

DATE: December 15, 2023
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FILE: 1296.0085.01
SUBJECT: Asphalt Levels of Service (LOS) Table

1.0 BACKGROUND

Following the City of Nanaimo's (the City) Asset Management Update in 2012, the City completed the 2017 Road Condition Assessment. The Road Condition Assessment included a comprehensive evaluation of 528 kilometres (km) of roads. This evaluation used a pavement management system to rate the roads using four (4) metrics to determine pavement performance and to develop an overall pavement performance indicator, the Pavement Quality Index (PQI). Pavement performance is rated along the PQI from failed (0) to perfect (100) and categorized into ten (10) condition ranges (poor to good). Results showed that approximately 115 km of roadways are below the acceptable PQI value of 79, with approximately 10 km of roads needing immediate rehabilitation.

Based on annual budgets, roadway investments (both capital and operational) are insufficiently funded to maintain current service levels. Current asphalt expenditures fluctuate annually, but on average are approximately \$3.2 M per year, including capital and operational costs. This average annual spending falls short of the required funding of \$5 M to maintain the current PQI of 79 recommended in the study.

As part of an earlier phase of this Asphalt Level of Service (LOS) Study, the City conducted a public engagement process that included detailed discussions with four focus groups (32 participants) with the goal of better understanding residents' expectations for road surface conditions, and how much they're willing to pay for the services required to maintain them. The results of the public engagement process, which are documented in the Asphalt LOS What We Heard Report, indicated that the overall quality of the service was fair to good. Participants indicated a Willingness To Pay (WTP) approximately \$40 each per year (above current levels) to maintain the current asphalt conditions and potentially improve some current conditions.

2.0 PURPOSE

A key outcome of the Asphalt LOS Study is to establish a target LOS that the City will aim to provide. The process of identifying the target LOS will assist the City with making decisions about road investment levels and guide the City in how to make the best use of the allotted funding to meet the community's expectations and needs.

The purpose of this technical memo is to develop a set of draft customer and technical levels of service (LOS) measures for the City's asphalt, including current performance, proposed targets based on engagement results and gaps in performance. The memo documents the draft LOS measures and how the engagement and technical inputs informed the development of the targets.

This memo contains:

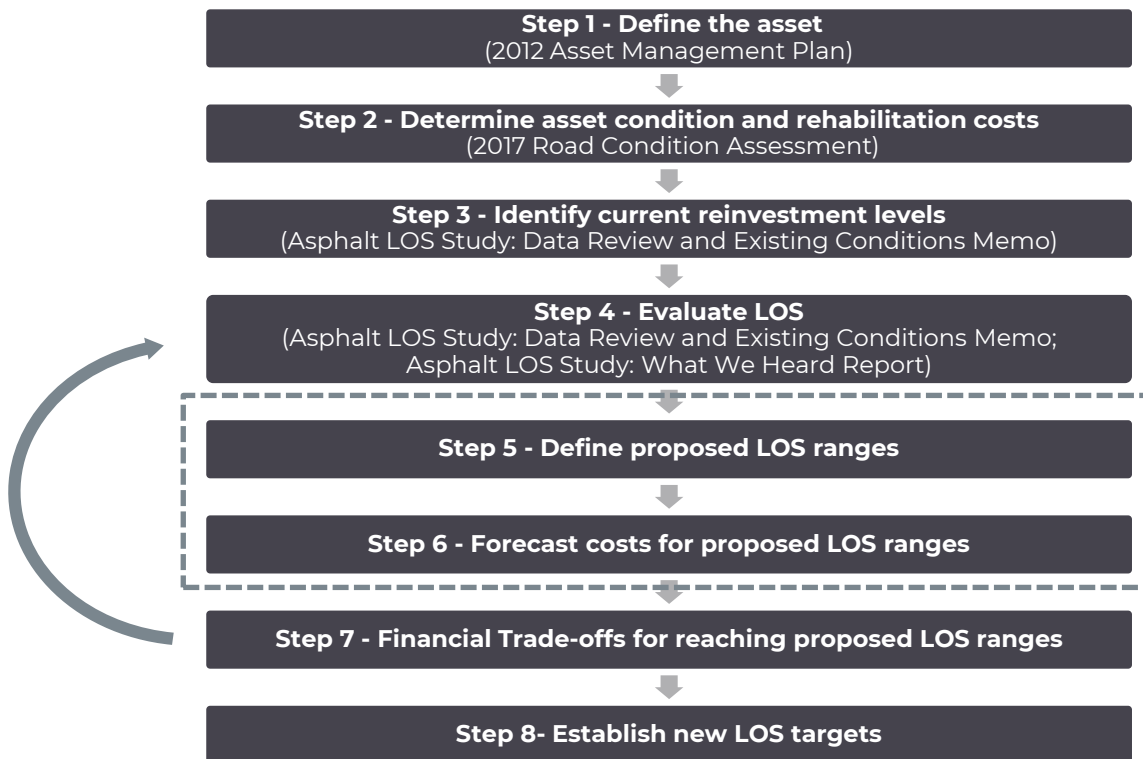
- The methodology for determining levels of service (LOS) for the City's asphalt, including the key measures for defining LOS and inputs and assumptions used to determine LOS ranges
- The resulting draft table of LOS ranges
- Next steps for determining the asphalt LOS target

