Creating Sustainable Pavements through Level of Service Options for Roads

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ABSTRACT

In December 2004, the City of Hamilton produced a Life-Cycle State of the Infrastructure (SOTI) Report for Public Works Assets, as well as a State of the Infrastructure Report Card for those assets. Five years later, in 2009, the initial SOTI report was updated to reflect the current state of the Public Works assets. In early 2010, the 2009 SOTI Report was presented to the Public Works Committee. Following that discussion, City staff were asked, among other things, to report on the implications and requirements to enhance the Hamilton Public Works Report Card on an incremental basis to achieve a B+ over a ten-year period.

Roads and Traffic is the City's largest asset group representing nearly one-third (32%) of the City's total assets with a replacement value of approximately $4.4 billion. According to the 2009 SOTI Report, the Roads are sitting at a D- grade based on their condition, capacity and funding.

The objective of this paper is to review the implications and funding needs to move the road network from its current D- grade to a B+ grade, which will allow for a more sustainable road network, which leads to the question of appropriate levels of service and affordability. This paper briefly discusses the SOTI report card evaluation and presents the current condition of the road network by functional class. The current condition by functional class allows the City to identify deficiencies in the road network and where more funds are required. In order to assist with the funding needs, prediction models and high-level decision trees were developed to estimate the performance over time and expected rehabilitation needs. Performance-based optimization with various level of service options are also presented for each functional class to determine the cost of attaining and achieving a specific level of service for a given functional class. These level of service options will allow for more open and transparent discussions with elected officials and the public as to what they are willing to pay for a given level of service.

Introduction

Following the presentation and discussion of the 2009 State of the Infrastructure Report to the Public Works Committee, City of Hamilton (City) staff were directed to report back to Committee on the implications and requirements to enhance the Hamilton Public Works Report Card (State of the Infrastructure Report on Public Works Assets) on an incremental basis to achieve a B+ over a ten-year period.

While all Public Works Assets were evaluate, the objective of this paper is to present the implications and funding needed to move the **Road Network** infrastructure as defined within the State of the Infrastructure Report from the current overall D- grade to B+. This rating is a function of three independent variables:

- Condition and Performance
- Capacity vs. Need
- Funding vs. Need

Therefore, achieving a B+ grade for the roads assets under consideration is not simply a matter of ensuring that the road asset condition is at the desired level. It will require that all three factors are balanced to ensure that not only is the overall network condition good but that both the capacity of the road network to meet demands and the funding to sustain the road assets both in the short- and long-term is available.

The paper outlines the importance of defining a level of service (LOS) for assets that can be used as the baseline for defining the budgetary requirements and provides transparency and accountability to the community for the upkeep of the asset within the City's portfolio. This paper examines the first six steps in the InfraGuide LOS development, including forecasting costs of level of service. The next step is for the City to evaluate the financial risks of reducing (or increasing) levels of service before establishing the final set of service levels.

This paper provides a detailed analysis of the present condition of the roads as well as a budgetary assessment in terms of needs and LOS for the road assets.

Approach

The City has an extensive road inventory databases that contains condition data that can be used to model future performance and hence provide an indication of the overall funding required to meet prescribed condition ratings over the next 10 years and beyond. Therefore, the project team used the existing Hansen database and a separate pavement management system to derive the current condition of the roads and then develop 10-year funding plans to meet a series of overall network asset condition grades up to and including B+.

The objective of this paper is to identify the level of investment required to return the Roads to a rating of B+; however, this rating is a function of three independent variables:

- **Condition and Performance** – a measure of the current condition of the assets based upon a visual inspection or other qualitative assessment if a physical inspection is not available.

  - A = Excellent
  - B = Good
  - C = Fair
  - D = Poor
  - F = Failed

- **Capacity vs. Need** – a measure of the ability of the assets to meet the current demand which in the case of the road network could relate to the network's ability to accommodate existing traffic volumes.
  - A = supports ≥ 100% of demand
  - B = supports 90-99% of demand
  - C = supports 80-89% of demand
  - D = supports 70-79% of demand
  - F = supports < 70% of demand

- **Funding vs. Need** - reflects the status of funding dedicated to maintaining, replacing, and improving the current condition of existing infrastructure, and to building new infrastructure that is needed to keep up with growth where development charges may not be applicable or may be difficult to define.
  - A = 90-100% of need
  - B = 80-89% of need
  - C = 70-79% need
  - D = 41-69% need
  - F = < 40% of need

Therefore, to reach a specific rating it is important that all three of these are considered and the impact on the overall rating of one of these criteria being below the optimal level should be understood.

For example if we assume that the capacity of the City's current road network is sufficient to meet the traffic demands then for the case of Condition and Performance we could consider an overall road network condition rating of 70 to be equivalent to a B/B+, this rating will then dictate a funding level required to meet the rehabilitation and reconstruction needs. If there is not a commitment to fund the roads program to the required levels then the Funding vs. Need criteria will reduce the overall rating to a lower value depending on the shortfall.

LEVEL OF SERVICE

This 3-criteria model outlines the importance of defining a level of service for each of the assets that can be used as the baseline for defining the budgetary requirements and provides transparency and accountability to the community for the upkeep of the asset within the City's portfolio.

The delivery of levels of service, as indicated by the InfraGuide, is illustrated in Figure 1.

FIGURE 1: Delivery of Levels of Service/Linkages (InfraGuide 2002)

A simple level of service measure for the road network would be the Overall Condition Index (OCI) which is currently used within the City's Hansen asset management system for roads which is an objective measure of the condition of each road and which can be aggregated to provide an overall condition for the network as a whole or alternatively for each of the discrete functional classes.

