York Region

On the Move...

...towards sustainable transportation

TRANSPORTATION MASTER PLAN

Policy Paper No. 7

ASSET MANAGEMENT

For Discussion Purposes Only

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CANSULT

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1.0 INTRODUCTION

Municipalities have made a multi-billion dollar investment in transportation infrastructure such as roads, bridges and traffic controls. This investment is vital to the social and economic well being of communities as it ensures the safe and efficient movement of people and goods.

To continue functioning properly, transportation infrastructure requires on-going maintenance such as pothole repair, crack sealing and traffic signal lamp replacement. However, with limited budgets and an increasing demand on the transportation network, municipalities are challenged to manage the existing transportation infrastructure in a cost-effective manner. Asset management is one tool designed to meet this challenge.

Asset management is a systematic process of constructing, operating, maintaining and upgrading physical assets cost-effectively. It draws on the principles of engineering, business management and economics, together with policy, planning and government directions to produce strategies, purposeful actions and priorities to ensure the assets meet their intended objectives.

This paper reviews the current issues related to asset management and York Region's current systems, standards and practices to identify options and directions for change.

2.0 BACKGROUND

Asset management is often confused with infrastructure management. Infrastructure management is a phase used to describe individual management systems for infrastructure such as pavement, pavement markings, bridges, traffic signals, equipment and buildings. Although these specialized tools vary in their purpose, there is consensus that the successful ones have 10 common elements:

1. *Feature inventory database* that identifies the type and location of maintenance related features and their respective quantities.
2. *Work activity definitions* that provide appropriate accomplishment and inventory units to facilitate planning, scheduling and control requirements.
3. *Work activity standards* that provide the desired quality levels related to physical condition, workmanship, and how often work is to be performed.
4. *Work programs* that achieve a consistent maintenance program from district to district.
5. *Performance budget* that considers the unit costs for each maintenance activity combined with the projected amount of each work activity from the annual work program.
6. *Work calendars* that estimates crew days for each maintenance activity, develops schedules and provides a basis for evaluating performance.
7. *Resource requirements*, such as labour, equipment and materials, are estimated for each work activity.
8. *Work scheduling* to facilitate effective scheduling and provide flexibility to accommodate emergencies and inclement weather.

9. *Work reporting* to provide a basis for comparing planned work with actual work and the adequacy of the maintenance budget.
10. *Management reports* to monitor the progress of work throughout the year in relation to annual work program and performance budget.

Successful infrastructure management systems enable a municipality to:
- quantify maintenance needs;
- identify resources to meet those needs;
- determine standards to measure accomplishments and set priorities;
- monitor performance; and
- exercise program, budget and expenditure controls.

Whereas infrastructure management is focused on defining work needs and schedules for individual assets, asset management concerns itself with the impacts of all infrastructure management decisions on each other and the community. It is a higher level of decision-making analysis that focuses on:
- protecting the value of the asset;
- tailoring of the asset portfolio to business needs;
- minimizing risks and liabilities to the agency and the public;
- compliance with technical, accounting and administrative requirements; and
- performance management.

Asset management results in strategies to direct action on all assets, including managing demand and funding. These strategies provide a context for government service obligations, environmental conservation and sustainable development objectives. The process is driven by community values and expectations, and is highly tied to strategic business needs. Successful asset management systems also ensure the assets meet community needs and expectations, minimize risk and maximize value.

3.0 YORK REGION SYSTEMS, STANDARDS & PRACTICES

The Region of York's Transportation division is presently responsible for the management of pavement surfaces and markings, bridges and signals along Regional roads, as well as the associated equipment (fleet) and facilities. The Region uses individual infrastructure management systems for each of these transportation components.

Pavement surfaces are managed through the use of a pavement management system (PMS). In general, every Regional road is scheduled for resurfacing every 13 years, although this timeline may be extended or shortened depending on field crew observations.

Pavement markings are upgraded on an annual basis.

Bridges are managed through the use of a bridge management system (BMS) that is similar to the PMS, although it requires more detailed data from field investigations.

Traffic signal lamps are replaced annually and, in the event of an early burn-out, are replaced immediately upon notification from the central computer system. Traffic signal heads and controllers are replaced on a 7 year rotation.