3.0 METHODOLOGY

To accomplish the broader goals of the Asphalt LOS Study, the City has been following an eight-step process for establishing new LOS targets for road surfaces (Figure 1 below). The City has completed the first four steps of this process (through the Asphalt LOS Study and through previous work). The focus of this technical memo is on defining the proposed LOS ranges and forecasting the projected costs for the proposed ranges (Steps 5 and 6).

Determining the LOS ranges and their costs supports evaluating the financial trade-offs (Step 7). If rate payers are not willing to accept the proposed costs, then service levels should be reduced to the point where costs are acceptable.

Figure 1. Process for Establishing Levels of Service (LOS)



Refining and confirming the proposed LOS ranges requires iteration until LOS and WTP are aligned. The following methodology will allow the City to better understand LOS trade-offs and undertake the iterative process.

3.1 MEASURES FOR DEFINING THE PROPOSED LOS RANGES AND FORECASTED COSTS

The following measures were used to develop the proposed LOS ranges and their respective forecasted costs.

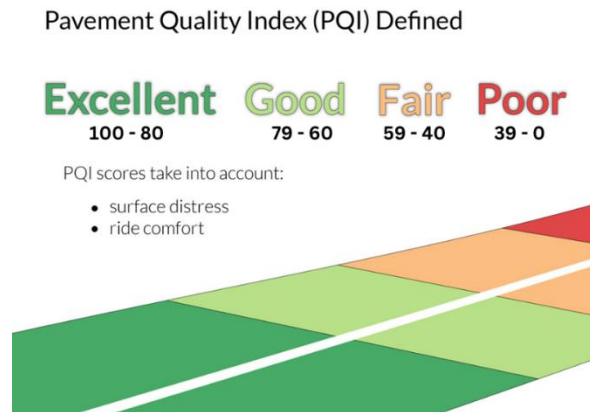
1. **Indicators** describe the quantity, quality, and reliability of current and future LOS in a way community members and Council understand.
2. **Costs** associated with providing the range of defined LOS so an informed decision can be made.
3. **Anticipated customer service feedback** on the performance of LOS ranges based on public engagement.

3.1.1 Indicators

Indicators are used to describe the quantity, quality, and reliability of the service for asphalt services:

- **Quantity:** The number of kilometers (km) of roads that will be deficient by 2027 that require major rehabilitation (2017 Road Condition Assessment).
- **Quality:** The Pavement Quality Index (PQI) provides an overall indication of the quality of pavement with regard to present and future service to the user from failed (0) to perfect (100). The PQI is derived through a combination of Riding Comfort Index (RCI), Surface Distress Index (SDI), and Structural Adequacy Index (SAI) (2017 Road Condition Assessment).

Figure 2. Understanding Pavement Quality Index (PQI)



Source: ArcGIS Hub. Pavement Quality Index (PQI): Safe and Secure Communities. Available : <https://hub.arcgis.com/pages/f222847cc6cb42f48a8814be1d52bbae>

- **Reliability of service:** Based on feedback from residents, reliability of the service includes the perceived ride comfort by the public, the number of unexpected disruptions in services, and the amount of significant distress areas (potholes, rutting, cracking) (see What We Heard report).

3.1.2 Costs

The City's services are largely funded through property taxes; asphalt is one service of many provided through Engineering and Public Works.