In order to establish levels of service, the InfraGuide recommends the approach shown in FIGURE 2. This paper examines the first six steps in the level of service development, including forecasting costs of level of service. The next step is for the City to evaluate the financial risks of reducing (or increasing) levels of service before establishing the final set of service levels

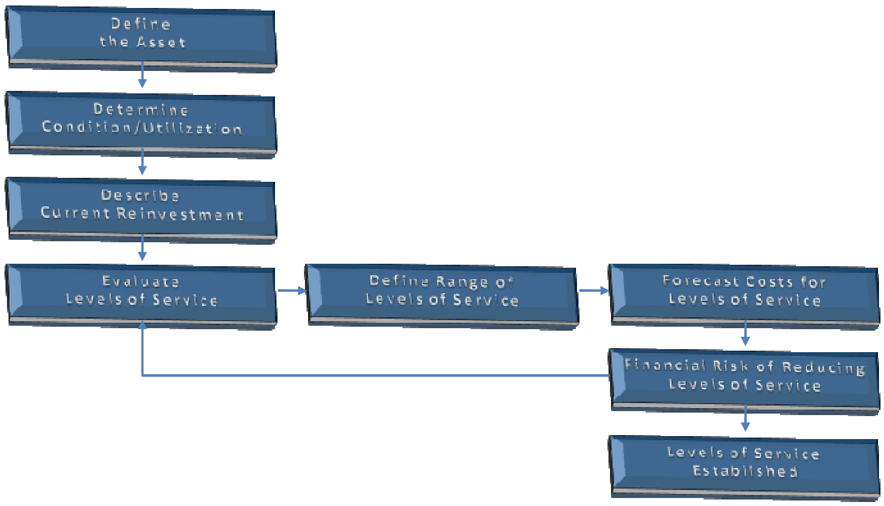

FIGURE 2: Developing Levels of Service (InfraGuide 2002)

For this paper the following data sources and analyses were completed for the various stages shown in Figure 2:

- **Define the Asset** - the asset inventory was defined from the existing Hansen asset management system for the roads. This database contained extensive attribute data that enabled the project team to identify the extent of the road asset inventories and the associated replacement costs.

- **Determine Replacement Value/Condition/Utilization** - using the attribute data with this database, analyses were performed to determine the condition of each of the discrete road segments.

- **Describe the Current Reinvestment in Existing Infrastructure Assets** – analyses were performed to assess the cost associated with maintaining certain levels of service including how to reach a B/B+ grade in the condition and performance category. From this analysis ongoing annual costs associated with maintaining these levels of service were determined.

- **Panel to Evaluate Levels of Service** - through discussions with City staff the project team identified options for the levels of service to be used for the analysis. It should be noted that at this time the analysis considered only asset condition, needs and funding, however, as can be seen from Figure 2 this is an iterative process and should also consider risk factors associated with the levels of service. This is outside of the scope of this paper and it has been recommended that Council and City staff should work together to define these risk criteria and determine priority levels of service.

- **Define Range of Levels of Service** - the costs associated with providing various levels of service are identified within later sections of this paper and can be used as the basis for decisions by Council and City staff on the preferred level of service.

- **Forecast Costs to Provide a Long-Term Level of Service** – the costs associated with the level of service were determined and includes the total capital and long-term operation and maintenance costs. The next phase should include an assessment by Council and City staff of the rate payer willingness/ability to pay.

- **Financial Risk of Reducing Levels of Service** – this analysis was not completed at this time, however, InfraGuide suggests that Council and City staff determine the impact of the funding not being available and the associated impact on safety, quality of life, health and increased future asset rehabilitation costs.

- **Levels of Service Established** – this final stage in the process is completed when the desired levels of service have been finalized and endorsed as being within its financial capability and aligned with the strategic vision for the City. Once defined, these levels of service can be reviewed periodically to determine if they are still set at appropriate levels and can also provide the basis of performance measures that can be used to confirm the City's commitment to ongoing maintenance of the assets.

CITY DATABASE

The following data from the City's Hansen database was migrated to the pavement management system for use in the subsequent analysis:

- Road attribute data including length, width, thickness

- Road inventory to provide a distribution of pavement type, functional class and replacement values

- Results of 2006 pavement condition survey (most recent survey)

In addition City staff provided details of all capital rehabilitation/reconstruction projects that were performed since the 2006 pavement condition survey.

The database contained 14,481 City owned pavement sections (2,527 hectare, 2,902 centreline-km or 6,362 lane-km) and the following charts shown the breakdown of the network in terms of construction/pavement type and functional classification. Approximately 70.5% of the network consists of asphalt surface pavements and approximately 15.8% of the network consists of surface treated pavements. Based on surface area, Urban Local roads represent nearly half of the network (45.9%), followed by Urban Collector roads at 20.6%

The pavement condition data contained within this database was derived from the 2006 pavement condition survey during which the consultant collected pavement distress and roughness information that were analyzed and combined to obtain an Overall Condition Index (OCI) for each road section.

