Optimized Pavement Preservation Planning

A City of Calgary Case Study

> An estimated $100M cost saving over a 10-year planning horizon by switching to a mathematically optimized solution.

BACKGROUND

Calgary's road network constitutes a major investment over many generations and plays a crucial role in the City's well-being by guaranteeing its citizens with full accessibility, ensuring safe travel, and providing a strong business competitiveness through an efficient movement of goods and services. As a national leader in utilizing advanced technologies for better asset management, the City of Calgary commissioned Infrastructure Solutions to identify limitations in its current life cycle cost analysis processes by comparing the results of Calgary's current prioritization approach to the true mathematical optimization approach offered by DOT (Decision Optimization Technology)™ investment planning software.

SOLUTION

The DOT™ software is used to analyze the City's road network data of 6,492 centerline kilometers consisting of 71,047 road segments. DOT™ provides a true mathematical optimization algorithm that calculates a multi-year, multi-constraint maintenance and capital plan that maximizes the overall performance of the network. To have an apples-to-apples comparison, both the City's current prioritization methodology and DOT's optimization results ran through the exact same base models in terms of deterioration, treatment alternatives, decision rules, and prioritization factors. Both scenarios used a $40M annual budget constraint with a predefined distribution limit based on functional classes to allocate maximum 50% of available budget to Arterial, 40% to Collector, and 10% to Local roads. Multiple scenarios are analyzed to determine the cost saving implications by calculating the estimated cost of rehabilitating the additional sections in poor and very poor conditions in the case of prioritization.
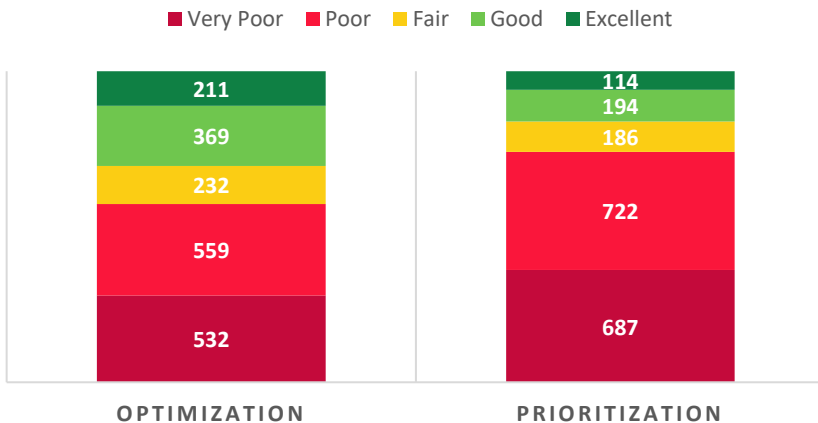
Infrastructure Solutions

KEY RESULTS

Optimization outperformed prioritization in all years, showing an average 5.3% improvement over the planning horizon and 9.3% by the end of the plan.

The 10-year average network improvement effect for Local, Collector, and Arterial roads are 0.4%, 5.3%, and 12.2%, respectively.

■ Optimization ■ Prioritization

	Optimization	Prioritization
10-YEAR AVERAGE PQI	5.21	4.95
END-OF-PLAN PQI	4.7	4.3
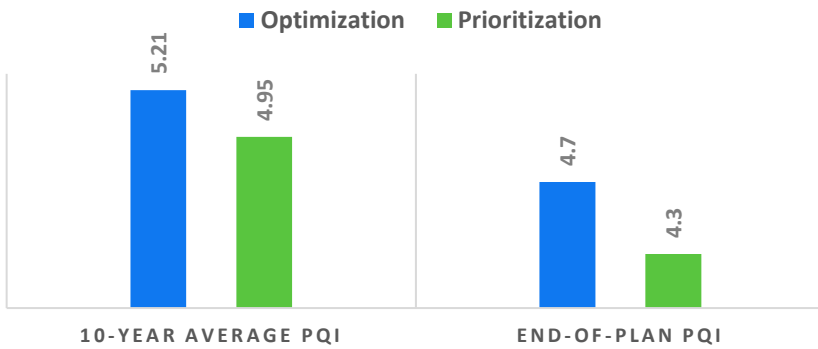
The cost of rehabilitating the additional 318 kilometers of Arterial roads in poor and very poor in the case of prioritization, and the additional investment needs to arrive at the same level of performance as the optimization solution, under the prioritization method, both are estimated to be around $100M over the 10-year planning horizon.

■ Very Poor ■ Poor ■ Fair ■ Good ■ Excellent

Condition	OPTIMIZATION	PRIORITIZATION
Excellent	211	114
Good	369	194
Fair	232	186
Poor	559	722
Very Poor	532	687

End-of-Plan Kilometers of Arterial Roads in Different Condition Sates

Infrastructure Solutions

10-year Cost Savings
25%+

Network Performance Improvement
9.3%+

Practical and easy-to-use decision support tools that make the process of capital planning **transparent**, **defensible**, and **technically robust.**