with the owner to address concerns regarding removal of building.	None expected	Use of special construction techniques if necessary, suitable to overcome unexpected ground conditions.		
				✓		Tunnel crossing near Bentall buildings north of Highway 407.	Potential structural effect tunnelling near existing buildings.	It is recommended that clearance of 1.5 to 2 diameters from the tunnel crown to the underside of the foundations be provided; if this envelop is less than desirable, special settlement control measures will be taken to ensure stability of the building while building the tunnels.	Unexpected ground conditions	Use of special construction techniques if necessary, suitable to overcome unexpected ground conditions.	Rare	Depending on the ground conditions and construction techniques used.
				✓		VCC Station north of Highway 7 crossing near a Future Shop Store.	Potential structural effect building a cut and cover station near an existing building.	Based on the prevailing ground conditions, temporary cuts for open-cut construction may be made with side slopes in the range of 1H:1V to 1.5H :1V. However, in this situation, due to space restrictions, vertical excavation sides are expected. To provide horizontal support during construction some form of temporary shoring is anticipated along with internal braces or drilled anchors that extend into the ground behind the supporting walls.	None expected			
						Crossings under Jane St., Hwy 407, Interchange Way.	Possibility of settlement effects during tunnel construction.	The depth of cover between the roadway surfaces, as well as any associated utilities such as sewers and water-mains, and the top of the tunnel excavation, is sufficient that damage from minor settlement due to tunnel construction is unlikely. The use of EPB-TBM's in conjunction with continuous monitoring should prevent settlement problems.	Unexpected ground conditions	Use of special construction techniques if necessary, suitable to overcome unexpected ground conditions.	Rare	Depending on the ground conditions and construction techniques used.
				✓		Highway 7 Crossing	Potential effects of cut and cover construction on utilities.	Alternate access and temporary re-arrangement of the vehicular and pedestrian circulation as well as the internal parking operation will be addressed during the design phase, based on the up-dated status of the VCC road network expansion and surrounding development plans.	None expected	None necessary	Rare	Make sure that the design phase of the subway extension addresses temporary arrangements to mitigate the operation of the Toromont's facilities
	Effects to the operations of industrial/commercial facilities during construction			✓		Crossing under Toromont facilities	Impact on the entrance to the facility, internal circulation roads and parking during construction.	The Region discussed with Toromont the potential construction site boundary, worksite area and liner segment storage area, as well as potential options of temporary access for Toromont users as well as construction access. The location of accesses and construction sites will be negotiated and defined between the Owner, the Contractor, Project Manager and the regional and local municipalities once the implementation phase is contracted, responding to all parties interests.	Mutual agreement required			