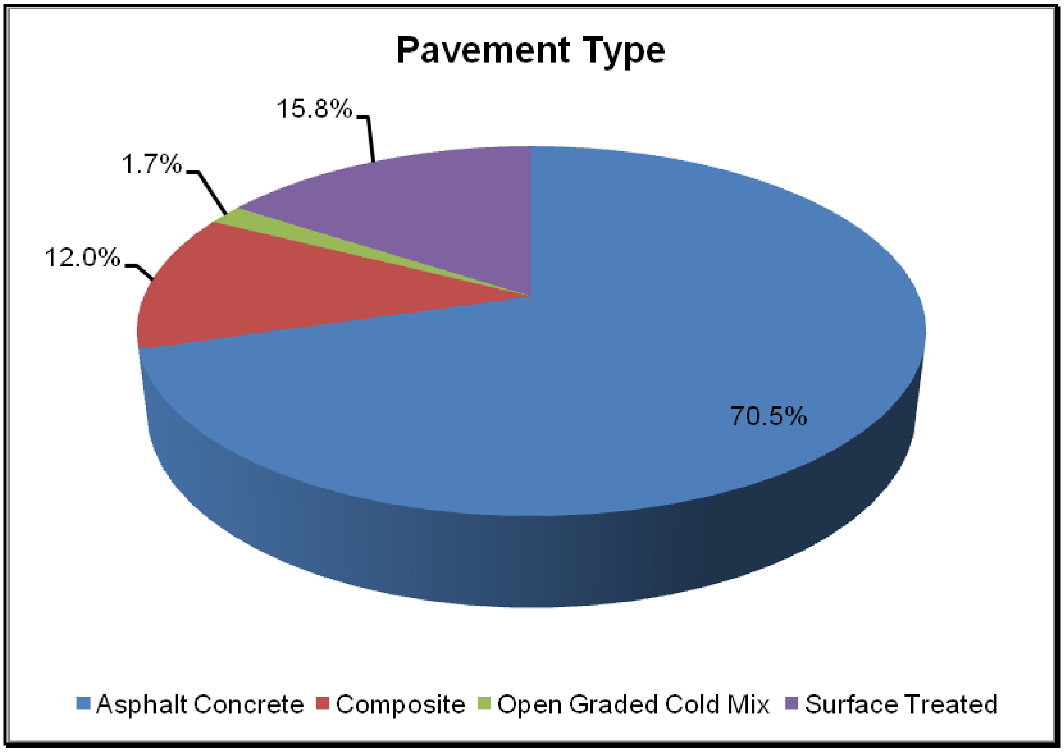

FIGURE 3: Pavement Type Distribution (based on 2,527 ha.)

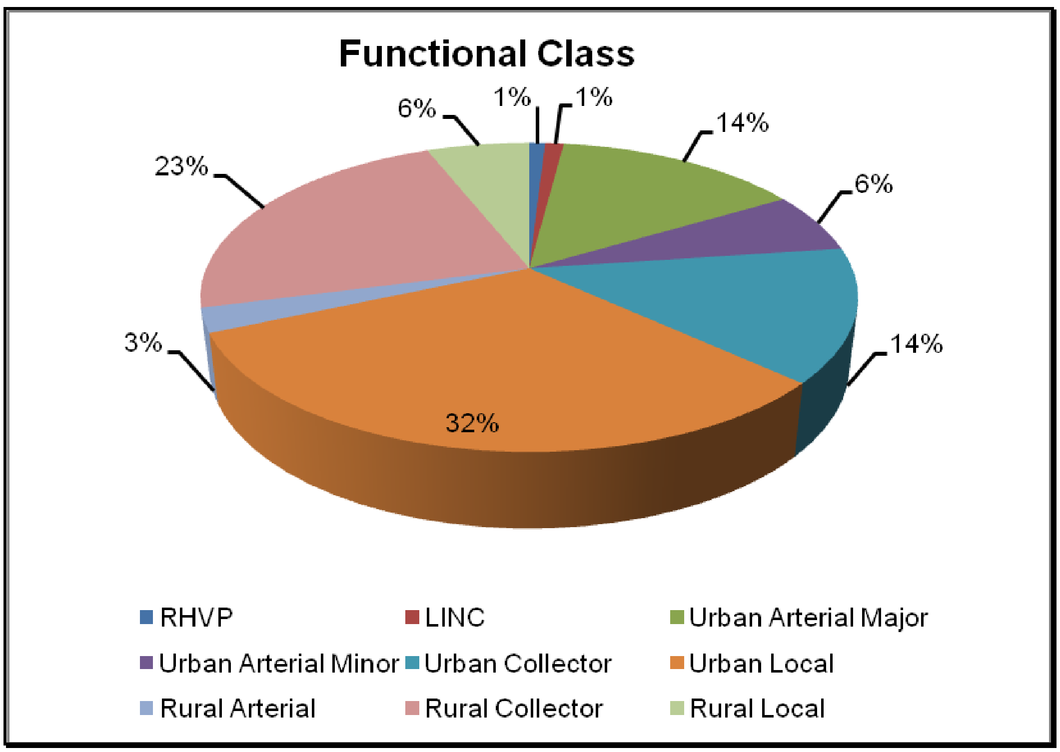

FIGURE 4: Functional Class Distribution (based on 2,527 ha.)

PAVEMENT MANAGEMENT SYSTEM

As part of the pavement management analysis, the attributes from the existing database were input into the pavement management database. Prediction models, costs models, and decision models were also developed, as subsequently discussed.

Pavement Prediction Models

Pavement deterioration models are used to predict the future pavement condition and the expected pavement service life. Pavement deterioration is site-specific, since it depends on many variables making the deterioration rates vary significantly from one pavement section to the other. However, general patterns for pavement deterioration can be expected, depending on the general condition of the road section.

Pavement deterioration typically depends on the construction history, traffic patterns, environmental conditions, etc. A newly constructed pavement would typically have a longer service life, than a rehabilitated section. As discussed in the previous section preventive maintenance activities can slow the deterioration rate of the pavement section and extend its service life.

