City of Prince Albert

RPT 20-333

TITLE: City's Paved Roadways - Condition Update

DATE: **July 30, 2020**

TO: Executive Committee

PUBLIC: X **INCAMERA:**

RECOMMENDATION:

That this report be received as information and filed.

TOPIC & PURPOSE:

To provide information regarding the current state of the City's paved roadways and the selection processes to develop the annual paving program.

BACKGROUND:

Over the past 20 years, the City has resurfaced, reconstructed or constructed 139 km of roadways within the City of Prince Albert.

In 2005 the City obtained a Pavement Management System through Stantec Consulting which is a computer based model utilized to create the framework for predictive, quantitative, and strategic selection of paving projects. The system is complex, but is essentially divided into two key components, the collection of raw data on the City's paved roadway network, and the analysis of the data. Every year the pavement analysis consultant drives 1/3 of the City's roadways in specialized vehicles equipped with electronic equipment and laser devises that collect data on the condition of roadway, ride quality, surface condition, and structural capacity. This information is uploaded into computer software and the Roadways are ranked by their overall Pavement Quality Index (PQI). The index range is 0 to 100. In very simplistic terms, zero is no road and 100 is a perfectly constructed new roadway.

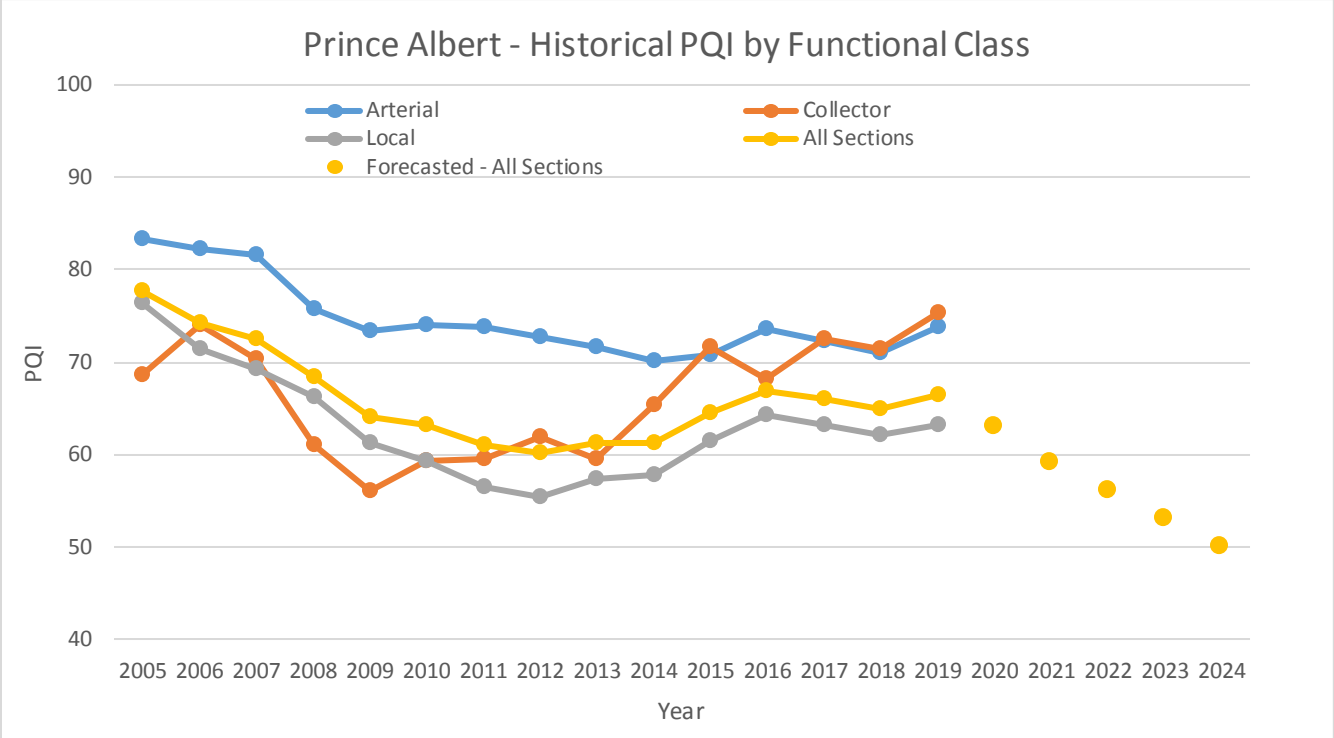
The minimum desired PQI for the roadway sections is different depending on the roadway classification with arterials being the highest and local (residential) roadways having the least minimum acceptable PQI due to the traffic volumes that they have. Arterials have the highest traffic volume which affect all residents followed by the collectors then local streets. For comparison purposes, arterials averages over 10,000 with some exceeding 28,000 vehicles per day while some local streets have 100 to 200 vehicles per day.