**Table 4-2
Effects and Mitigation for Social Environment**

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase ¹			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE B: To protect and enhance the social environment in the corridor												
				✓		Crossing under Smart Centres facilities	Impact to Future Shop Millway Ave. access to main entrance.	Potential temporary access options were discussed with Smart Centres. The selected option will be negotiated and defined between the Owner, the Contractor, the Project Manager and the regional and local municipalities once the implementation phase is contracted.	Mutual agreement required			
				✓		Crossing under UPS facilities.	Partial impact to the existing circulation area and the future parking expansion on the north side of their facility, during construction.	Temporary measures to provide access around the affected open area of UPS will be developed with UPS and included in the project during the design phase.	None expected	None necessary	Minor	Make sure that the design phase of the subway extension addresses temporary arrangements to mitigate the operation of the UPS facilities.
		Effects to private property (at grade facilities)	✓	✓	✓	VCC Station area	PPUDO for VCC Station will require property acquisition south of future Ring Road.	Land required for the PPUDO will be acquired.	None expected	None necessary	None	
				✓	✓	Hydro Corridor	Future East-West Collector Road to be built along the south edge of the Hydro easement east of Jane Street.	Maintenance access to all Hydro Facilities will be maintained. An area around the towers for parking and manoeuvring of maintenance vehicles will also be respected.				
		Effects to business activities		✓		VCC Station area	Possible disruption of business activities during construction.	Appropriate temporary measures and construction techniques will maintain access and circulation in the vicinity of the station work.	None expected	None necessary	Minor	
		Effect to Ontario Realty Corporation (ORC) lands	✓	✓	✓	407 Station area	407 Station and station facilities (PPUDO, Parking etc) will require property acquisition west of Jane Street between the Hydro Corridor and the 407.	The Region will negotiate with the ORC to address concerns regarding removal of ORC tenant (i.e. farmer) and any associated buildings, and land acquisition. Note, depending on timing, and the status of the MTO transitway design/study, MTO will be invited to participate in discussions and identification of land requirements.	Mutual agreement required		Minor	
		Effect to Beechwood Cemetery activities	✓			Beechwood Cemetery	Possible disruption of business activities during construction.	The subway alignment is outside of the cemetery property and as such no negative effects are expected. Jane St./Main Access Road Intersection improvements will be built in advance of the subway construction when Jane Street is widened to six lanes. The new intersection will be controlled by a traffic signal.	None expected	None expected	Impact on traffic will be limited to Jane Street widening construction phase.	Monitor traffic volumes and intersections operation to confirm assumptions
B5	Minimize adverse effects on cultural resources	Disruption of Built Heritage Features (BHF)		✓			The potential introduction of rapid transit operation may cause changes in visual, audible and atmospheric environment around built heritage features.	None required – Subway facilities will be integrated with existing streetscape and VCC road network.	None expected	None necessary	Insignificant	None required

**Table 4-2
Effects and Mitigation for Social Environment**

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase ¹			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE B: To protect and enhance the social environment in the corridor												
B5	Minimize adverse effects on cultural resources	Disruption of Cultural Landscape Units (CLU)		✓			The potential introduction of rapid transit operation may cause changes in visual, audible and atmospheric environment to the cultural heritage features in the Cultural Landscape.	None required – Subway will be integrated with existing streetscape and road traffic operations.	None expected	None necessary	Insignificant	None required
B6	Minimize disruption of community vistas and adverse effects on street and neighbourhood aesthetics	Visual Effects	✓		✓	VCC Station	Introduction of surface transit facilities serving the VCC station may reduce visual aesthetics of Highway 7.	Transit intermodal facilities are being developed in consultation with Vaughan Municipality. A preliminary short-stay bus lay-over location has been identified on a local minor road,	None expected	None necessary	Insignificant	Monitor VCC planning and development applications and acquire property for facilities and streetscape enhancement through redevelopment applications
		Landscaping	✓		✓	Station precincts	Landscaping species may not survive in winter months.	Choose appropriate species for both winter and other months to maintain greenery throughout corridor. Where necessary, place landscaping in planters and incorporate buried irrigation systems.	Species may still not survive	Change species', irrigation patterns, etc.	Insignificant	Monitor health of landscaping continuously

Notes: P – Pre construction, C – Construction, O – Operation

4.1.6 OBJECTIVE C: To protect and enhance the natural environment in the corridor

The limited natural environment along the subway extension route can be protected and enhanced in a small way. Most of the preferred subway extension alignment is set in a developed urban environment where natural features have already been disturbed by previous development. Nevertheless, within the Humber River watershed, the Black Creek watercourse crosses Highway 7 and Highway 407 on the east of Jane Street and swings under Jane street south of Highway 407. Black Creek also crosses the proposed subway alignment south of Highway 407. North of Highway 407, the subway tunnel, station and surface works will be remote from the watercourse and outside the floodplain. South of Highway 407 the tunnel profile will be designed to allow the subway to pass under Black Creek. The only potential to effect to the watercourse and related natural vegetation would come from the Hwy 407 station surface elements, bus transfer facilities, park and ride, PPUDO and construction cut and cover operations. Wherever possible the project will aim to achieve a net environmental gain.