The key to understanding the condition and specifically the future needs for any road network lies in knowing how the various pavement types will deteriorate. Based on input from the City regarding the service life of their pavements and experience with other Ontario-based prediction models, the prediction models shown in FIGURE 5 were developed. The service life is an estimate, measured in years, of how long a given road section will last until it reaches a given trigger or service level. In this case, the service life shown below is measured based on the reconstruction trigger. The rehabilitation trigger identifies when a pavement should be considered for a rehabilitation or resurfacing treatment; whereas a reconstruction trigger indicates when a pavement may qualify for major rehabilitation or full reconstruction.

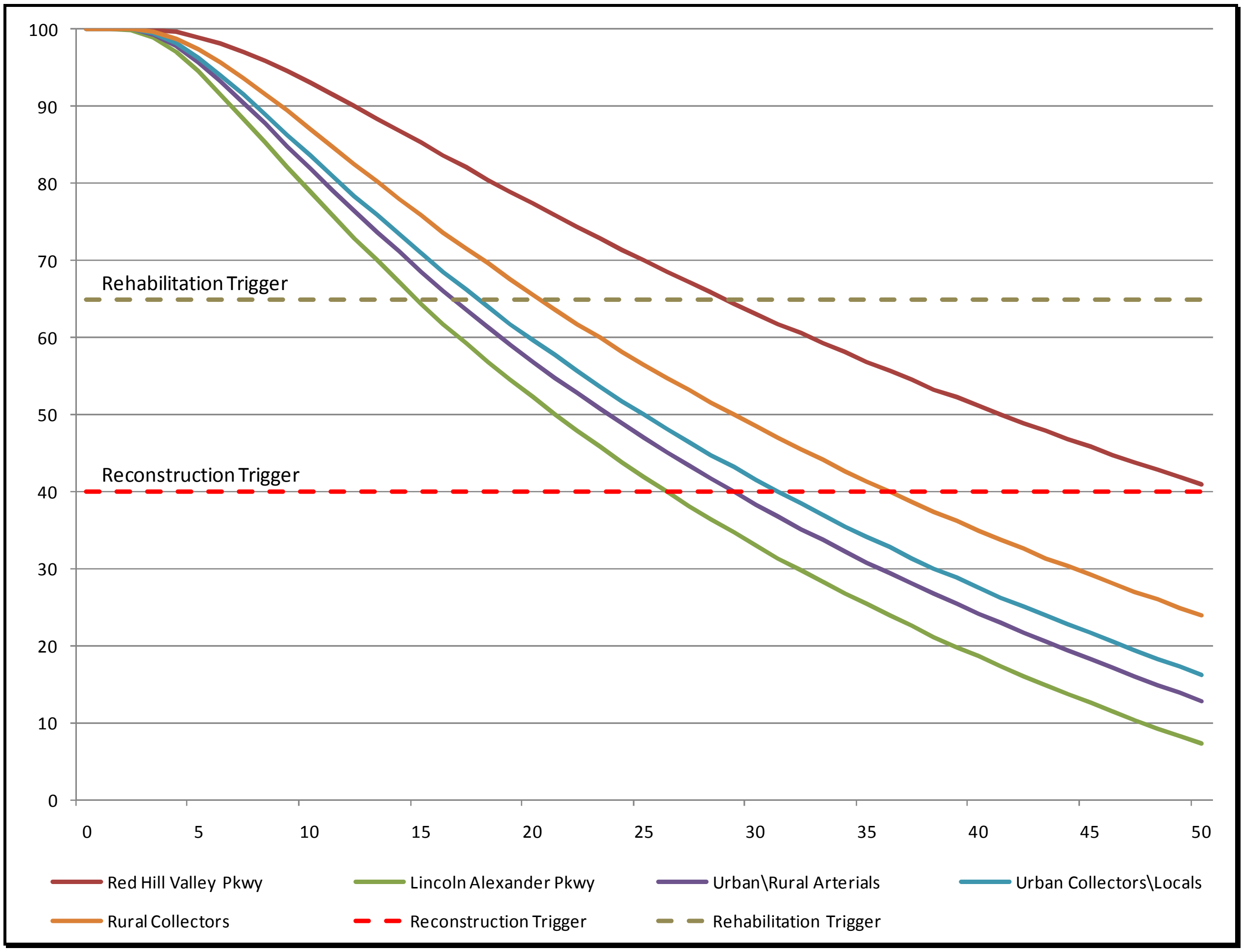

FIGURE 5: Pavement Performance Curves

PAVEMENT COST MODELS

In order to develop a financial plan, it is important to understand the costs associated with rehabilitation strategies for the different pavement types and functional classes. Based on input from staff, resurfacing (Resurf) and reconstruction (Recon) costs were developed for asphalt concrete, composite, open graded cold mix, and surface treated roads (see Table 1). All values are based on 2007 cost data.