In 2006, a report was submitted to City Council which identified an annual need of $2.5 Million per year for roadway paving projects in order to preserve the road network in its current condition which at the time had a PQI of 74. From 2006 to 2012, the annual roadways funding was less than the minimum identified, with some years like 2010 having zero capital funding (no paving) which resulted in the City's roadway network deteriorating down to a PQI of 60 a reduction of 14 points from 2006.

In 2013, Administration identified that $4.0 million per year was now required to address the pavement condition within the City. Realizing the significance of saving the City's roadway asset, in 2013, the annual Base Tax was approved providing the requested $4.0 million budget.

The annual commitment of the Base Tax combined with 7.2 kilometers of new roadway construction where paved roads did not previously exist has resulted in recognized improvements to the City's paved roadway system. The 2019 PQI has increased to 67, but it still remains 7 points below the PQI of 2006.

The graph below represents the Historical PQI from 2005 to 2019 and the projection of what the forecasted PQI will be if the $4.0 million budget is maintained over the next five years. It does not take into account future funding such as Urban Highway Connector Program or future subdivisions such as Crescent Acres, Lake Estates, Marquis Road West extension. Future funding and subdivision paving increases the PQI as additional sections are included to the roadway network with a PQI of 99. To forecast the future PQI, the pavement management program utilizes industry standards to predict pavement degradation and historical data on how the roadway sections have performed since the collection of their data began. It is broken down into 4 categories being Arterial, Collector, Local and All Sections.



PROPOSED APPROACH AND RATIONALE:

The decision to complete rehabilitation treatment (mill and pave), reconstruction treatment or a combination of the two treatments is established for the roadways based on a variety of factors including but not limited to:

1. Budget – The Base Tax has remained constant since 2013 with the 8 year average being $4.05 million per year.
2. Underground Utility Program – Administration when making the selections for underground utility replacement strive to select roads that require pavement rehabilitation as well as utility reconstruction. The exception to this is when emergent utility replacement is required.
3. Visual Inspection After Spring Thaw – Roadway sections that were not identified for immediate rehabilitation may be added to the program after spring conditions deteriorate them. This is visually noted by frost boils and structural failures.
4. Roadway Condition Rating (PQI) – This report focuses on the rating of the roadways to establish the paving program.

Pavement Quality Index (PQI) – Current Required Treatments

Stantec and Public Works administration have set thresholds for the different roadway types being Arterial, Collector and Local and the treatment type that each threshold triggers. The minimum desired PQI for the road classifications are:

Arterial	65
Collector	55
Local	50

The Chart on the following page details how many sections in kilometers and city blocks within the City's paved roadway network fall below the minimum threshold triggers which require the various treatment options being:

1. Reconstruction – removing the existing asphalt surface, granular base or soil cement, subgrade if not suitable for compaction and reconstructing the roadway to the current roadway structure standards.
2. Combination of Rehabilitation and Reconstruction – milling the existing asphalt surface, removing and replacing the existing granular base in areas where structural failures have occurred and repaving.
3. Rehabilitation – milling the existing asphalt surface and repaving
4. Preventative Maintenance – crack sealing, pot hole repairs, small surface repairs. (Operations Budget)