The optimized alignment to tie-into the diagonal Steeles Station selected by the Toronto/TTC study, enables all underground Highway 407 station works to be constructed south of the Highway 407 ramps without directly impacting the Black Creek meander belt and most of the valley lands. Works in the valley lands will be limited to the new creek crossing structure to provide access to the station facilities and construction of the south-eastern corner of the station underground structure. All potential adverse effects of these works can be mitigated by built-in design attributes or specific construction techniques to mitigate temporary effects.

In terms of all other environmental components to be considered, effects on aquatic and terrestrial ecosystems are either negligible or insignificant when built-in mitigation measures are implemented or sensitive construction and operation methods are respected. The lengthening of existing culverts or installation of new culverts along the subway extension will incorporate mitigation measures where required to preserve or enhance the aquatic habitat, however, a fluvial geomorphological assessment and plan of action as required will be conducted in the design phase. Future air quality is generally expected to be better than current air quality mainly due to improvements in engine technology and fuels but also with some contribution from the diversion of car and diesel bus trips to electric subway. While PM levels can be expected to increase as traffic increases, rapid transit will slow the rate of increase. Green house gas emissions will be reduced due to the energy efficiency of an improved public transit alternative. Wherever possible the project will aim to achieve a net environmental gain.

Note that the statements indicated above will be revised and verified during the detail design phase through a comprehensive Environmental Management Plan.

The assessment for Objective C is tabulated in **Table 4-3**

**Table 4-3
Effects and Mitigation for Natural Environment**

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase ¹			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE C: To protect and enhance the natural environment in the corridor												
C1	Minimize adverse effects on Aquatic Ecosystems	Fuel spills entering the watercourses, due to accidents during construction refuelling and accidents at bus terminals during operation.		✓	✓	Entire Route	Fish kills due to chemical spills resulting in short term population decline.	<ul style="list-style-type: none"> No refuelling within 30 m of a watercourse or catchbasin. Emergency Response Plan. Oil & grit separators on stormwater drainage from station site. Inspection and maintenance control at all times. Construction will be performed in the dry. 	<ul style="list-style-type: none"> Short term population decline. Some contaminants within storm-water system. 	None practical	Insignificant	None required
		Sediment laden stormwater entering watercourses during construction.		✓		Entire Route	Fish kills and loss of aquatic habitat resulting in short term population decline.	<ul style="list-style-type: none"> Minimize the duration and extent of soil exposure. Manage surface water to prevent contact with exposed soil surfaces. Implement erosion and sedimentation control measures on-site to prevent sediment migration off-site. Erosion and Sedimentation Control Plan. 	Short term population decline.	None practical	Insignificant	None required
		Sediment laden stormwater entering watercourses during operation.			✓	Entire Route	Loss of aquatic habitat resulting in population decline.	<ul style="list-style-type: none"> Stormwater management facilities such as grassed swales, oil and grit separators, stormwater ponds. 	Short term population decline.	Clean-out facilities as required.	Insignificant	Normal monitoring of drainage facilities.