TABLE 1: Rehabilitation Strategy Costs (based on 2007)

Code	Treatment	Unit Cost ($\$/m^2$)
200	Recon (AC/COMP): UAMJ/UAMI	194.10
201	Recon (COMP): RA	194.10
202	Recon (AC/COMP): UC(Ind)/UL(Ind)	182.40
203	Recon (AC/COMP): UC	170.60
207	Recon (COMP): RC	170.60
204	Recon (AC/COMP): UL	164.70
208	Recon (COMP): RL	164.70

Code	Treatment	Unit Cost ($/m^2)
205	Recon (AC): RA/RC	64.00
230	Recon (OGCM): UC/UL	57.33
206	Recon (AC): RL	56.00
240	Recon (SRFT): UAMI/UC/UL	54.67
210	Resurf (COMP): UAMJ/UAMI	54.12
211	Resurf (AC): UAMJ/UAMI	52.94
212	Resurf (COMP): RA	51.76
213	Resurf (AC/COMP): UC(Ind)/UL(Ind)	41.18
215	Resurf (AC/COMP): UC/UL	40.00
214	Resurf (COMP): RC/RL	40.00
216	Resurf (AC): RA/RC	34.67
217	Resurf (AC): RL	33.33
231	Recon (OGCM): RC/RL	28.00
241	Recon (SRFT): RA/RC/RL	25.33
232	Resurf (OGCM): UC/UL/RC/RL	17.33
242	Resurf (SRFT): UAMI/UL/UC/RA/RC/RL	10.67

Once the appropriate rehabilitation strategies and unit costs were established, a decision making tool or decision tree was developed to determine when the rehabilitation strategies should be applied. It should be noted that the decision trees used in this analysis are high-level to provide the City with a general idea of costs. The decision trees for Urban Local – Asphalt Concrete and Rural Collector – Open Graded Cold mix are shown in FIGURE 6 and FIGURE 7, respectively. Each node in the decision tree represents a question and the green arrows correspond to a “yes” response, while the red arrows correspond to a “no” response. Table 2 provides a brief description of the two decision trees shown below.

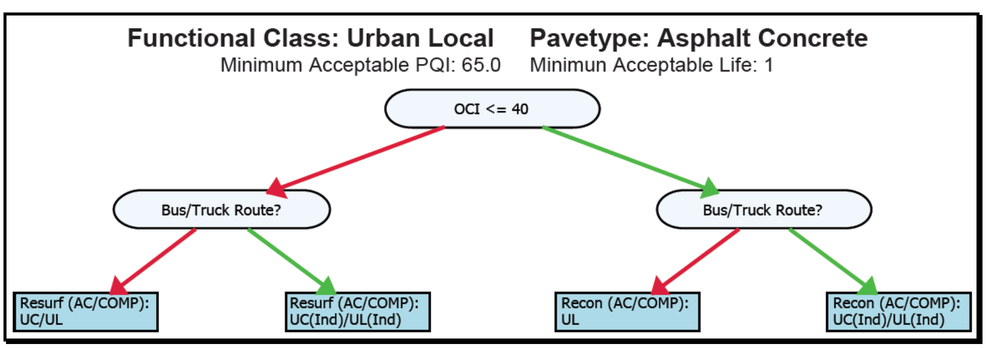

FIGURE 6: Decision Tree for Urban Local – Asphalt Concrete

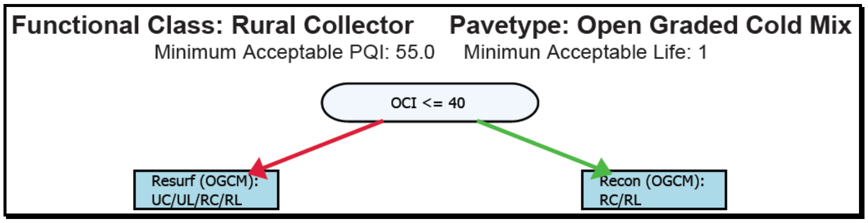

FIGURE 7: Decision Tree for Rural Collector – Open Graded Cold Mix

TABLE 2: Decision Tree Description

Pavement Type	Functional Class	Pavement Condition	Treatment
AC	UL	OCI between 40 and 65 and not a bus route or truck route	Resurf (AC/COMP): UC/UL
AC	UL	Bus route or truck route with OCI between 40 and 65	Resurf (AC/COMP): UC(Ind)/UL(Ind)
AC	UL	OCI less than 40 and not a bus route or truck route	Recon (AC/COMP): UL
AC	UL	Bus route or truck route with OCI less than 40	Recon (AC/COMP): UC(Ind)/UL(Ind)
OGCM	RC	OCI between 40 and 55	Resurf (OGCM): UC/UL/RC/RL
OGCM	RC	OCI less than 40	Recon (OGCM): RC/RL

Present Condition of the Road Network

Given the time constraints of this analysis it was not possible to conduct a new condition survey for the road network for use in the analysis. Therefore, the condition data extracted from the Hansen database was aged using the deterioration models shown in FIGURE 5 to provide an estimate of the current condition of the network in 2010.

FIGURE 8 illustrates the current condition of the network in 2010 and FIGURE 9 summarizes the distribution of the three treatment categories currently identified as a result of the analysis.

