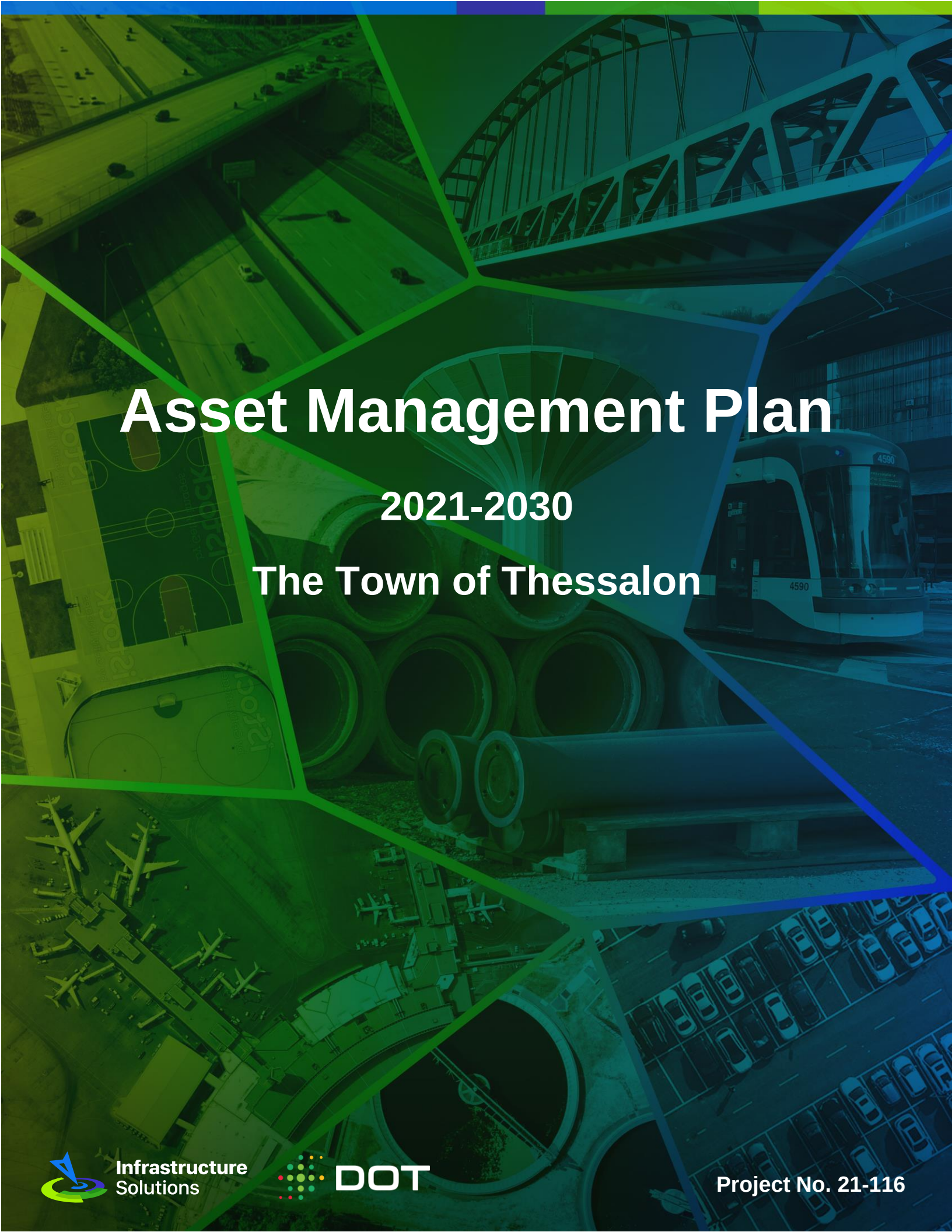

Asset Management Plan

2021-2030

The Town of Thessalon

Infrastructure Solutions

DOT

Project No. 21-116

Limitations and Disclosure

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The preparation of this project was carried out with assistance from the Government of Canada and the Federation of Canadian Municipalities. Notwithstanding this support, the views expressed are the personal views of the authors, and the Federation of Canadian Municipalities and the Government of Canada accept no responsibility for them.

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1 EXECUTIVE SUMMARY

The Town of Thessalon is undertaking a detailed evaluation of all its existing infrastructure in order to update their long-term Asset Management Plan, put the municipality in a position to receive the Federal Canada Community-Building Fund (formerly Gas Tax Fund) and other grants, and build a fully implementable program for its residents which aims to further strengthen municipal asset management practices.

Infrastructure Solutions Inc. was well supported by the Town's Asset Manager to accumulate the geometric and condition assessment data, where available. We based the Asset Management Plan on all asset types and their current replacement costs. Asset lifespans, condition and project requirements were determined by engineering assessments and degradation curves. Where condition assessments were unavailable, ISI applied an age-based analysis. Our objective was to build a practical asset management plan based on optimizing the capital spend and taking corrective action to address the Town of Thessalon's infrastructure deficit.

The Municipality's infrastructure deficit is defined as the added investment that would be required to maintain a Municipality's infrastructure at appropriate service levels and in a good state of repair today. Based on our calculations, Thessalon's infrastructure deficit is calculated to be $2,866,434. The Town's infrastructure deficit is quite significant and eliminating it within a 10-year period will be challenging with the Town's current financial capability. We have analyzed the Town's assets in detail with the objective of optimizing how capital is expended.

We have reviewed the Town's current/projected capital contributions in relation to its current/projected needs. For the primarily tax funded assets, the Town currently has an operating deficit of $436,227, resulting in a negative contribution of ($436,227) per annum to its capital program with a contribution requirement of $1,396,166 per annum. Therefore, with an annual funding gape of #1.83 million, the Town of Thessalon does not have sufficient funds available to fund capital projects and to eliminate its deficit within the 10-year plan period.

For the user fee funded water and wastewater assets, the Town currently is contributing $290,326 per annum to its capital program with a requirement to contribute $282,676 per annum. Therefore, the Town of Thessalon has sufficient funds available to fund water and wastewater capital projects and to eliminate its deficit within the 10-year plan period.

As highlighted in the SOTI Report within this document, the Town's most valuable assets by replacement cost are the Facilities (25.9%), the Roads (24.7%), Water (21.8%) and Wastewater (16.4%). The Facilities, Water and Wastewater assets are in Fair condition overall, while Roads are in Good condition. All the other asset types are in Fair, Good or Excellent condition. Only the Sidewalks and Playgrounds are in Poor condition overall, based on an age-based analysis, and need attention. To improve the accuracy of the capital planning, it is recommended to establish periodic condition assessments for the key assets.

2 ONTARIO ASSET MANAGEMENT REGULATION

2.1 HISTORICAL OVERVIEW

Municipal infrastructure is the foundation that the daily life of Canadians is built upon. The strength of this foundation enables our communities and local businesses to grow and it ensures that Canadians have a high quality of life. Municipalities own the core infrastructure assets that are critical to the quality of life of Canadians and the competitiveness of our country. Almost 60% of Canada's core public infrastructure is owned and maintained by municipal governments. According to survey results, the total value of core municipal infrastructure assets is estimated at $1.1 trillion dollars or about $80,000 per household.

The Town of Thessalon is not alone in dealing with an infrastructure deficit. According to the Canadian Infrastructure Report Card (CIRC), one-third of our Canadian municipal infrastructure is in fair, poor or very poor condition, increasing the risk of service disruption. Assets in fair, poor and very poor conditions represent a call for action. Survey results demonstrate that roads, municipal buildings, sport and recreation facilities and public transit are the asset classes most in need of attention. Figure 1 provides a summary of the physical condition ratings for all municipal asset categories across the country.