**Table 4-3
Effects and Mitigation for Natural Environment**

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase ¹			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE C: To protect and enhance the natural environment in the corridor												
	Minimize adverse effects on Aquatic Ecosystems (cont'd)	Loss of site-specific habitat.		✓		Black Creek and tributary watercourses within route.	Potential loss of fish habitat as a result of watercourse realignment, new culverts/bridges, culvert/bridge extensions and/or culvert/bridge replacements or repairs.	<ul style="list-style-type: none"> Design subway works to avoid modifications at culverts/bridges. Any new structure will be sized in accordance with TRCA's criteria for spanning watercourses and floodplain following appropriate further studies. Avoid in-water work to the extent possible. Minimize the area of in-water alteration to the extent possible. Follow in-water construction timing restriction. Perform all in-water work in the dry using a temporary flow bypass system. 	An improvement to fish habitat may result from channel modifications at Black Creek watercourses that support fish habitat.	Consultations with regulatory agencies during detail design to confirm no harmful alteration of fish habitat.	Insignificant	On-site environmental inspection during in-water work. Post-construction monitoring of fish habitat recovery measures.
C1-Cont'd	Fish mortality			✓		Black Creek and tributary watercourses within route.	Fish may be injured or killed by dewatering.	<ul style="list-style-type: none"> Design subway works to avoid modification of water quantity and quality in watercourses. Avoid in-water work to the extent possible. Perform all in-water work in the dry using a temporary flow bypass system. Capture fish trapped during dewatering of the work zone and safely release upstream. Prohibit the entry of heavy equipment into the watercourse. 	None expected.	None	Negligible	On-site environmental inspection during in-water work.
	Barriers to fish movement.			✓	✓	Black Creek and tributary watercourses within route.	Subway and station works may create a barrier to fish movement.	<ul style="list-style-type: none"> Use open footing culverts or countersink closed culverts a minimum of 20% of culvert diameter. Span the watercourse, meander belt or floodplain with new structures where warranted by site conditions. 	New bridges or culverts and culvert modifications will be designed to avoid the creation of a barrier to fish movement.	Negotiations with regulatory agencies during detail design.	Negligible	On-site environmental inspection during in-water work.
	Baseflow alterations			✓	✓	Black Creek and tributary watercourses within route.	New impervious surfaces at stations can lead to changes in the frequency, magnitude and duration of flows.	<ul style="list-style-type: none"> Reduce the area of impervious surfaces to the extent possible. Use stormwater management practices that encourage infiltration and recharge of groundwater. 	None expected.	None	Negligible	<ul style="list-style-type: none"> Post-construction inspection of stormwater management facilities to evaluate their effectiveness. On-going maintenance as required.
	Increased temperature			✓	✓	Black Creek and tributary watercourses within route.	Clearing of riparian vegetation and stormwater management practices can impact temperature regimes.	<ul style="list-style-type: none"> Minimize the area of stream bank alteration to the extent possible. Use stormwater management practices that encourage infiltration and recharge of groundwater. 	Shading provided by culvert/bridge offsets shading lost through removal of riparian vegetation.	Restore riparian areas disturbed during construction with native vegetation.	Negligible	<ul style="list-style-type: none"> Post-construction inspection of stormwater management facilities to evaluate their effectiveness. On-going maintenance as required. Post-construction inspection of riparian plantings to confirm survival.
	Disturbance to rare, threatened or endangered species			✓	✓	Black Creek and tributary watercourses within route.	No rare, threatened or endangered species have been recorded in Black Creek.	No species-specific mitigation required.	None expected.	None required.	Negligible	None required.