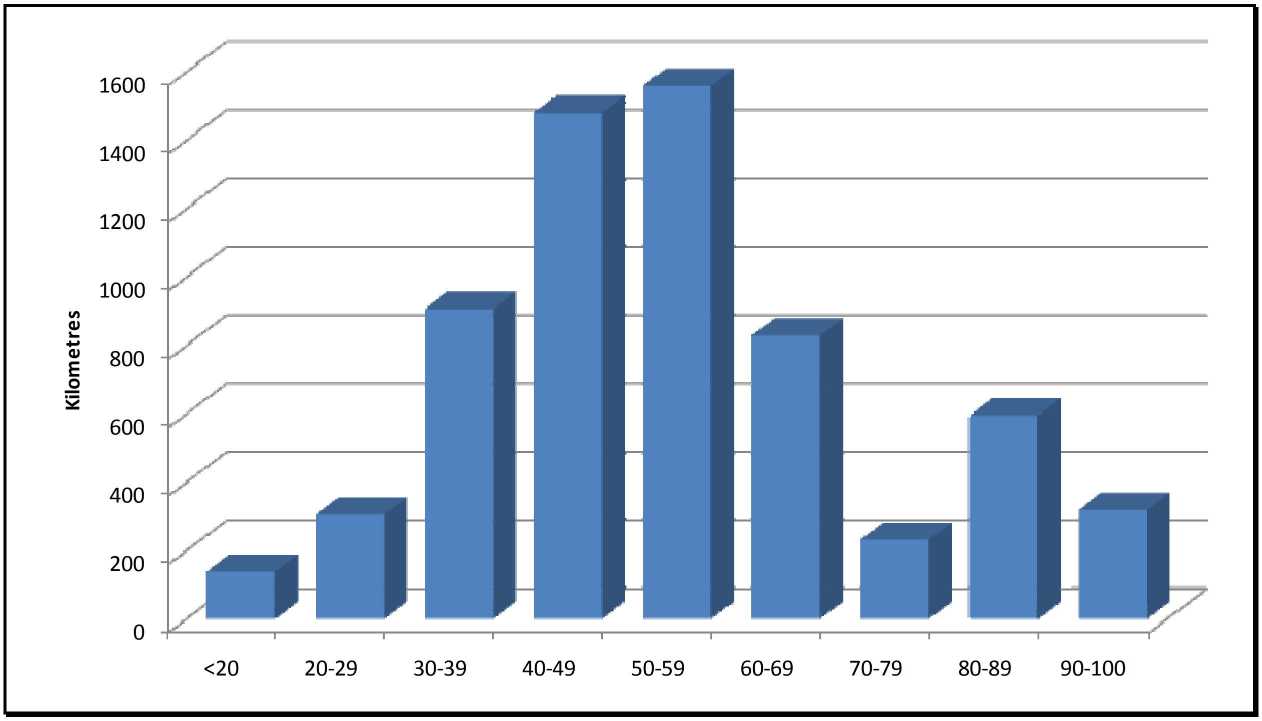

FIGURE 8: Present Condition of the Network (OCI) - 2010

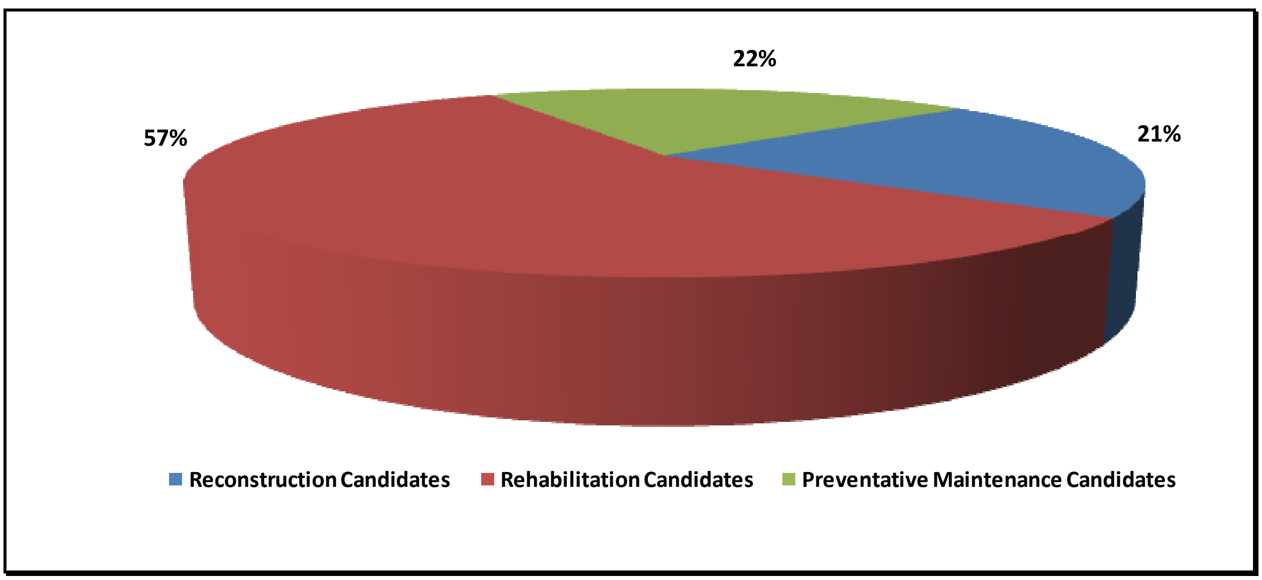

FIGURE 9: Network Treatment Needs **(based on present condition)**

The current OCI average for the entire network is estimated to be 55.8 and as shown in Figure 8 approximately 78% of the road network requires some form of either rehabilitation or reconstruction due to the deteriorated condition.

As shown previously, deterioration of the road network is a dynamic system and the proportion of the network that will require reconstruction and rehabilitation will increase as each section continues to deteriorate. The only way to prevent this continuing deterioration is to invest in the application of treatment to the various roads that will give the greatest benefit for the lowest cost. It should be noted that this may mean that preventative maintenance and rehabilitation work will be done on roads that appear to be in better condition than others in the network. While this may be difficult to justify to the traveling public - i.e., Why are the good roads getting fixed first? - it is important to do from a management perspective, as it will delay the deterioration rate, thereby minimizing the amount of reconstruction in the future. Maintaining roads in condition is a cost-effective long-term solution.

Table 3 summarizes the average Overall Condition Index (OCI) for each function classification of roads as well as the overall network average.