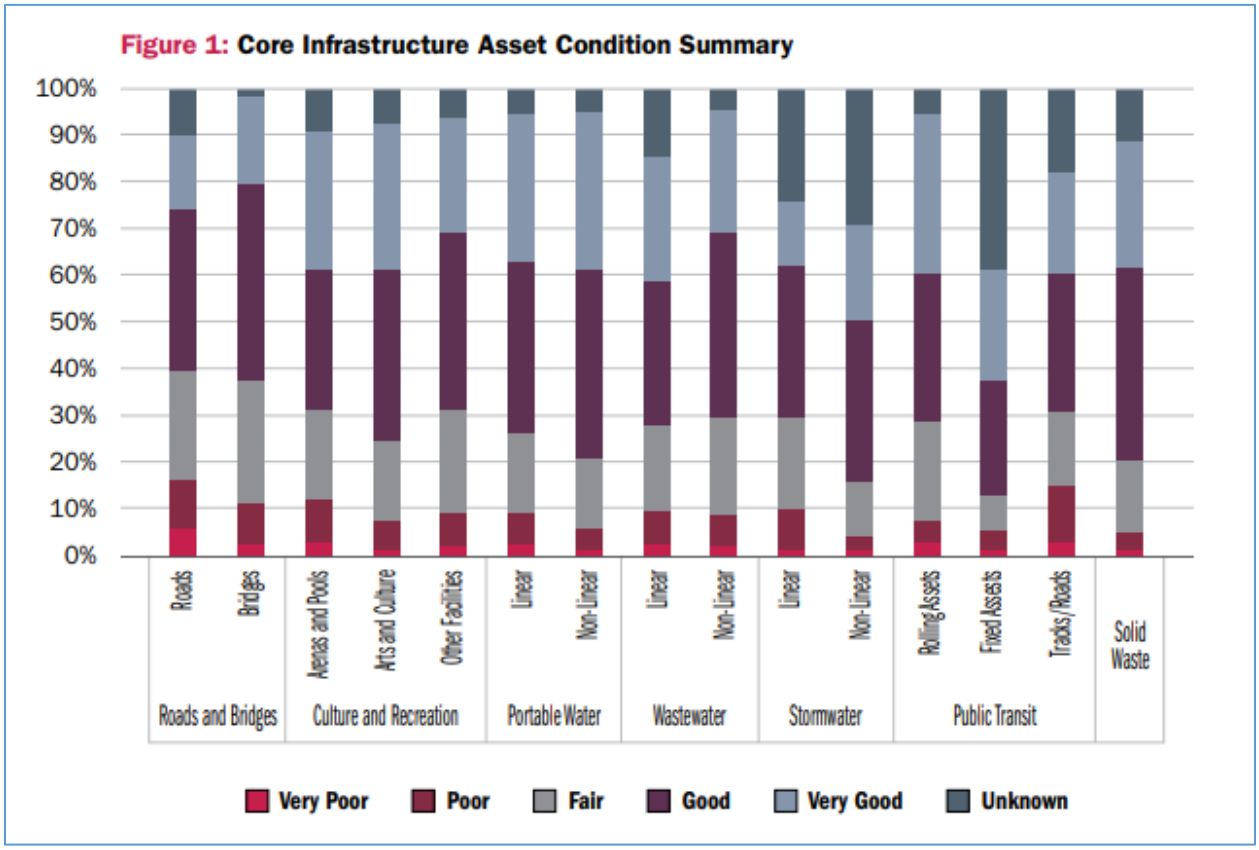


Figure 1: Physical Condition Ratings by Asset Category
Source: 2019 Canada Infrastructure Report Card

Increasing reinvestment rates will stop the deterioration of municipal infrastructure. The 2019 CIRC report found that rates of reinvestment are lower than targets recommended by asset

management practitioners. The rate can vary based on factors such as the age of the infrastructure, the level of service and risk tolerance. The values provided are based on the experience of municipal asset management practitioners and are intended to be informative in nature. Roads and sidewalks, storm water, and sport and recreation infrastructure presented the largest gaps in terms of current and target rates of reinvestment. Figure 2 demonstrate the gap between current and target reinvestment levels. Continuing down this path will result in a gradual decline of physical condition levels that will impact municipal services. When contrasted with target reinvestment rates it becomes clear that current levels of reinvestment in municipal infrastructure are inadequate.

Target Reinvestment Rates vs Current Reinvestment Rate

Infrastructure	Lower Target Reinvestment Rate	Upper Target Reinvestment Rate	Current Reinvestment Rate
Potable Water (linear)	1.0%	1.5%	0.9%
Potable Water non-linear)	1.7%	2.5%	1.1%
Wastewater (linear)	1.0%	1.3%	0.7%
Wastewater (non-linear)	1.7%	2.5%	1.4%
Stormwater (linear)	1.0%	1.3%	0.3%
Stormwater (non-linear)	1.7%	2.0%	1.3%
Roads and Sidewalks	2.0%	3.0%	1.1%
Buildings	17.0%	2.5%	1.7%
Sport and Recreation	1.7%	2.5%	1.3%

Figure 2: Target Reinvestment Rates vs Current Reinvestment Rate

Under the Ontario MIII program in 2013, for the first time Ontario municipalities were required to develop an Asset Management Plan in order to qualify for certain grants and to receive federal Canada Community-Building Fund (formerly Gas Tax Fund) revenue. This first round of Asset Management Planning focused primarily on the core assets, and to assemble inventory data, identify the condition state, quantify the infrastructure deficit, and determine the required capital expenditures based on expected service life.

2.2 REQUIREMENTS OF ONTARIO REGULATION 588/17

As part of the *Infrastructure for Jobs and Prosperity Act, 2015*, the Ontario government introduced Regulation 588/17 - Asset Management Planning for Municipal Infrastructure (O. Reg 588/17). Along with creating better performing organizations, more liveable and sustainable communities, the mandated regulation is a key driver of asset management planning and reporting. It places substantial emphasis on current and proposed levels of service and the lifecycle costs incurred in delivering them.

The Requirements of O.Reg.588/17 will progressively come into effect in three phases until July 1, 2025. This comprehensive Asset Management Plan addresses the requirements of all three phases. The regulation requirements are summarized as follows:

1. **General**
   - The municipality shall prepare an asset management plan in respect of its core municipal infrastructure assets by July 1, 2022 (Phase 1), and in respect of all of its

other municipal infrastructure assets by July 1, 2024 (Phase 2). The municipality shall prepare a revised asset management plan for July 1, 2025 (Phase 3, to include proposed levels of service, financial strategy, and asset lifecycle management strategy). Please note that the implementation deadlines of the 3 phases shown have been adjusted to reflect that they each have been moved forward by one year due to Covid 19.

- The municipality must post its current strategic asset management policy by July 1, 2019 and asset management plan on a website that is available to the public, and shall provide a copy of the policy and Plan Governance plan to any person who requests it.
- The municipality shall review and update its asset management plan at least five years after the year in which the plan is completed and at least every five years thereafter.
- Every asset management plan prepared or updated, must be endorsed by the executive lead of the municipality, and Plan Governance, and must be approved by a resolution passed by the municipal council.
- Every municipal council shall conduct an annual review of its asset management progress on or before July 1 in each year, starting the year after the municipality's asset management plan is completed.
- The annual review must address the municipality's progress in implementing its asset management plan, any factors impeding the municipality's ability to implement its asset management plan; and Plan Governance, and a strategy to address the factors impeding municipalities' ability to implement its asset management plan.

2. Level of Service

- Current Level of Service is required for Phase 1 for core assets, Phase 2 for non-core assets: For each asset category, the current levels of service being provided, determined in accordance with qualitative descriptions and technical metrics, based on data within the past two calendar years; With respect to core municipal infrastructure assets, the qualitative descriptions and the technical metrics set out in the Regulation; With respect to all other municipal infrastructure assets, the qualitative descriptions and technical metrics established by the municipality. The current performance of each asset category, determined in accordance with the performance measures established by the municipality, based on data within the past two calendar years.
- Proposed Level of Service Is required for Phase 3: For each asset category, the levels of service that the municipality proposes to provide for each of the 10 years following, is included in the asset management plan, determined in accordance with the following qualitative descriptions and technical metrics: With respect to core municipal infrastructure assets, the qualitative descriptions and the technical metrics set out in the Regulation; With respect to all other municipal infrastructure assets, the qualitative descriptions and technical metrics established by the municipality.
- A discussion of the proposed versus current Level of Service is required for Phase3: An explanation of why the proposed levels of service are appropriate for the

municipality, based on an assessment of the following: The options for the proposed levels of service and the risks associated with those options to the long-term sustainability of the municipality; How the proposed levels of service differ from the current levels of service; Whether the proposed levels of service are achievable; The municipality's ability to afford the proposed levels of service.

- Required for Phase 3): The proposed performance of each asset category for each year of the 10-year period, determined in accordance with the performance measures established by the municipality, such as those that would measure energy usage and operating efficiency.

3. **State of local infrastructure**
   - Required for Phase 1 for core assets, Phase 2 for non-core assets: For each asset category: A summary of the assets in each category; The replacement costs of the assets in the category; The average age of the assets in the category; The information available on the condition of the assets in the category; A description of the municipality's approach to assessing the condition of the assets in the Category.

4. **Asset Lifecycle Management Strategy**
   - Required for Phase 3: For each asset category, the lifecycle activities that would need to be undertaken to maintain the current levels of service for the next 10 years and the costs of providing those activities based on an assessment of the following: The full lifecycle of the assets; The options for which lifecycle activities could potentially be undertaken to maintain the current levels of service; The risks associated with the options for lifecycle activities; The lifecycle activities defend that can be undertaken for the lowest cost to maintain the current levels of service.

5. **Financial Strategy**
   - Required for Phase 3: For each of the 10 years following the year for which the current levels of service are determined, the estimated capital expenditures and significant operating costs related to the lifecycle activities required to maintain the current levels of service in order to accommodate projected increases in demand caused by growth, including estimated capital expenditures and significant operating costs related to new construction or to upgrading of existing municipal infrastructure assets.
   - Required for Phase 3: An identification of the annual funding projected to be Financial Strategy available to undertake lifecycle activities and an explanation of the options examined by Cambridge Appendices to maximize the funding projected to be available.
   - Required for Phase 3: If, based on the funding projected to be available, the municipality identifies a funding shortfall for the lifecycle activities; An identification of the lifecycle activities that the municipality will undertake, and if applicable, an explanation of how the municipality will manage the risks associated with not undertaking any of the lifecycle activities.

3 SCOPE AND METHODOLOGY

The scope of this project is to undertake a detailed evaluation of all the Town's existing infrastructure in order to update a long-term Asset Management Plan in accordance with Ontario Reg 588/17, give the municipality continued eligibility to receive the Federal Canada Community-Building Fund (formerly Gas Tax Fund) and other grants, and build a fully implementable program for its residents which aims to further strengthen municipal asset management practices.