**Table 4-3
Effects and Mitigation for Natural Environment**

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase ¹			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE C: To protect and enhance the natural environment in the corridor												
C2	Minimize adverse effects on Terrestrial Ecosystems	Loss of wildlife habitat		✓	✓	In the vicinity of surface subway facilities.	Construction of the subway and station facilities may result in the removal of vegetation and the wildlife habitat it supports.	<ul style="list-style-type: none"> ▪ Minimize the area of vegetation removals to the extent possible. ▪ Minimize grade changes to the extent possible. ▪ Delineate work zones using construction fencing/tree protection barrier. ▪ Clear vegetation during non-breeding seasons. 	None expected.	Restore natural areas disturbed during construction with native vegetation, where feasible.	Negligible	None required.
		Wildlife mortality		✓	✓	In the vicinity of surface subway facilities.	Removal of wildlife habitat may result in wildlife mortality.	<ul style="list-style-type: none"> ▪ Perform vegetation removals outside of wildlife breeding seasons (typically April 1 to July 31). ▪ Perform any channel realignment and culvert/bridge extension, repair and replacement outside of wildlife breeding season. 	None expected.	None required.	Negligible	None required.
		Barriers to wildlife movement.		✓	✓	In the vicinity of surface subway facilities.	<ul style="list-style-type: none"> ▪ Channel realignment or culvert/bridge extension, repair or replacement may create a barrier to wildlife movement. ▪ Insertion of subway station surface facilities may create an additional impediment to wildlife movement and increase the potential for wildlife/vehicle conflicts. 	Enhance wildlife passage around facilities, where feasible through culvert/bridge modifications and re-vegetation along boundaries.	Design of new bridges or culvert extensions to provide access to station facilities will not impede wildlife passage.	None required	Negligible	None required.
		Disturbance to rare, threatened, or endangered wildlife		✓	✓	In the vicinity of surface subway facilities.	No rare, threatened or endangered wildlife species have been recorded in the project limits.	<ul style="list-style-type: none"> ▪ No species-specific mitigation required. 	None expected.	None required.	Negligible	None required.
		Disturbance to vegetation through edge effects, drainage modifications and road salt		✓	✓	Station surface facilities.	<ul style="list-style-type: none"> ▪ Clearing of new forest edges may result in sunscald, windthrow, and invasion of exotic species. ▪ Ditching, grading and other drainage modifications may alter local soil moisture regimes. 	<ul style="list-style-type: none"> ▪ Minimize the area of vegetation removals to the extent possible. ▪ Minimize the grade changes and cut/fill requirements to the extent possible. ▪ Delineate work zones using construction fencing/ tree protection barrier. ▪ At detailed design an inventory of the vegetation to be removed during construction will be performed and a restoration or compensation plan will be provided. 	<ul style="list-style-type: none"> ▪ Vegetation communities within the study area are primarily cultural in origin and have been impacted by Highways 7 and 407. ▪ Subway stations represent a minor incremental encroachment into these already disturbed communities. 	Re-vegetation along watercourses and landscape treatments.	Insignificant	None required.
	Minimize adverse effects on Terrestrial Ecosystems (cont'd)	Disturbance to rare, threatened or endangered flora		✓		In the vicinity of surface subway facilities.	<ul style="list-style-type: none"> ▪ No rare, threatened or endangered wildlife species have been recorded in the project limits. 	<ul style="list-style-type: none"> ▪ No species-specific mitigation required. 	Trees may be removed by the construction of the subway and its associated facilities.	None required.	Insignificant	Monitor clearing activities to ensure that minimum work zones are used to avoid any unnecessary tree removal.

**Table 4-3
Effects and Mitigation for Natural Environment**

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase ¹			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE C: To protect and enhance the natural environment in the corridor												
C3	Improve regional air quality and minimize adverse local effects	Degradation of existing local and regional air quality when compared to MOE standards			✓	VCC, Hwy 407 and Steeles Avenue Station areas	Situation expected to be unchanged or marginally better than 2001 The design of the station will also involve landscape and streetscape design which will result in the planting of new trees and vegetation which will improve air quality in those areas.	The fleet average emissions will drop significantly due to technological improvements balancing the increase in traffic volumes. The subway extension will divert commuters from individual highly polluting sources (single occupancy automobiles). The design of the station will also involve landscape and streetscape design which will result in the planting of new trees and vegetation which will improve air quality in those areas.	Improvement of about 4% in all pollutants except PM. Subway availability will slow the rate of increase of PM.	None required	Positive Effect	None recommended
		Increase in emissions of Greenhouse Gases (GhG)			✓	Entire route	GhGs emitted may not be improved	Compared to the status quo (no rapid transit) there will be far less GhGs emitted per commuting person.	Net decrease in CO ₂ -equivalent emissions of 4-5 kilotonnes	None required	Positive Effect	None recommended
		Degradation of air quality during construction		✓		Entire route	Some dust may be created during the construction period.	Regulations require that all possible pollutant emission mitigation steps possible be taken during construction activities.	Some PM emissions locally.	None required.	Negligible	None recommended
C4	Minimize adverse effects on corridor hydro-geological, geological and hydrological conditions	Water quality in shallow groundwater that can affect quality in surface watercourses			✓	Areas located hydraulically down gradient of transit alignment, where receiving surface watercourses are present.	Subway park-and-ride lots and bus loops will require de-icing salt and also will accumulate various chemical substances that can impact water quality of runoff. Impacted runoff that infiltrates can increase concentrations in shallow groundwater. Potential to affect shallow groundwater that discharges to surface watercourses.	Dilution and other natural processes will attenuate elevated parameters in groundwater.	<ul style="list-style-type: none"> Potential effects to water quality of surface water courses. Groundwater quality effects are anticipated to be detectable. 	Reduce application of road salt, where possible. Curbs and gutters to convey impacted runoff away from permeable soil areas.	Moderately Significant	None required. Water quality effects are anticipated to remain acceptable.
		Baseflow in surface water courses		✓	✓	Recharge areas within proposed alignment, particularly in areas of Newmarket Till and sand textured glacial lake deposits.	Increase of paved area at stations decreases the pervious area that existed prior to construction, resulting in proportionally decreased recharge to shallow groundwater.	N/A	<ul style="list-style-type: none"> Decreases in recharge can decrease baseflow in surface water course(s). Reduced baseflow in surface watercourses. 	Construction of pervious surfaces where practical, including grassed areas and permeable pavements.	Negligible	None required. The degree of impact is anticipated to be undetectable.
		Increased pavement; decreased infiltration			✓	Stations along route	Minor increase in quantity of surface runoff. Minor decrease in quantity of groundwater.	Storm water management facilities such as grassed swales and storm water ponds will be designed to meet current TRCA stormwater management criteria for quality, quantity and erosion control.	<ul style="list-style-type: none"> None. The pond will be designed to mitigate all effects. 	None	-	None required