TABLE 3: Present Condition Results by Functional Class

Functional Class	No. Sections	Lane-Length (km)	Area (m^2)	Network %	Replacement Value ($M)	2010 OCI Average
Lincoln Alexander Parkway (LINC)	102	76	278,393	1.1%	$46	63.3
Red Hill Valley Parkway (RHVP)	111	60	235,610	0.9%	$54	100.0
Expressway Network	**213**	**136**	**514,003**	**2.0%**	**$100**	**79.5**
Urban Arterial Major (UAMJ)	1,895	986	3,662,427	14.5%	$711	51.9
Urban Arterial Minor (UAMI)	1,029	421	1,594,354	6.3%	$309	51.0
Urban Collector (UC)	2,988	827	3,522,653	13.9%	$592	48.8
Urban Local (UL)	6,654	1,871	7,997,138	31.6%	$1,286	50.7
Urban Network	**12,566**	**4,105**	**16,776,572**	**66.4%**	**$2,898**	**50.6**
Rural Arterial(RA)	149	170	639,176	2.5%	$42	64.2
Rural Collector (RC)	1,029	1,550	5,815,504	23.0%	$249	65.1
Rural Local (RL)	524	402	1,527,530	6.0%	$60	61.4
Rural Network	**1,702**	**2,121**	**7,982,210**	31.6%	$351	64.3
ENTIRE NETWORK	**14,481**	**6,362**	**25,272,785**	**100.0%**	**$3,349**	**55.8**

BUDGET CONSTRAINT RESULTS

The main goal of this exercise is to determine how much money it will take to improve the City's level of service to a B/B+ rating. The next question the City needs to consider is how much they are willing to pay for a given level of service. To assist with these questions, the following budget analyses were run:

- Extreme budget scenarios (see Table 4)
    - Need driven where unlimited funds are available to fix everything when it hits the rehabilitation trigger level
    - Do nothing where no funds are made available to complete the required work
- Budget-based scenarios (see Table 5)

- Projected Block Funding available for the roads capital budget
- $40 million annual budget proportionally assigned to network by percent area

- Performance-based scenarios (see Table 6)
  - Maintain current level of service or OCI of 55.8
  - Attain OCI 60 over 10 years (C- service level)
  - Attain OCI 70 over 10 years (B- service level)

TABLE 4: Extreme Budget Options – Estimated Total Costs and 2020 OCI by Functional Class

		Need Driven		Do Nothing	
Functional Class	**Current OCI**	**10-year Budget**	**2020 Predicted OCI**	**10-year Budget**	**2020 Predicted OCI**
Expressway	79.5	$ 15 M	71.4	$ -	61.3
Urban Arterial Major	51.9	$ 353 M	69.9	$ -	34.5
Urban Arterial Minor	51.0	$ 147 M	69.1	$ -	34.0
Urban Collector	48.8	$ 296 M	71.1	$ -	33.5
Urban Local	50.7	$ 599 M	70.7	$ -	35.1
Rural Arterial	64.2	$ 21 M	69.7	$ -	43.7
Rural Collector	65.1	$ 91 M	68.5	$ -	48.2
Rural Local	61.4	$ 31 M	69.2	$ -	45.5
Entire Network	**55.8**	**$ 1,553 M**	**69.9**	**$ -**	**39.4**

The extreme budget scenario illustrates that it would cost approximately $1.6 billion dollars to fix all the roads as soon as they became in need of some form of rehabilitation as a result of employing this strategy the overall network performance would increase to an OCI of 70.

On the other extreme, if no money was spent, the network performance would decrease to less than 40 and almost all pavements would be in need of major rehabilitation including reconstruction based on the current O&M and M&R practices. Introducing preventive maintenance or lighter rehabilitation strategies would help to maintain the level of service at a higher rate, thereby reducing the rate of deterioration and overall reconstruction needs.

TABLE 5: Budget-based Options – Estimated Total Costs and 2020 OCI by Functional Class

Functional Class	Current OCI	Block Funding - Roads 10-year Budget	 2020 Predicted OCI	$40 M Annual Budget 10-year Budget	 2020 Predicted OCI
Expressway	79.5	$ 6 M	67.8	$ 8 M	70.4
Urban Arterial Major	51.9	$ 122 M	51.9	$ 58 M	43.9
Urban Arterial Minor	51.0	$ 48 M	50.8	$ 25 M	44.9
Urban Collector	48.8	$ 69 M	48.4	$ 56 M	46.4
Urban Local	50.7	$ 10 M	36.7	$ 127 M	50.1
Rural Arterial Network	64.2	$ 10 M	58.6	$ 10 M	58.7
Rural Collector	65.1	$ 6 M	51.3	$ 92 M	70.1
Rural Local	61.4	$ -	45.5	$ 24 M	67.3
Entire Network	**55.8**	**$ 271 M**	**46.9**	**$ 400 M**	**54.9**

The Block Funding – Roads budget option is based on the current projected funding level as provided by staff. The $40M Annual budget assigns costs based on the relative percentage of the network. For example, the Expressway represents 2.0% of the network and is therefore assumed that the budget assigned to it would be $8 million, or 2.0% of the $400 million 10-year budget.

The results(see Table 5) indicate that based on the current projected funding level, the roads will continue to deteriorate with the most significant decrease being attributed to the Urban Local roads (OCI 51 in 2010 to OCI 37 in 2020) - the neighbourhood roads the public use every day.