Asset management planning requires that the most cost effective and realistic decisions are made regarding the building, operating, maintaining, renewing, replacing and disposing of infrastructure assets. The prime goal of the Asset Management Plan is to maximize benefits, manage risk, and offer satisfactory, safe and sustainable service levels to the public. Asset management planning requires that the Town of Thessalon has an in-depth understanding of the characteristics and condition of infrastructure assets, as well as the service levels they are expected to meet. Asset management planning also involves strategic prioritization and optimization to obtain the best decision-making concerning the timing and utilization of investments, which includes a comprehensive and achievable financial strategy.

ISI and the Town are using the DOT™ (Decision Optimization Technology) software), a leading-edge asset management and investment planning software to assist in establishing that the most cost-effective and realistic decisions are made regarding the replacement, maintenance, rehabilitation, and reconstruction of the Town's assets. DOT™ will give you a plan that is flexible, easy to update, credible, defensible, and implementable.

Using any software to build an Asset Management or Capital Plan is complex. Effective planning requires a balancing act which contemplates fluctuating annual budgets, shifting strategic priorities, service levels objectives and public expectations, risk and safety considerations, cross-departmental co-operation, and due consideration to political objectives. DOT™ helps with the analytical process, best utilizing your current budget to best meet your financial and socioeconomic objectives. It determines what your budget needs to be to manage your infrastructure deficit and reach your levels of service objectives. It provides concrete recommendations and an actionable plan to put your community on a solid path forward. It generates a plan that well exceeds ISI 55000 standards and meets all Provincial and Federal regulations.

DOT™ is unique in the industry. Firstly, for the plan to be right, the civil engineering must be right. We have spent years in R&D working out degradation curves, lifecycle expectations, and factors like the impact of preventive maintenance. Secondly, prioritization and cost-benefit analysis methodologies do not have the analytical capability to manage a SAMP or Capital plan's complexity. Instead, DOT™ utilizes state-of-the-art, multiyear, multi-constraint optimization algorithms to create a range of scenarios to attain the best plan forward. Our flexible and comprehensive analytical processes give you the opportunity to attain your unique objectives for levels of service, socio-economic factors, and safety considerations. Finally, the plan you generate is only as good as your ability to gain support from your Council and community. DOT™ uses highly visual reports, presentation, and report ready, to simplify your communication task.

With DOT™ our objective is simple. We believe that the best plans are generated by local administrators and their public works department (and external engineering companies when necessary), and interfacing with the community and Council to establish their political and level

of service objectives. We will continue to expand the functionality of DOT™ as a world class Municipal planning tool, built for Canadian governments by a Canadian company.

4 STATE OF THE INFRASTRUCTURE

4.1 ASSET INVENTORY

The Asset Repositories for all asset types have been assembled, using as much information as the Municipality had available. The following procedure was used to assemble the Asset Inventories for this plan:

a) All asset types, location and quantities;
b) Segmenting of linear assets into manageable sections;
c) Unique Asset ID's for each asset type;
d) Geometrics of the asset (dimensions and physical properties)
e) Current year financial accounting valuation using historical costs and depreciation assumptions and replacement cost calculation accounting for expected inflation, changes in technology and other factors;
f) Asset age distribution and asset age as proportion of expected useful life;
g) Identified needs for all asset types
    i. identify deficiencies
    ii. identify treatments and life cycle interventions currently used to address deficiencies, including maintenance
    iii. determine cost of treatments and interventions
    iv. develop list of all asset needs with a multi-year listing (10-year) projects assuming unlimited funding; and a year-by-year (10-year) listing of total costs and capital requirements.

This section will also be supported by:
a) An inventory database of infrastructure covered by the plan, which includes basic asset information.
b) Records of all assumptions.
c) A data verification policy and a condition assessment policy, consistent with provincial requirements, setting out when and how asset information will be verified and when and how assets will be assessed to determine their condition.

4.2 REPLACEMENT COST

Replacement Costs are calculated for each asset. The following hierarchy is used in calculating Replacement Costs, depending on data availability:

1. Replacement Costs provided by client, inflated to 2020
2. Reconstruction unit costs where available, inflated to 2020
3. Initial Cost, inflated to 2020

The Municipality's Replacements costs by Asset Category is shown here:

Asset Category	Replacement Cost	Percentage
Transportation	$23,527,777	24.7%
Bridges	$3,920,262	4.1%
Water	$20,719,799	21.8%
Wastewater	$15,591,160	16.4%
Stormwater	$3,933,588	4.1%
Facilities	$24,694,509	25.9%
Vehicles	$1,290,300	1.4%
Parks	$324,800	0.3%
Equipment	$1,251,608	1.3%
TOTAL	**$95,253,804**	**100.0%**

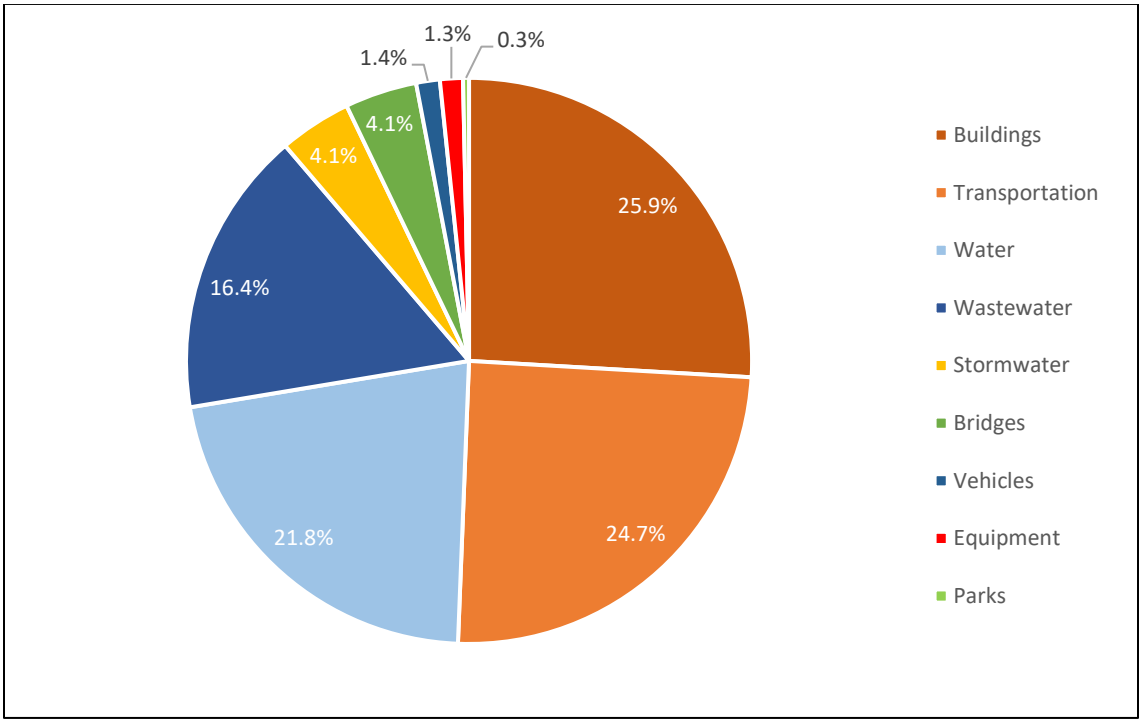


Figure 3: Asset Replacement Cost by Category

4.3 CONDITION ASSESSMENT APPROACH

Wherever condition assessments are available, they were utilized to determine asset conditions. When no condition data were available, an age-based condition rating of %RSL (% Remaining Service Life) was calculated based on predicted service life for a given asset. The condition assessment approach used is stated for each Asset Type in Section 5.

4.4 LEVELS OF SERVICE

The plan will define potential Levels of Service (LOS) for community consideration through performance measures, targets, and timeframes to achieve them. This section provides an overview of the Level of Service methodology used and is supported by specifications for each asset type in Section 5, of which performance measures are associated with a given asset type, current performance and expected performance over the planning period, as well as any assumptions. We made recommendations, but significant input was provided by the Town to define their desired levels of service, and these targets will be refined further with time.

4.4.1 OVERVIEW

Levels of Service (LOS) are statements of service performance delivery. LOS is established based on Council direction, the needs or wants of the community as well as legislative and regulatory requirements. This report includes Operating Performance Indicators (OPI's) for current levels of service. Through the ongoing Asset Management process, LOS will be further defined for the Municipality, the Municipality's assets, and the community. They all are interconnected.

There is likely further effort required by the Municipality to address and formally define levels of service from a customer perspective. Asset management, at its root, is really about balancing the full life cycle costs of various services and the levels of service being provided. It is about knowing what levels of service customers expect and what they are willing to pay. The level of service is a reflection of the quality, function, and capacity of the services being provided. As a Municipality, you might consider:

- The level of service you are currently providing to users
- The annual cost to continue to provide the current level of service
- How the level of service is expected to change in the future given current funding levels
- If you are meeting the level of service expectations of your users given the costs to provide current and desired levels of service

As a rough generalization, the higher the level of service provided, the higher the life cycle costs of providing that service. Levels of service drive the expected treatments in the management of infrastructure. Customer levels of service outline the overall quality, function, capacity, and safety of the service being provided. Technical levels of service outline the operating, maintenance, rehabilitation, renewal and upgrade activities expected to occur within the Municipality. When practicing asset management, it is important to first document the current level of service being provided. As asset management becomes more established within your Municipality, levels of service may be set through consultation with the community. However, it is critical that prior to consulting with the public, the current levels of service along with associated life cycle costs are understood.