Current Roadway PQI & Resulting Treatment Requirement

PQI	Treatment	Cost	KM	Average City Blocks	Arterial KM	Collector KM	Local KM
1 - 39.9	Reconstruction	$$$	21	142	0	0	21
40 - 59.9	Rehabilitation mixed Reconstruction	$$	56	372	9	1	46
60 - 69.9	Rehabilitation	$	38	251	8	2	28
70 - 100	Preventative	Maintenance	88	584	27	6	56
Total			**202**	**1,348**	**43**	**10**	**150**

To compare the progress of the paving program to the totals noted in the chart above which shows what the current backlog of paved roads requiring roadway treatment is, the 2019 data of roadway construction is as follows; In 2019 the City reconstructed 2.4 kilometers (16 blocks), rehabilitation combined with reconstruction 0.9 kilometers (6 blocks) and rehabilitation 3.5 kilometers (23 blocks).

Pavement Quality Index (PQI) – Roadway Selection Process

To preserve the roadway system and minimize costs, in a perfect scenario with budget being unlimited, roadway treatments would be completed before the minimum PQI triggers are met. As this is not feasible, administration utilizing the Pavement Management System, selects the roadways that meet both the criteria of requiring treatment and maximizing the roadways receiving the treatments. The cost for rehabilitation (mill & pave) is approximately 1/3 that of complete reconstruction and the combined rehabilitation is 2/3 the cost. This is displayed in the chart above as $ rehabilitation, $$ combined and $$$ reconstruction. Ideally you want to perform rehabilitation on a street where the repair cost is the least amount.

This unfortunately results in streets that have reached complete failure not being able to get reconstructed due to budget and the streets underground utility condition. Another factor that is taken into consideration is if the street has a soil cement structure. Soil cement is where cement was mixed with whatever the structure was including black dirt, water added and the surface was packed then paved. When these streets surpass their life expectancy due to structural failures, reconstruction is required. Examples of these locations are Central Avenue 22 Street – 28 Street and 22 Street East from 7 Avenue to 12 Avenue. The City does not follow this construction practice any more, but it was one that was done in the 1950's & 1960's.

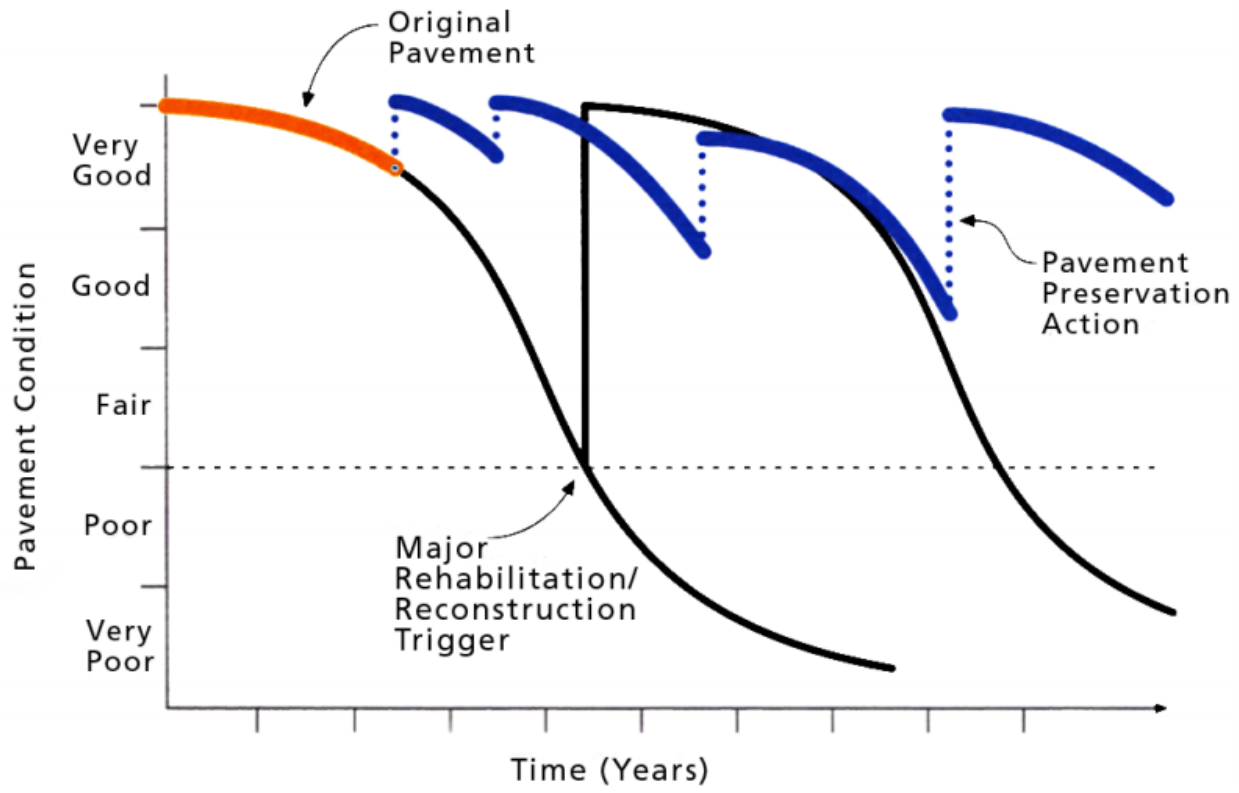
The Chart below details the Pavement Preservation Process. If roads are rehabilitated as their condition starts to fail, the cost for milling and paving is significantly less that the when the road requires reconstruction with both treatment bringing the roadway to a PQI of 99. By performing pavement preservation treatments, the roadway asset condition can be maintained infinitely as long as the structure below the pavement is good. This chart representation aids in providing the answer to the question;