Although annual asphalt spending varies from year to year, based on annual budgets and information from City staff, asphalt budgets receive on average \$3.2M of funding per year.

To develop the proposed LOS ranges, the average annual investment has been assessed as a cost per parcel. The number of parcels in Nanaimo is 36,098.

AVERAGE INVESTMENT PER YEAR = COST PER PARCEL

e.g., \$3.2M = \$88.65 × 36,098 parcels

3.1.3 Anticipated customer service feedback

During the public engagement (see What We Heard report), participating residents indicated that roads in Nanaimo are in “fair” to “good” condition. Feedback for enhancing the asphalt LOS was neutral, as most participants noted that their current driving experience is largely satisfactory. Primary concerns were related to the significant variability in driving conditions, emphasizing that experiences differ based on location and road class. Concerns were voiced regarding specific locations that require targeted improvements.

Residents indicated that it is important to maintain the current LOS expectations and are willing to pay an additional **\$40 per year each (per parcel)** to do so. Participants expressed a strong expectation that the City continue to strategically focus these investments on improvements to high-traffic areas and road classes, and that increases should be considered within the wider context of other cost increases and competing priorities.

4.0 RESULTS

The following table summarizes LOS ranges and their respective measures and indicators.

Table 1. LOS Table based on Willingness to Pay (WTP) and 2017 Pavement Quality Index (PQI)

LOS Scenario	Indicators			Costs			Anticipated Customer Feedback	
	Average PQI (2027)	PQI Description	Quantity of deficient roads (2027)	Total Average Investment per Year	Average Cost per Parcel	Average Cost Increase per Parcel	Level of Service (LOS) Satisfaction	Willingness to pay (WTP)
Scenario 1	64	<ul style="list-style-type: none"> - The road is in good condition with minor observable distress. - Limited cracking or rutting may be present, but the pavement remains serviceable. - Routine maintenance is recommended to address emerging issues. 	60 km	\$0	\$0	(\$88.65)	Significant Public displeasure with LOS	Significantly lower than the WTP threshold
Scenario 2	69	<ul style="list-style-type: none"> - The road is in good condition with minor distress. - Similar to PQI 64, with limited cracking or rutting. - The pavement is serviceable, and routine maintenance is advised 	37 km	\$2.0M	\$55.40	(\$33.24)	Certain public displeasure with LOS	Significantly lower than the WTP threshold
Scenario 3	70	<ul style="list-style-type: none"> - The road is in good condition with minimal distress. - Minor cracking or rutting may be present, but the pavement remains in a serviceable state. - Routine maintenance is recommended to preserve the current condition 	30 km	\$3.0M	\$83.11	(\$5.54)	Some public displeasure with LOS	Significantly lower than the WTP threshold
Scenario 4	75	<ul style="list-style-type: none"> - The road is in good condition with very minor distress. - Limited to no significant cracking or rutting. - The pavement is smooth and structurally sound, requiring routine maintenance for optimal performance 	10 km	\$5.0M	\$138.51	\$49.86	Some public displeasure with LOS	Begins to exceed WTP threshold
Scenario 5	79	<ul style="list-style-type: none"> - The road is in excellent condition with minimal to no distress. - A smooth surface and overall good structural and functional condition. - Routine maintenance is recommended to sustain the high-quality pavement 	5 km	\$5.7M	\$157.90	\$69.26	Meets public expectations for LOS	Exceeds WTP threshold

5.0 NEXT STEPS

The draft LOS table will be used to engage with council in a process to get feedback on proposed customer LOS targets. Council's direction on customer LOS and funding levels will be used to identify changes to the City's existing maintenance and renewal programs (technical LOS).

Technical LOS considerations will be developed by identifying the capital, operational, and maintenance activities required to deliver the target LOS. Guiding questions to identify which activities should be prioritized can include:

- Which projects will close the gap between the current and target LOS most cost effectively? Most sustainably? When will these projects be needed?
- What capital and operational projects will be needed to maintain current levels of service AND deal with pressures of growth or deteriorating assets?
- What is the impact of each project on providing or sustaining service?
- What are the impacts (on service) of actions such as cutting costs and making investments?

The updated maintenance and renewal programs will be compiled along with interim deliverables into a final report to document the project process and report to FCM.