The Region's transportation fleet is managed through a fleet management system (FMS) that collects and analyzes data related to kilometres travelled, hours in service, gasoline consumption and repairs. Based on the analysis, the FMS determines when a vehicle should be repaired or replaced.
In terms of facilities, the Transportation division is presently responsible for the 4 area yards in Maple, Markham North, Markham South and Newmarket. The facilities in Maple and Markham North are relatively new, and the other two are scheduled for replacement. The management of these facilities may be transferred to another department within the Region.

The Region of York is assuming responsibility for local public transit effective January 1, 2001. The integration of transit services previously provided by the local municipalities will require a consistent and coordinated system of managing transit assets. This will be limited to transit shelters, bus loops and terminals, since all fleet operations will be contracted out. The concept of private sector involvement in municipal bus operations is not new in York Region. At present, all five municipalities who operate scheduled bus service utilize private operators. This includes Laidlaw in Aurora and Newmarket, Miller in Markham, Pac West in Richmond Hill and Can Ar in Vaughan. Special services for the disabled are currently a mix of private or private/public sector operations throughout the five exiting municipal agencies. This situation is similar to the challenges faced by numerous other municipalities who as a result of amalgamation, are working toward integrating infrastructure management systems that have different operating systems and data sets.

For example, the Transportation Division of the City of Toronto is responsible for roadway pavement and markings, bridges, signs and signals. The City is in the process of combining the various data sets and management systems employed by each of the former municipalities into individual systems. Over the long term, it is their objective to develop an integrated asset management system that would coordinate and analyze the information from all of the individual infrastructure management systems.

4.0 OPTIONS

Developing a quality asset management system is critical. Through the literature there are three broad categories of recommendations on how to develop quality asset management systems:

1. Conceptual changes;
2. Integration with other management systems; and
3. Incorporating new technologies.

4.1 CONCEPTUAL CHANGES

The conceptual changes involve improving the current concepts that define asset management systems. Some of these improvements include:

- *more customer involvement* in the establishment of levels of service to allow agencies to determine how well they are satisfying their customer needs;
- *increased use of technology* to translate assessed conditions into estimated workloads and reduced subjectivity;
- *optimal programming* to aid in the timing, frequency, extent and type of routine maintenance required; and
- *privatization* of certain maintenance activities to firms that have special equipment and trained personnel if it is determined that this is a more cost effective means to carry out a particular task.

The data collected for analysis must be relevant to the condition and performance of the infrastructure under examination. While there is a wealth of condition assessment criteria for transportation infrastructure such as pavement and bridges, there is a general lack of performance parameters that are more relevant to the general public. Examples of such performance parameters include:

- smoothness of ride and overall quality of service;
- timeliness of travel and overall mobility on the system;
- accessibility provided to all areas by the system; and
- availability of facilities (whether facilities are always open).

Integrating such performance measures is consistent with making transportation agencies more customer oriented, and confirming the true impacts on the community.

4.2 INTEGRATION WITH OTHER MANAGEMENT SYSTEMS

In high growth municipalities there is often competition for transportation infrastructure funding between preservation programs and new development projects. To effectively argue for preservation programs, transportation agencies must be able to substantiate their claim that preservation costs rise as infrastructure ages, and that new development projects should be prioritized and funded in recognition of their long-term maintenance costs.

However, the software used in infrastructure management is usually one-dimensional. It only analyzes information for one specific transportation infrastructure asset. Typically, it lacks the capability to support comparisons between competing choices, address interoperability issues, enable more comprehensive evaluation of all assets and alternatives, and generally support good asset management practices at all levels of the organization. As a result, agencies are losing out on the efficiencies that come from a more integrated approach to planning and the opportunity to educate decision-makers of the consequences of trade-offs and the need for funding flexibility.

The challenge with integrating many different infrastructure management systems into an asset management system is that the data must be maintained using consistent formats to successfully share data between systems. This implies that agencies must be consistent in recording certain types of data, plus the frequency and methodology for updating, collecting and retrieving must also be a uniform standard. The emergence of geographic information systems and global positioning technology has aided in the creation of this data consistency; however, most agencies are still struggling to develop an integrated software system to coordinate and analyze this information.