It is also important to discuss how various levels of service may have different risks associated with them. These risks may play an important role in determining if certain levels of service are acceptable. As with all economic analysis, a sensitivity analysis should be carried out on those parameters which are more likely to be beyond the control of the organization, such as market forces affecting the opportunity cost of capital, community expectations/perception on risk and factors in the long-term, health and safety effects, community economic effects, environmental and social effects, feasibility including public support and the Municipality's readiness.

4.4.2 LEVEL OF SERVICE APPROACH

The implementation of a formal Maintenance Management System (MMS), among many other items, measures the response time, lag time, total time to resolution, resources involved, and communication logs for all issues identified internally and by customers. Going forward, this type of information not only provides the basis for resource and program management decisions but is key information that will provide council and the public with the service level information in relation to the cost of service. Historically a significant portion of activities has been provided at a 'best we can do with what we have' basis. Through a review of design guidelines, and metrics being captured by the MMS, the Town of Thessalon can re-orientate service delivery that is driven by service level expectations that incorporate Level of Service factors. To assist in better establishing Levels of Service, the Town should also consider collecting technical performance measures needed to provide information on:

- the types of failure
- the number of customers affected
- the duration of the failure
- the severity of the failure

This kind of technical performance measurement and monitoring is undertaken to support decision-making by the asset managers within an organization. It addresses issues for consideration in the effective management of the assets, such as:

- Assessing the effectiveness of the operational, maintenance and capital works program
- Review and refinement of maintenance and rehabilitation strategies and standards
- Assistance in strategic decision-making through the definition of remaining life, based on the measure being assessed, e.g. capacity of a pipe versus demand.

Benchmarking and other comparison management techniques are used both internally and for external regulation and monitoring, to assess the performance of infrastructure groups and asset owners. Each Municipality needs to consider developing rating systems to judge the assets from both a Municipality's perspective with the values that it brings to the organization, and also from a user's or regulator's perspective, in terms of the functionality, suitability, cost and service performance of the asset.

4.4.3 LEVELS OF SERVICE PROCESS

Some Levels of Service (LOS) for the Municipality can be attained through documents developed in the industry and by internally focusing on technical requirements that meet generally expected levels of operation and safety:

- Provincial Minimum Maintenance Standards (MMS) for roads, street lighting, water and drainage
- Drinking Water Quality Management System (DWQMS)
- Engineering Standards Manuals

Operating Performance Indicators – These are the main activities within each operating budget cost center. These activities (OPI's) link directly to the level of service provided by the Municipality. The OPI's also include maintenance tasks that help extend asset life. A good balance between asset replacement through capital funding and ongoing maintenance provides the best cost efficiency and service productivity.

4.4.4 OPERATING PERFORMANCE INDICATOR EXAMPLE

ROADS				
Service	Operating Performance Indicators (OPI)	Current Performance	Target Performance	Timeframe
Examples for Roads below:				
Road Maintenance & Repairs	Complete approximately X work orders per year for service requests including pothole repair, minor asphalt patching, sightline improvement, MVA clean-up.	1500	500	3 Years
Brushing and Roadside Mowing	Complete approximately X km's of brushing on roadsides annually.	N/A	50 km	2 Years
	Complete roadside mowing X times annually	2	3	3 years
Boulevard Maintenance	Twice per year cut every boulevard in the RM.	2	3	3 Years
	Annual weeding, cleaning, and caulking of X km of sidewalk and curb.	7	7	
	Maintain sight lines at intersections for vehicle and pedestrian safety.	14 Days	14 Days	Timeline Achieved
	Roads Recapped ____km's - Annual Average	8	30	2 Years
	Gravel Roads Surface Treated ___km's - Annual Average	3.5	20	2 Years
Curbing/Shoulders	Annual repair, by August, of all curbing damage in previous winter.	September	July	1 Year
Sidewalks & Walkways	Completed Inspections _____times per year	1	1	Timeline Achieved
	Sidewalks / Walkways swept _____ times per year	1	1	Timeline Achieved
Vandalism	Within X hours of notification, remove graffiti.	48	24	1 Year
Street Lighting	Service requests for street light repair completed within X hours.	5 days	48 hours	1 Year
Signs	Annual inspection and maintenance of all X stop signs.	1225	1225	Timeline Achieved
	Annual inspection of crosswalk, pedestrian, school	September	July	1 Year

	and playground signs and beacons.			
	Annual Upgrade of X signs to diamond grade	12	25	1 Year
Snow and Ice Control	Major roads including emergency routes during winter events.	16 Hours	16 Hours	Timeline Achieved
	Residential areas – through roads first then cul-de-sacs and dead ends.	16 Hours	16 Hours	Timeline Achieved
	Residential areas will be plowed and maintained within 96 hours unless snow and icy conditions return crews back to major roads.	16 Hours	16 Hours	Timeline Achieved
VEHICLES – FLEET				
Service	Operating Performance Indicators (OPI)	Current Performance	Target Performance	Timeframe
Fleet Maintenance	Undertake preventative maintenance and repairs to meet industry standards for safety and operation.	Daily	Daily	Timeline Achieved
	Maintain fleet availability at X%.	80	100	3 Years
Small Equipment	Inventory, maintain and repair X pieces of small equipment for use by all departments.	40	40	Timeline Achieved
Preventative Maintenance Services	X units inspected every X months to maintain safety and fleet efficiency.	32 Units every 250 Hours	32 Units every 250 Hours	Timeline Achieved
WATER / WASTEWATER				
Service	**Operating Performance Indicators (OPI)**	**Current Performance**	**Target Performance**	**Timeframe**
Examples for Water/ Wastewater below:				
Valves & Air Valves	Exercise all line valves once per year with yearly reporting	1	1	present
Main Breaks	Upon notification emergency response and water shut down within 45 minutes.	45	45	present
	Repair completed and service re-instated within 2 hours.	2	2	present

	Currently experiencing 10 breaks per year on average	10	>8	present
Service Connection Renewals	30 renewals completed each year on average.	30	20	
	Service connections associated with Road Rehab Program and capital projects are checked and replaced as necessary.	at that time	at that time	present
Water Towers - Reservoirs	Weekly inspections	no	every 6 months	2014
	1 year cycle - drain, inspect, clean and repair	every year	every 2 years	present
Pump Stations	Annual painting	no	yes	2014
	Annual vegetation control	yes	yes	present
	20 year cycle – rebuild control valves.	as necessary	10 years	2014
	20 year cycle – rebuild or replace pumps.	as necessary	15 years	2025
	Weekly trouble shooting and repairs	yes	yes	present
	5 weekly visual inspections	5	5	present
Stations	Maintain all pressure reducing stations to operate without failure.	as necessary	every 5 years	2013
	30 year cycle - complete replacement of each station	as necessary	as necessary	present
	10 year cycle - complete rebuild of system.	as necessary	every 10 years	2015/2020
	Annual painting and vegetation control.	n/a	n/a	n/a
Testing	100% of water samples contain no bacteriological contaminants.	100%	100%	present
	Monthly reporting	yes	yes	present
WPC Chlorination	Disinfects 100% of City supply	100%	100%	present
	Daily data acquisition and inspection	yes	yes	present
	Daily water testing	yes	yes	present
	Monthly chlorine cylinder replacement.	as necessary	as necessary	present
	Semi-annual chlorination equipment replacement and repairs	n/a	n/a	n/a
	Annual painting and vegetation removal	yes	yes	present
	10 year cycle - replacement of small piping and control valves.	as necessary	every 10 years	2014
Reservoir Chlorination	Disinfects 100% of City supply	100%	100%	present
Water Main Flushing	Twice Annually flush all supply lines.	Twice annual	Twice annual	present

Service Call-outs	Provide 24/7 on call coverage for emergency response.	yes	yes	present
STORM / DRAINAGE				
Service	**Operating Performance Indicators (OPI)**	**Current Performance**	**Target Performance**	**Timeframe**
Examples for Drainage below:				
Flushing	Annual flushing of 100 m of the 236 m storm system	50	100	2014
Video Inspections	Annual video inspection of 10m of the storm system.	5	10	2014
Manholes / Cleanouts	Install and repair manholes and cleanouts.	yearly	yearly	present
Catch Basins	Annual inspection and cleaning of all 793 catch basins	150	250	2014
Detention Systems	Annual inspection of all X detention systems.	N/A		
Inlet / Outlet Structures	As needed Inspect and clean all critical inlet and outlet structures and service before, during and post-storm events.	yes	yes	present
	Annual inspection and maintenance of inlet and outlet structures.	yes	yes	present
Ditch Cleaning	Annual inspection of all ditches and clean as needed.	yes	yes	present
Culverts	Repair driveway and road crossing culverts as assigned through work orders.	yes	yes	present
Service Call-outs	Provide 24/7 on call coverage for sewer and drainage emergency response.	yes	yes	present

4.4.5 CURRENT LEVEL OF SERVICE

The Level of Service for each asset is defined either by its condition rating, or by an age-based rating, e.g. Percent of Remaining Service Life (%RSL). Generally, condition ratings are preferred to age-based ratings, and are used wherever they are available. Different condition rating Indices are used for different assets, for example PCI, PQI or PASER, etc. for roads, NCAP for pipes, BCI for bridges, etc. Municipalities are encouraged to have conditions assessed for as many assets as possible.