**Table 4-3
Effects and Mitigation for Natural Environment**

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase ¹			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE C: To protect and enhance the natural environment in the corridor												
	Minimize adverse effects on corridor hydro-geological, geological and hydrological conditions.	Groundwater resources and aquifers		✓		Black Creek crossing	Construction of subway tunnels and the planned Hwy 407 station could affect groundwater resources if significant dewatering is required.	The extent of dewatering and any aquifer depressurization to permit tunnel and station construction will be minimized by the use of earth pressure balancing tunnel boring equipment in areas where groundwater resources could be affected. Local dewatering and recharge will likely be required around the station which must be constructed by the cut-and-cover method. Measures to mitigate any potential effects will be identified and incorporated in the detailed design and construction contract specifications.	▪ None anticipated.	None anticipated	Insignificant	An on-going program to monitor groundwater and creek flow conditions will be conducted during construction

Notes:
P – Pre construction, C – Construction, O – Operation

4.1.7 OBJECTIVE D: To promote smart growth and economic development in the corridor

One of the main purposes of the Rapid Transit System is to support the smart growth policies in the Region and simultaneously encourage economic development. From this perspective, the early implementation of the Vaughan N-S link as subway technology strongly supports Provincial, Regional and Municipal planning policies, such as the “Places to Grow” and “Centres and Corridors” urban form. In many respects, the undertaking will contribute to the intensification of underutilized sites and encourage transit-oriented development at infill locations and vacant land along the corridor. At the same time, several built-in design characteristics are aimed at reducing the potential for adverse effects on business or access to social and community facilities.

The transit system will support the overall structure of the Region’s Planning Policies by ensuring that form follows function and creating a sustainable environment that will increase development leading to increased business activity along the corridor. Through the increase in business activity, infill locations and vacant land can be developed, maximizing the density of development and leading to greater benefit from investment in rapid transit in York Region. The assessment for Objective D is tabulated in **Table 4-4**.