Why Not Reconstruct Worst First?

There are three problems with this reactive approach to road maintenance:

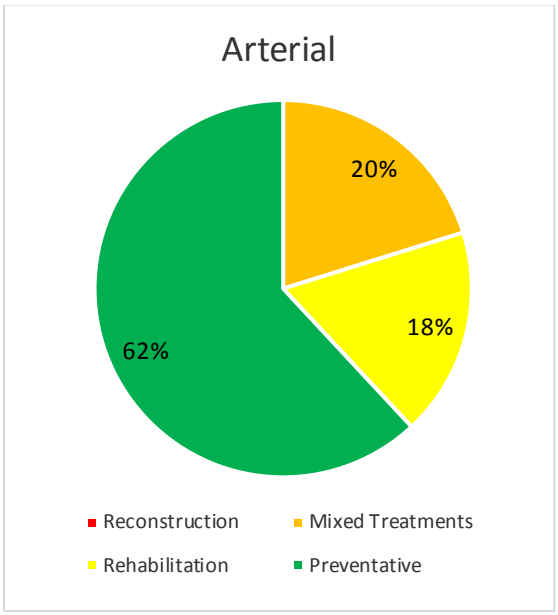
- The deterioration of the other roadway segments will begin to fail below the trigger for rehabilitation (mill & pave)
- The reconstruction process is very expensive
- Major reconstruction is disruptive to traffic flow