In comparison under the $40 million annual budget scenario, where the budget is proportionally assigned to the network, the Urban Local roads would only decrease slightly (OCI 51 in 2010 to OCI 50 in 2020); however, the Urban Arterial Major roads, which service the most users based on daily traffic volume would decrease significantly (OCI 52 in 2010 to OCI 44 in 2020). Therefore, it can be inferred from this result that assigning funding based on the proportion of the network that the road class represents may not be the most appropriate method as these higher traffic volume roads require additional funding to maintain or improve their condition.

Table 6 illustrates the results for the level of service analyses.

The level of service analyses show the cost implications of trying to achieve different performance levels for each functional class. For example, it would cost approximately $122 million over 10 years to maintain the current level of service (OCI of 51.9) for the Urban Arterial Major roads. To gradually increase this to an OCI level of 60 would require an additional $69 million; and an additional $95 million to increase from an OCI level of 60 to an OCI level of 70. The cost of fixing all of the Urban Arterial Major roads as soon as they reach a trigger level and required some form of rehabilitation or reconstruction is $ 353 million.

TABLE 6: LOS Options – Estimated Total 10-year Costs by Functional Class

Functional Class	Current OCI	LOS Options			
		Status Quo	Attain OCI 60	Attain OCI 70	Needs
Expressway	79.5	$ 12 M	$ 10 M	$ 19 M	$ 15 M
Urban Arterial Major	51.9	$ 122 M	$ 191 M	$ 286 M	$ 353 M
Urban Arterial Minor	51.0	$ 48 M	$ 83 M	$ 127 M	$ 147 M
Urban Collector	48.8	$ 73 M	$ 162 M	$ 238 M	$ 296 M
Urban Local	50.7	$ 137 M	$ 316 M	$ 495 M	$ 599 M
Rural Arterial Network	64.2	$ 14 M	$ 11 M	$ 18 M	$ 21 M
Rural Collector	65.1	$ 73 M	$ 48 M	$ 92 M	$ 91 M
Rural Local	61.4	$ 15 M	$ 13 M	$ 27 M	$ 31 M
Entire Network	**55.8**	**$ 495 M**	**$ 835 M**	**$ 1,301 M**	**$ 1,553 M**

Report Card Summary

CONDITION AND PERFORMANCE – ROADS

The road network currently sits at an OCI average of 55.8, with the Expressway network at an OCI of 79.5, the rural network at an OCI of 64.3, and the urban network, which represents two-thirds of the network, at an OCI of 50.6. Based on the do nothing approach, the road network would deteriorate to an average OCI less than 40 by 2020, thereby indicating that most roads would be in need of major rehabilitation or total reconstruction, i.e., replacement.

In order to achieve an OCI of 70 for all functional class roads, it would require approximately $1.3 billion over the next 10 years or an average annual operating budget for roads of $130 million, with the majority of the funds being needed to improve the urban network. While this seems impractical based on current funding levels, the budget required just to maintain the current level of service would require nearly $500 million over the next 10 years, or an annual operating budget for roads of approximately $50 million. With any budget level less than $50 million per year, the City will struggle to maintain the current level of service, let alone try to improve the level of service.

The current overall condition and performance grade for the road network is **D-**, however, a B or C condition can be achieved with the appropriate funding levels.

CAPACITY VS NEED – ROADS

The costs provided in this paper included rehabilitation needs for the existing road network. Any additional roads added to the network to increase or improve capacity would require additional funds to be included as part of the capital program. Quite often only the initial construction costs associated with roads are considered during planning discussions; however, it is important to consider the life cycle costs associated with roads as their maintenance and rehabilitation costs ultimately impact the City budget. As more roads are added to the network, more funds are required to maintain those roads.

The current overall capacity vs. need grade for the road network is a **B** since the current road network capacity support 90-99% of the demand.

FUNDING VS. NEED – ROADS

Given that the required budget to simply maintain the current level of service is approximately $500 million over the next 10 years, it is apparent that the current expected funding level of $271 million does not even begin to address the current needs let alone any future needs. In order to maintain, let alone improve the current level of service, the City must be willing to make some major investments in their road network.

If the City wished to maintain its current level of service, then the grade for funding vs. need would be **D** since the funding only meets 54% of the required budget; however, since the City wishes to improve the level of service for all roads to a B condition, then the grade for funding vs. need would be **F** since the funding level only meets 20% of the required funding. Even if the City employed the optimized LOS option presented, then a F grade would apply since the current funding would still account for less than 30% of the required funds.

UPDATED 2010 REPORT CARD – ROAD NETWORK & TRAFFIC SYSTEM

Based on information provided in the previous sections and input from the City staff, the updated Report Card for the Road Network and Traffic System is provided below in TABLE 7.

TABLE 7: Road Network and Traffic System Condition Assessment

Asset	Individual Ratings			Overall Rating		Trend
		2009	2010	2009	2010	
Road Network	Condition & Performance	D+	D-	D+	D+	
	Capacity vs. Need	C+	B			
	Funding vs. Need	D-	F			
	Capacity vs. Need	C+	C+			
	Funding vs. Need	F	F			

Summary of Findings

Overall, this paper provides the City with information on how to enhance the Hamilton Public Works Report Card on an incremental basis to achieve a B+ over a ten-year period. The road network is extremely underfunded, even just to maintain the current condition let alone to improve the overall condition. In all likelihood, the City will not be able to achieve a B-level within the next 10 years. However, the information provided in this paper will help to facilitate the discussion of level of service with the Public Works Committee, the City Council and the tax payers. As suggested in this paper, the City may wish to consider establishing different levels of service for different road functional classes and determine funding priorities in conjunction with the LOS.