**Table 4-4
Effects and Mitigation for Smart Growth and Economic Development**

GOAL	Environmental Value/ Criterion	Project Activity/ Issue	Project Phase ¹			Location	Assessment of Effect on the Environment	Built-In Positive Attributes and/or Mitigations	Potential Residual Effects	Further Mitigation	Level of Significance after Mitigation	Monitoring and Recommendation
			P	C	O							
OBJECTIVE D: To promote smart growth and economic development in the corridor												
D1	Support Regional and Municipal Planning Policies and approved urban structure	Need for pedestrian-friendly streets and walkways for access to stations		✓	✓	VCC and Steeles Ave. Stations	Pedestrian access to the proposed subway stations could be degraded by increased vehicular traffic generated by development around the planned stations.	<ul style="list-style-type: none"> The VCC Streetscaping Study recommendations and York Region’s streetscaping policies applied to the Steeles Avenue precinct will create a pedestrian-friendly station environment. Signalized pedestrian crosswalks will be provided at all station locations and an appropriate number of intersections; Pedestrian safety will be considered in the design of station precincts and road signage will be highly visible to both pedestrians and automobiles. 	Potential for jaywalking in vicinity of stations, which could lead to increased in number of vehicle/pedestrian incidents.	Streetscaping treatment will discourage illegal access by defining pedestrian paths to signalized intersections	Negligible	Monitor traffic accidents involving pedestrians to establish whether cause is transit related.
		Locating higher density and transit-oriented development where it can be served by transitway			✓	New and redevelopment/infill locations	Current landowners could object to implementation of changes to existing land use pattern around subway stations.	<ul style="list-style-type: none"> Regional/Municipal land use controls and approval processes to encourage transit-oriented development or re-development in support of OP objectives. 	Redevelopment pressure on surrounding areas	Apply Municipal Site Plan approval process	Insignificant	Monitor re-development activity to control overall increase in development density
D2	Provide convenient access to social and community facilities in corridor	Potential barrier effects during construction and operation		✓	✓	VCC and York University stations	Subway construction works could be perceived as a barrier in access to future community centres, hospital(s), malls, parks, etc.	<ul style="list-style-type: none"> Construction Traffic and Pedestrian Management Plan will avoid wherever possible, barriers to entrances/exits to large attractors along Highway 7. 	Alternative access routes to facilities may affect adjacent properties	Mark detours and alternative access points clearly	Insignificant	Monitor congestion levels during construction and traffic patterns during operations.
D3	Minimize adverse effects on business activities in corridor	The potential for an increase in business activity.	✓	✓	✓	Entire route	Increased pedestrian traffic via the implementation of a rapid transit system will increase the potential for business activity.	<ul style="list-style-type: none"> A higher density of development on underutilized sites, infill locations and on vacant land should increase the market for some business activity. 	Increase in vehicular traffic; increase in workforce/ population.	Encourage intensification meeting urban form objectives.	Insignificant and positive	Monitor building applications/ permits, economic influences (employment rate, etc.)
		The potential for a decrease in business activity.		✓	✓	Entire route	Modification of road access could lead to displacement and/or business loss.	<ul style="list-style-type: none"> Implement procedures to address requests of affected businesses; incorporate design solutions and construction methods to minimize number of businesses affected. 	Decrease in traffic; decrease in workforce/population	Encourage alternative compatible development	Moderately significant	Cooperative response to business loss concerns addressed to municipalities.

Notes: P – Pre construction, C – Construction, O – Operation

4.2 LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN (LEED)

Leadership in Energy and Environmental Design (LEED) criteria will apply where feasible during the detail design phase, following the recommendations and guidelines of the TRCA document *"The Living City - Supporting Green Building Initiatives across the Greater Toronto Region"*. LEED emphasizes state-of-the-art strategies aiming to obtain:

- ✓ **Sustainable site development** through erosion and sedimentation control; optimum transit connections; avoiding excessive parking and encouraging preferred parking for car-vanpooling; protecting and restoring the open space; providing adequate stormwater management; minimizing site lighting where possible.
- ✓ **Water savings** through water efficient landscaping; innovative wastewater technologies; water-use reduction
- ✓ **Energy efficiency** through optimization of energy performance; use of renewable energy; reduction in chlorofluorocarbons (CFC); and fundamental building systems commissioning specs.
- ✓ **Materials selection** through storage and collection of recyclables; resource re-use; usage of regional material; reduction of the use of finite raw materials.
- ✓ **Indoor environmental quality** through identifying potential problems and minimizing Indoor Air Quality (IAQ) performance; monitoring the presence of Carbon Dioxide; providing effective ventilation; reducing the quantity of indoor air contaminant materials; among others.