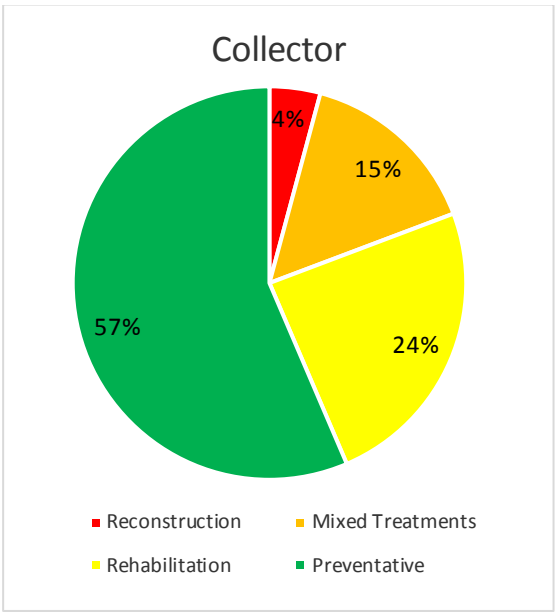
Pavement Preservation Performance Curve

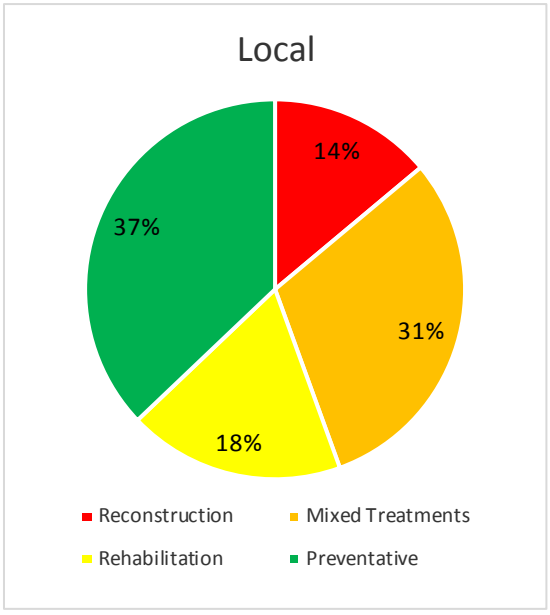


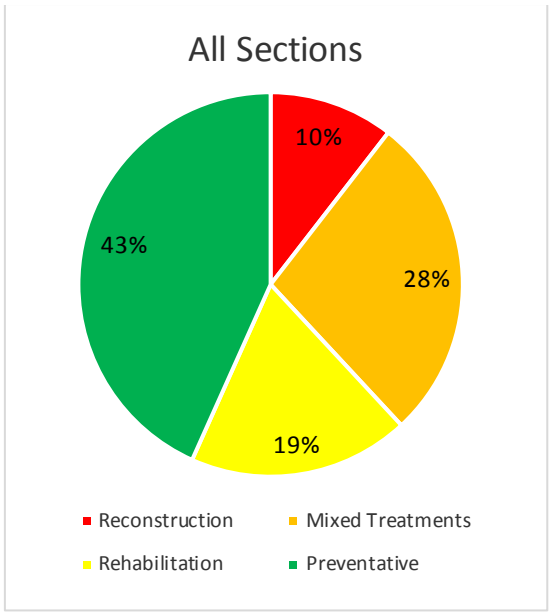
Pavement performance curves are non-linear and once the pavement condition is reduced deterioration accelerates exponentially as shown above.

The Pie Charts below represent the percentage and type of treatments that are required for each of the 4 categories being Arterial, Collector, Local and All Sections. The red, orange and yellow colors fall below the minimum PQI triggers being 65 Arterial, 55 Collector and 50 Local.









FINANCIAL IMPLICATIONS:

In 2006 the backlog for the City's paved roadway network was estimated to be $27 million. The current backlog that exists estimated to be $45.5 million dollars which is the amount it would cost to bring all of the paved roadways to a condition that meet the minimum PQI triggers. The increase in the backlog from 2006 to 2019 is due to insufficient funding from 2006 to 2012 and increases in roadway construction costs over the last 15 years.

When funding does not keep up pace with falling PQI's, it is like trying to stop a speeding train going down hill, the longer you wait the harder it is to recover. The commitment by City Council in 2013 to apply the Base Tax was a great decision to save the failing roadways and has allowed administration to make great progress. From 2013, the arterials are up 2 points, collectors up 15 points and residential is up 6 points, but we are still not back to the 2006 PQI levels so more needs to be done.

Improving the PQI further can be accomplished by increasing the funding for the roadway program from the 2020 budget of $4,235,000 to $4,500,000 in 2021.

The paving program has been very well received by the citizens as they can see direct results for their money on the roads they drive. If additional budget is allocated to the roadway program in 2021, it would be focused on the residential streets. This could be accomplished by increasing the Paving Base Tax.

PUBLIC NOTICE:

Public Notice pursuant to Public Notice Bylaw No. 24 of 2015 is not required.

PRESENTATION:

Verbal Presentation by Nykol Miller, Capital Projects Manager.

ATTACHMENTS:

1. 20 Year Paving History
2. 2020 Paving Map

Written by: Nykol Miller, Capital Projects Manager

Approved by: Director of Public Works & City Manager