4.3 INCORPORATION OF NEW TECHNOLOGIES

New data collection technologies enable more accurate and objective information to be gathered, often at a lower cost and greater speed. Advances in data communications and computer software are allowing improved access to information and the ability to link disparate databases. They are also providing a powerful array of tools for people at all organizational levels to make better use of available data.

Table 1 provides an overview of different technologies and their potential uses in asset management.

Table 1: Technology Options for Asset Management

Integrated Inventory	Inspection, Condition & Assessment	Work Support	Work Scheduling & Activity Reporting	Equipment & Inventory Management
• GPS • GIS • CADD • Videologs • Photologs • Portable data entry terminals • Map conversions (scanners, conversion software) • Bar coding • Radio frequency identification tags • Metal detectors • Electronic distance measuring instruments	• Videologs • Photologs • Portable data entry terminals • Acoustics (distress identification) • Radar (structural conditions) • Eddy currents (structure and distress) • Infrared thermography (temperature) • Profilometers, roadmeters (pavement roughness) • Deflectometers (structural conditions) • Reflectometers (visibility of signs, markings)	• Real-time video monitoring • Vehicle tracking • Data communications (celluar telephone, satellite, microwave, UHF) • Sensors (hazard identification, snow/ice conditions) • Display of real-time weather, temperature, snow/ice, vehicle location data	• Bar coding • Portable data entry terminals • Voice recognition • Electronic scales • Electronic fuel gauges • Radio frequency identification tags	• Portable data entry terminals • Bar code scanners • Voice recognition • GPS • Distance measuring instrument • GIS with shortest path/vehicle routing capability

5.0 DIRECTIONS FOR CHANGE

The Region should begin to develop an asset management system. As previously noted, such a system would enable the Region to make strategic infrastructure investment decisions, better meet community expectations and maximize the value of infrastructure investments.

The Region needs to carry out a number of sequential activities that will allow it to develop a comprehensive asset management system. These activities include:

1. *Evaluation of the Region's current practice with respect to the basic elements and components of asset management*. This will help identify gaps, strengths and weaknesses. This activity includes the consolidation of documents related to existing systems and the evaluation of them against typical asset management components.

2. *Development of a business process for managing the decisions related to the regional assets*. Given the changes in provincial/municipal relations and the amalgamations currently underway in other Ontario municipalities, it may be an opportune time for the Region to consider changes to its decision making process.

3. *Definition of a set of constraints set by Council and/or the province*, including compliance with accounting, technical and administrative procedures. The Canadian Institute of Chartered Accountants requested the use of accrual accounting as a basis for reporting infrastructure investments, and the Province has accepted this practice.

4. *Identification of key issues emanating from the above business process and constraints.* To illustrate the importance of this activity, the accrual accounting requirements should be considered. This approach is useful for "closing the books", but is not helpful in managing the assets because each time a government invests money in a facility, its value rises. This may not be the case for a number of situations where the money invested is to arrest the rate of deterioration, yet the value continues to decline. A more useful approach would be the "discounted replacement value". This approach accounts for the deterioration of the asset and hence is useful for managing the asset. The major issue is determining which one will be used as a base, and how to reconcile between the two values.

5. *Setting priorities* among the competing issues and areas for development. Since resources are limited, it is essential to set some priorities in this area in order to maximize the return on the Region's investment.

6. *Development of a program of action, based on the above priorities,* that will lead to the transformation of the fragmented component management systems, such as pavement, maintenance and fleet management systems, into a coherent and integrated asset management system.

With the amalgamation of transit services, the Region should also develop a single transit infrastructure management system for the previously noted shelters, loops and terminals. In terms of the Regional bus fleet, the necessary language will need to be included in the contract with the private operator to insure minimum maintenance requirements and performance specifications. This system should be developed in parallel with the Regional asset management system to ensure compatibility, and to optimize efficiency and cost-saving opportunities.

6.0 CONCLUSION

Asset management is a new concept that has evolved out of necessity based on increasing demands, shrinking budgets and staff resources, plus advancements in technology and the successful implementation of management science in optimizing field operations. Like all new ideas and innovations, there is not yet one complete system on the market that the Region can buy and utilize immediately. There are numerous fragmented computer packages that can assist in the management of some aspects of asset management. However, simply purchasing them without a strategic plan can be wasteful. Therefore, it is essential for the Region to develop such a strategic plan and detailed transition plans before decisions are made in this area.

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