The overall Level of Service Rating is weighed in the most appropriate way, depending on the asset. For example, linear assets like roads and utility pipes are usually weighed be length, assets of similar cost like hydrants, park benches, etc. are weighed by Quantity or Count, and Equipment or Fleet assets with large cost variations would typically weighed by Replacement Costs.

Thessalon's Condition Report Card is shown here:

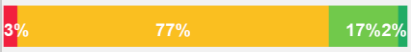
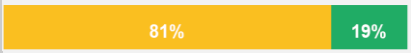
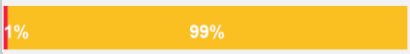
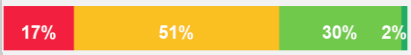
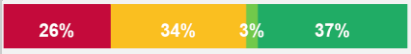
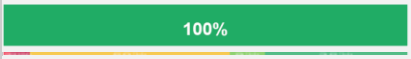
Asset Type	Network Size	No. of Assets	Network Condition	Condition State	Condition Distribution
Curbs & Gutters	3 Km	22	68	Excellent	
Roads	22 Km	89	66	Good	
Street Lights	$251,802	295	74	Excellent	
Sidewalks	6 Km	41	19	Poor	
Sewerlines	17 Km	67	48	Fair	
Pumping Station (Sewer)	$225,500	4	47	Fair	
Lagoons	$1,211,900	2	33	Fair	
Waterlines	20 Km	72	44	Fair	
Treatment Plants (Water)	$7,291,865	12	81	Good	
Hydrants	99 ea.	99	44	Good	
Stormlines	6 Km	52	56	Good	
Vehicles	$1,290,300	15	39	Fair	
Paved Area	$86,400	1	63	Excellent	
Playgrounds	$135,000	3	5	Poor	
Ball Fields-Diamonds	3 ea.	3	24	Fair	
Equipment	$1,182,108	38	47	Good	
Signs (Not Traffic)	30 ea.	4	98	Excellent	
Buildings	$12,389,655	19	40	Fair	
Bridges	$3,674,458	80	70.5	Good	

Figure 4: State of the Infrastructure Report Card

4.4.6 LIFE CYCLE CONSIDERATION

The Life Cycle of an asset is the time span from when an asset is first put into service to when it is replaced or discarded. Various intervention options are available during the life on an asset. These are divided into Early-Life interventions, (preventive maintenance), Mid-Life interventions (minor rehabilitation) and End-of-Life interventions (major rehabilitation, reconstruction, replacement). In addition, there are operation or routine maintenance interventions. For each asset type the suitable life cycle interventions available to the municipality are identified with the corresponding costs. The DOT™ software, during its optimization analysis, will determine the best possible intervention strategy, applying the right treatment at the right time, to maximize the life cycle of each asset at minimum cost and ensuring the maximizing the asset performance

throughout the asset's lifecycle, while satisfying the Level of Service, risk tolerance and budget constraints at the same time.

4.4.7 RISK METHODOLGY

The Concept of Risk

In an ideal case, Risk can be determined using the formula below based on the Probability of Failure and the Consequence of Failure in monetary terms. Formulations can be more complex using concepts such as risk mitigation and vulnerability.

Risk = Pf × Cf
Pf = probability of failure
Cf = consequence of failure in monetary terms

Quantification of Pf and Cf, however, is not an easy task and requires major research and development in addition to data collection by experts at municipalities. In practice, a variation of the above formula is used to determine a Risk Index based on the combination of **Criticality** (instead of the monetized consequence of failure) and **Likelihood of Failure** (instead of detailed probability functions and values). Criticality is typically determined based on the properties of various assets. Physical attributes or Community Impact factors can contribute to the criticality level. As an example, a large size sewer pipe with potential environmental impact has a higher criticality as compared to a small residential pipe. Likelihood of failure is determined based on the condition assessment protocol and determination models. In the software, you can create various functional relationships between condition index and LoF as part of your CI settings.

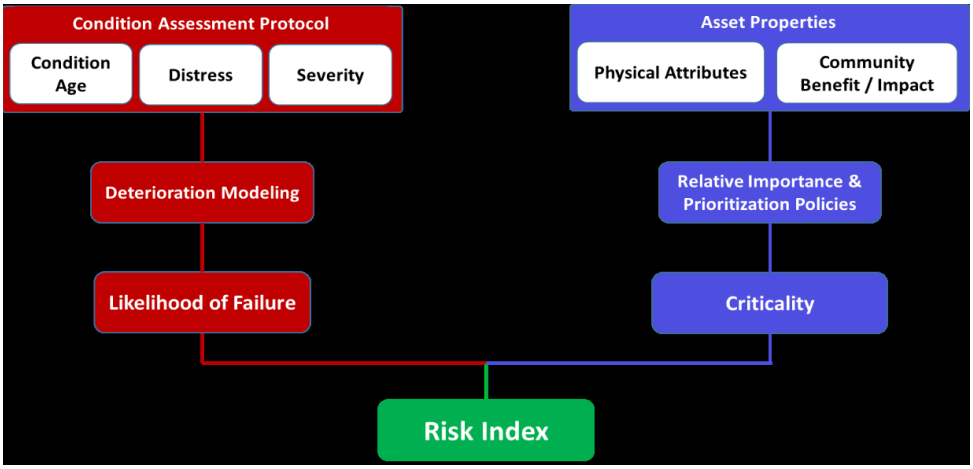


Figure 5: Concept of Risk

Risk Matrix Settings

Likelihood of Failure is calculated from the Level of Service for each asset. A typical relation of Asset Condition and Likelihood of Failure for a specific asset type is shown in Figure 6:

Figure 6: Likelihood of Failure Setting

Consequence of Failure is calculated from the Criticality value calculated for each asset. A typical relation of Criticality and Consequence of Failure is shown in Figure 7:

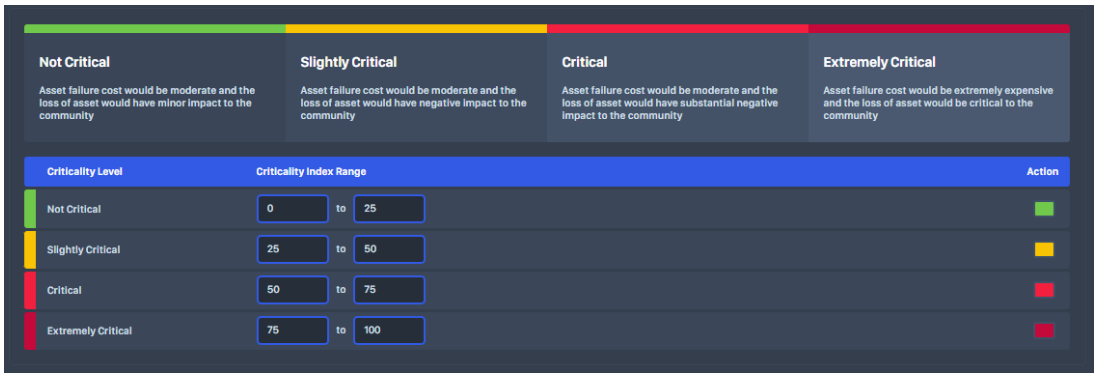


Figure 7: Consequence of Failure Setting

The combination of Criticality and Likelihood of Failure represents different risk levels. This combination is usually presented using a Risk Exposure Matrix and shown below.

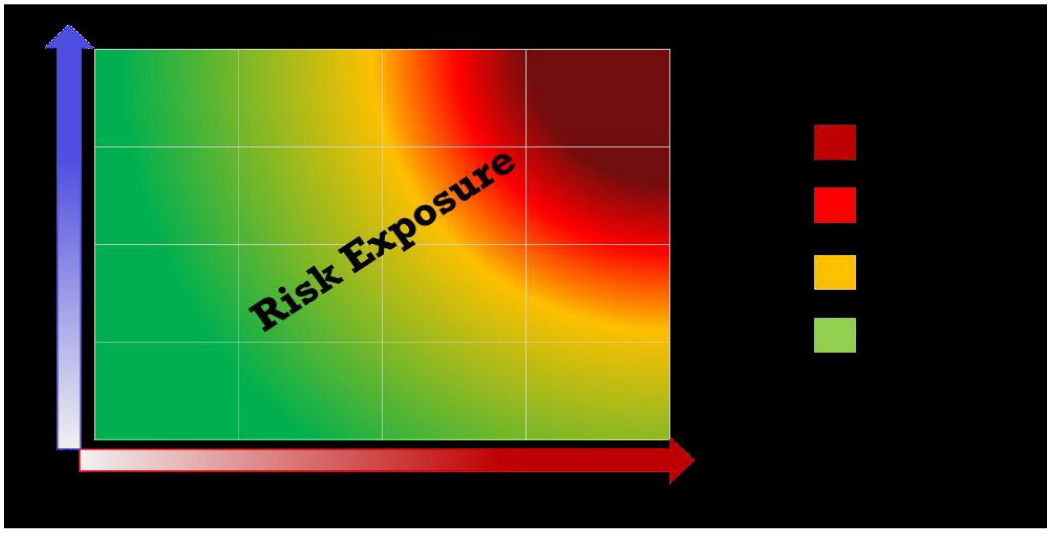


Figure 8: Risk Exposure Matrix

The DOT™ software utilizes your Criticality and Likelihood of Failure settings to automatically calculate and produce Risk Matrix results to identify assets at different risk levels. Each point on the Risk Matrix below represents one asset such as a road segment or sewer pipe.

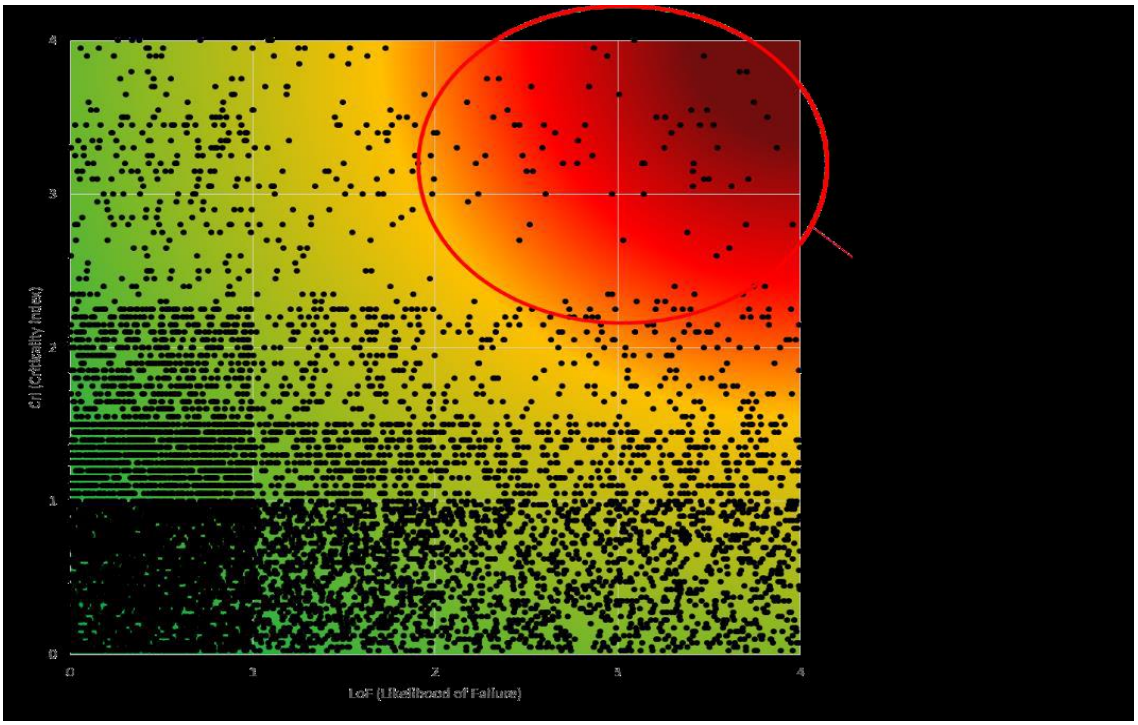


Figure 9: Risk Exposure Matrix of Assets

Risk matrix and risk level ranges can be set on the settings page of the software.

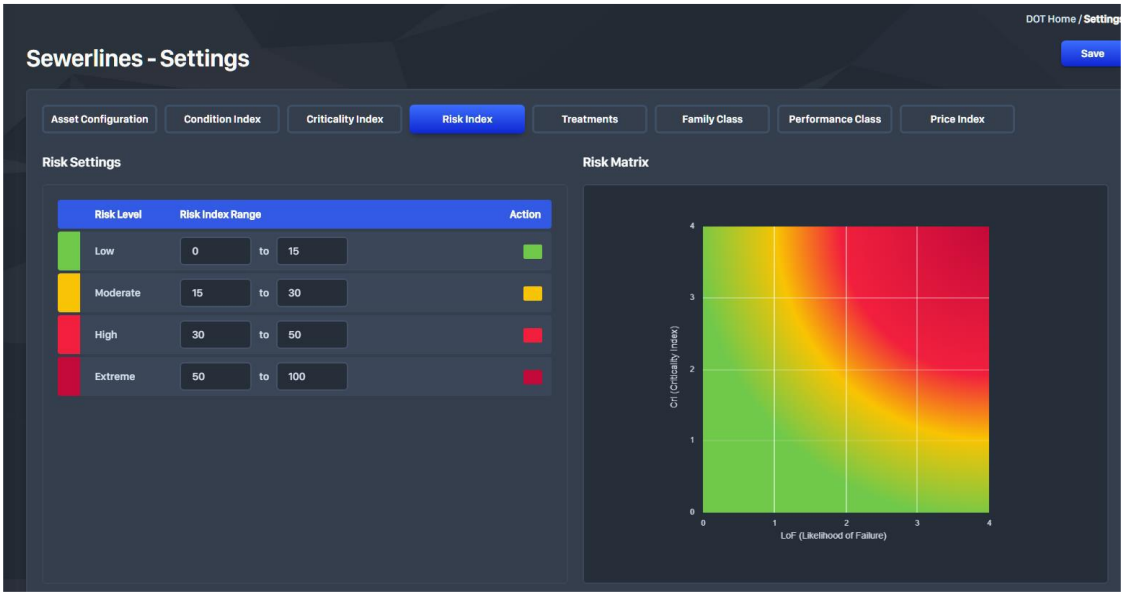


Figure 10: Risk Settings in DOT™

Risk Tolerance

As part of LoS settings, Risk Tolerance can be set to determine allowable risk thresholds for various Performance Classes and asset types. The following example shows a risked-based optimization scenario with the objective of maintaining the network risk level at low and moderate levels. In other words, the optimization process allocates available funding to eliminate all events exhibiting high and extreme risk levels over the planning horizon.

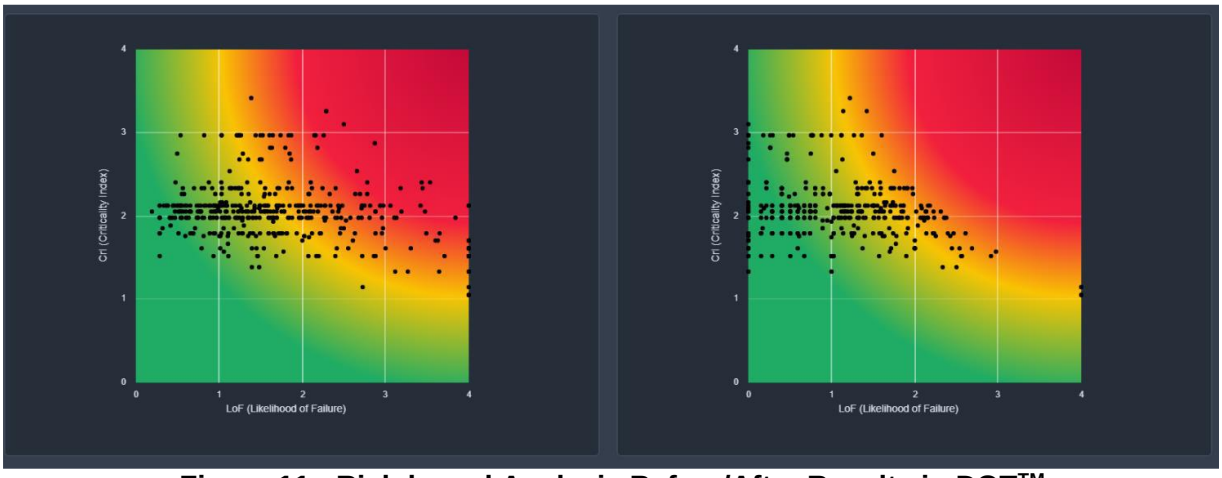


Figure 11: Risk-based Analysis Before/After Results in DOT™

4.5 CLIMATE CHANGE AND ADAPTION MEASURES

Municipalities are encouraged to address climate change, both by adopting measures to mitigate the effects and risks of climate change to the municipality, and by looking for ways to reduce the carbon footprint. Municipalities have the ability to force change through by-laws and zoning. The Town of Thessalon is a designated Green Community and committed to addressing climate change.

Carbon Footprint

Municipalities can have a positive impact on reducing the carbon footprint. These include improving the energy efficiency of municipal facilities, buildings and fleet. Municipalities can also work with utility providers to facilitate the installation of public and private electric vehicle charging stations, wind generators, etc. through by-laws, zoning or even by just making public land available for installations. For new construction, the use of sustainable energy can be mandated, for example through photovoltaic installation on roofs, as well as requiring provisions for EV charging, for example.

The municipality should engage in the development of a Climate Change Action Plan (CCAP). The objectives of the Plan are to:

1. Understand and address climate change at the municipal level (infrastructure, operations, service delivery) using Infrastructure Canada's two Climate Lens assessment frameworks for greenhouse gas (GHG) mitigation and climate resilience.
2. Provide a municipality-wide baseline and forecast of greenhouse gas (GHG) emissions using the Broader Public Sector: Energy Reporting and Conservation and Demand Management Plan required under Ontario Regulation 507/18.
3. Complete a climate change risk assessment for critical municipal infrastructure that is in accordance with Ontario Regulation 588/17 Asset Management Planning for Municipal Infrastructure.
4. Establish specific targets for reducing GHG emissions using a scenario planning approach. These benchmarks should align with the federal GHG reduction target of 40-45 percent below 2005 levels by 2030 under the Canadian Net-Zero Emissions Accountability Act and outlined in Canada's Climate Actions for a Healthy Environment and a Healthy Economy.

5. Compliance (see PCP compliant plans) with FCM's Partners for Climate Protection (PCP) program's Milestones One, Two, and Three requirements.
6. Compliance with ICLEI Building Adaptive & Resilient Communities (BARC) Milestones One, Two, and Three requirements.

Mitigation:
Climate change, also referred to as global warming, results in more extreme and more frequent severe weather events. This includes strong winds, tornados and hurricanes, heat waves and intense rain or snow falls. The municipality should assess its infrastructure to minimize the risk of damage/loss to life and property, and to be prepared to deal with these extreme weather events.

Examples of climate change mitigation include upgrading infrastructure to minimize flooding, for example improving storm water run-off into waterways, doing a flood plain analysis and minimize development in low lying areas with higher flood risk, LID's (Low Impact Developments) like rain gardens, bioswales, infiltration trenches, permeable pavement or rainwater harvesting, and minimizing storm water from entering the wastewater system to prevent the release of untreated wastewater into the environment.

Measures to mitigate draught include minimizing the run-off of rainwater into the storm system, for example by disconnecting roof drains from the storm system and discharging downpipes into permeable landscape, permeable pavement driveways, minimizing water consumption through metering and rate structures, and to ensure sufficient water supply. Another aspect is to deal with the increased likelihood of fires, in particular wildfires, by strictly enforcing seasonal fire bans and other activities that could start a fire, providing sufficient water reservoirs for firefighting.

Mitigation measures also include an effective early warning system and having clearly defined emergency procedures and periodic training in place.

5 COMPREHENSIVE ANALYSIS BY ASSET TYPE

Our DOT (Decision Optimization Technology)™ capital planning tool provides a robust decision-making process, identifies the best possible course of action, and considers both the short-term needs and the long-term goals of a municipality. It includes an advanced decision-making process called optimization or prescriptive modeling, which is the most powerful and effective way of finding the best possible solution to a decision-making problem. A capital planning tool with optimization capability can maximize the overall performance of a network in terms of physical condition (or any other criteria) over a multi-year analysis horizon and provides municipalities with the best possible course of action in terms of timing and selection of different maintenance, rehabilitation, or reconstruction treatments considering all municipal goals and constraints. The improvements achieved through an optimized solution, which inevitably highlights the critical importance of preventive maintenance, can be translated into substantial savings and increased socio-economic benefit (Figure 5).

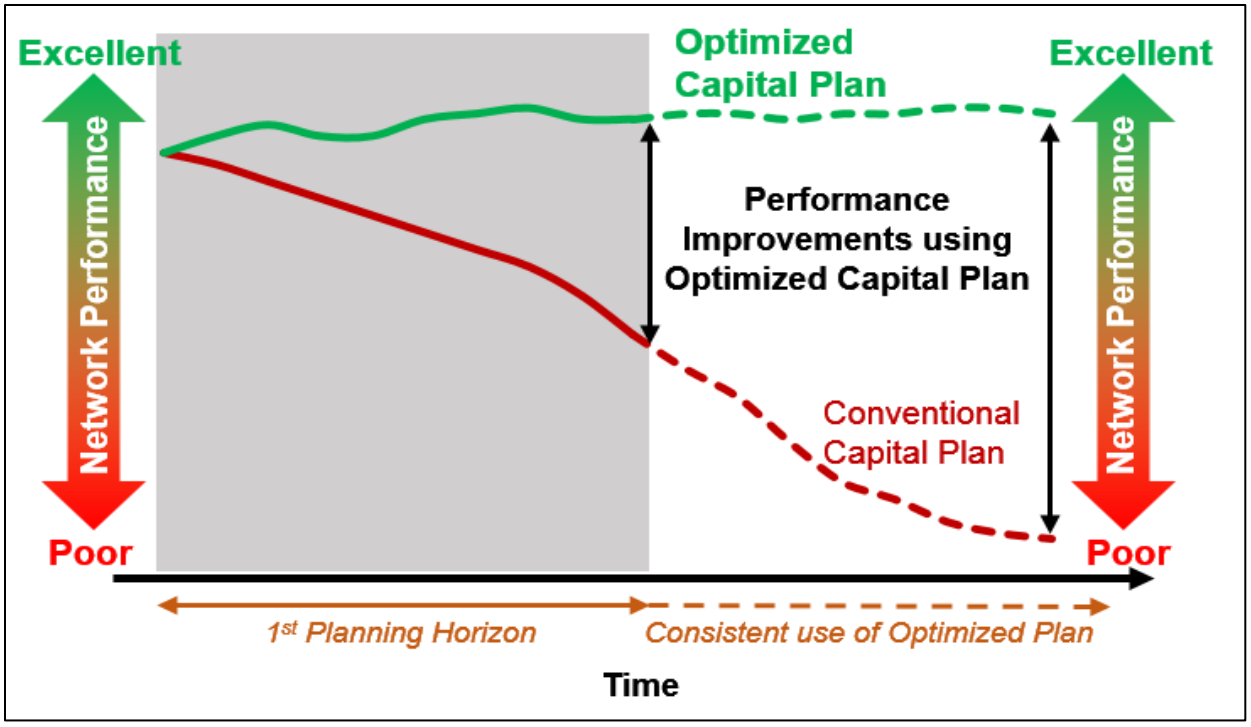


Figure 12: Optimized vs. Conventional Capital Planning

Combining advanced optimization capabilities with robust engineering models and socio-economic consideration provides municipalities with a fully implementable and defensible capital plan. The analytical models used in the system are flexible, able to adjust to regional variances and reflect the behavior of assets verified through a rigorous analysis.

5.1 ROAD NETWORK

The Town of Thessalon has a total of 21.8 km of roads in with Hot Mix Asphalt, Surface Treated, Gravel surfaces.

5.1.1 ROAD GEOMETRICS AND ATTRIBUTES

The following summarizes the road surface types within the Municipality, weighed by length:

Surface Type	Length (km)	Percentage
Hot Mix Asphalt	15.0	68.8%
Surface Treated	6.6	30.3%
Gravel	0.2	0.9%

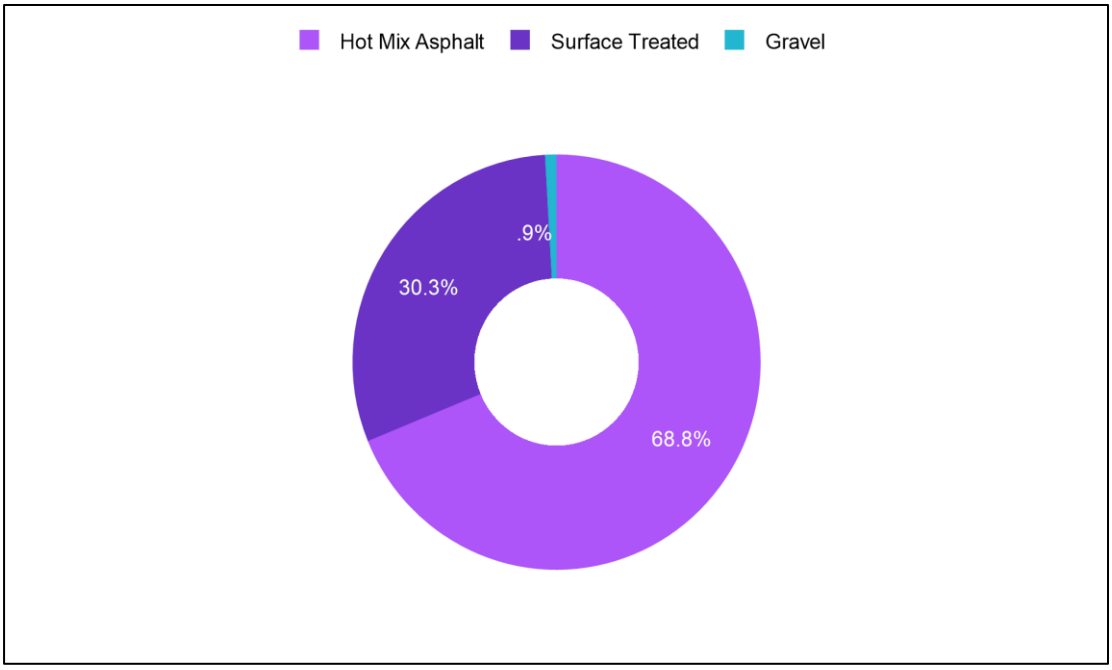


Figure 13: Roads by Surface Types

5.1.2 CONDITION ASSESSMENT APPROACH

The state of the infrastructure for roads is determined through a condition based analysis. The five (5) Condition States are defined as follows:

Active	Condition Level	Condition Index Range		
✓	Very Poor	0	to	35
✓	Poor	35	to	50
✓	Fair	50	to	65
✓	Good	65	to	80
✓	Excellent	80	to	100

Figure 14: Road Condition State Ranges

The most recent Roads condition assessment was done by the Municipality's Public Works department in 2020. This condition assessment was a windshield inspection, assessing the road surface visually and taking into account the ride comfort to assign condition ratings. The Municipality's condition ratings were then converted to a PCI scale from 0 to 100. Since the assessment is current, the DOT™ feature to calculate estimated current condition ratings by applying all road maintenance projects since the most recent assessment, and built-in degradation curves, are not utilized. The 2020 Overall Network Condition (PCI) of the roads is 66. This represents an overall "Good" condition state.

Title	Condition	Condition State
Network Overall Condition	66	Good

The following summarizes the Network Pavement Condition States, weighted by section length:

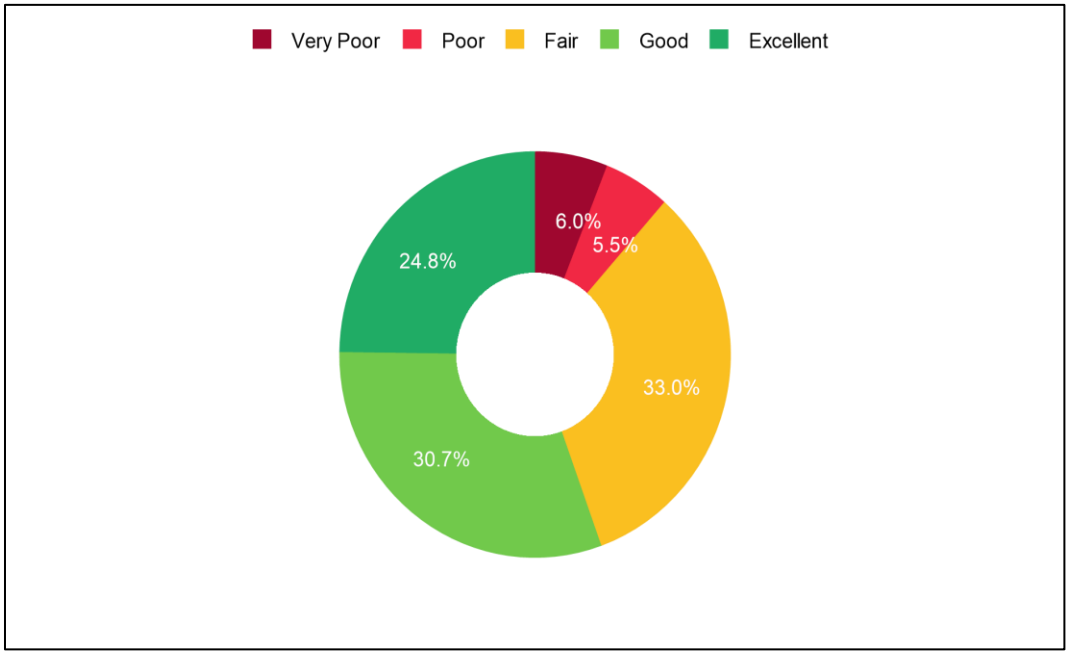


Figure 15: Road Network Condition States

The Condition States by Surface Type are shown in Figure 16:

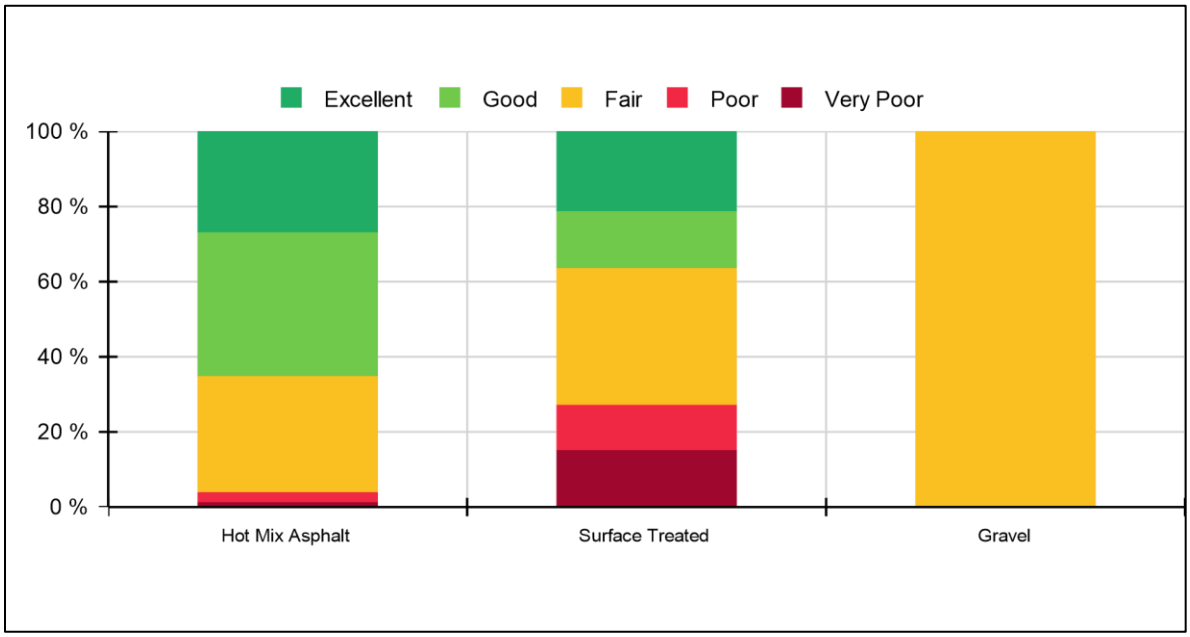


Figure 16: Road Network Condition by Surface Type

The Map view of the condition state is shown in Figure 17.

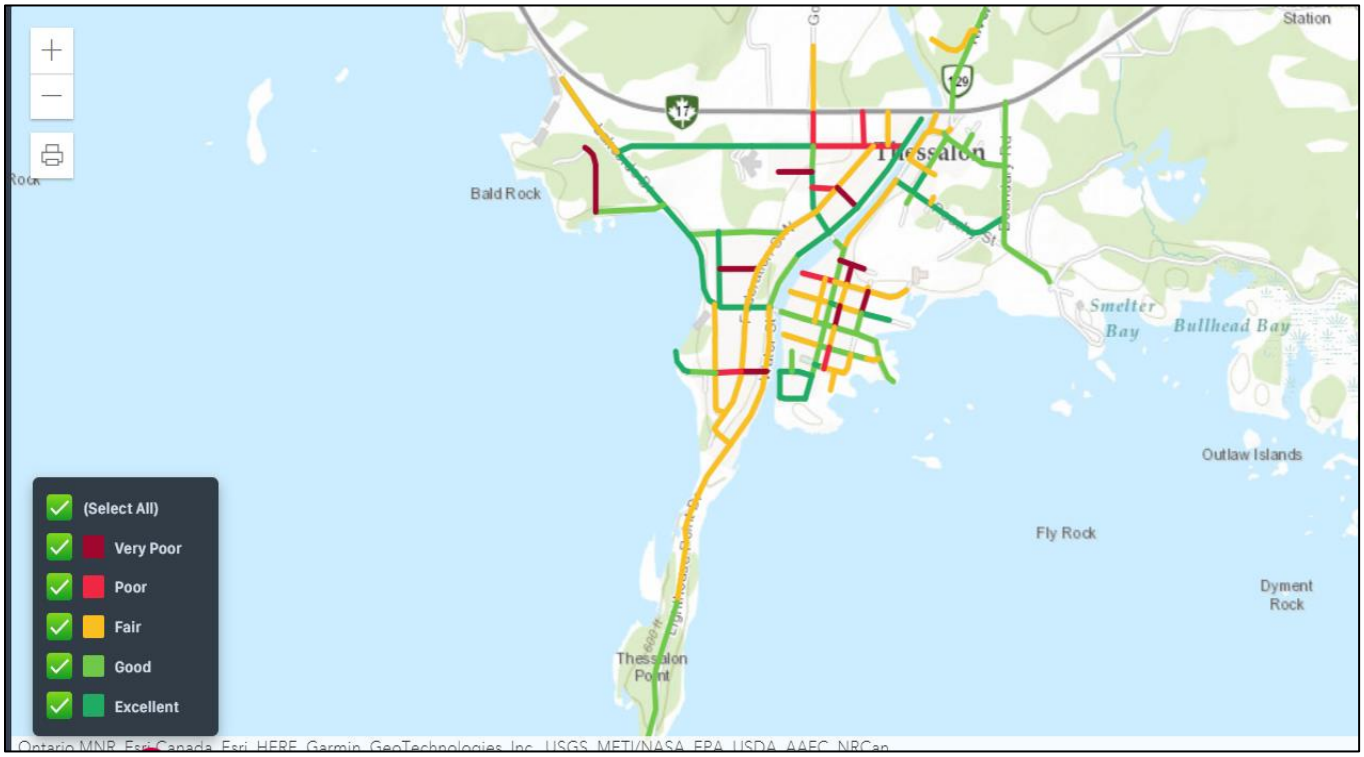


Figure 17: Road Network Condition Map

5.1.3 CRITICALITY AND RISK CRITERIA

Criticality

Based on the data attributes available, the Criticality settings were applied based on Surface Type and Traffic (AADT). Socio-economic factors were not included at this time.

Criticality Settings

Surface Type	4
Gravel	10
Hot Mix Asphalt	100
Surface Treated	60
AADT	**10**
1 - 50	0
50 - 200	20
200 - 400	40
> 400	100

Figure 18 shows the Criticality states of the various road sections:

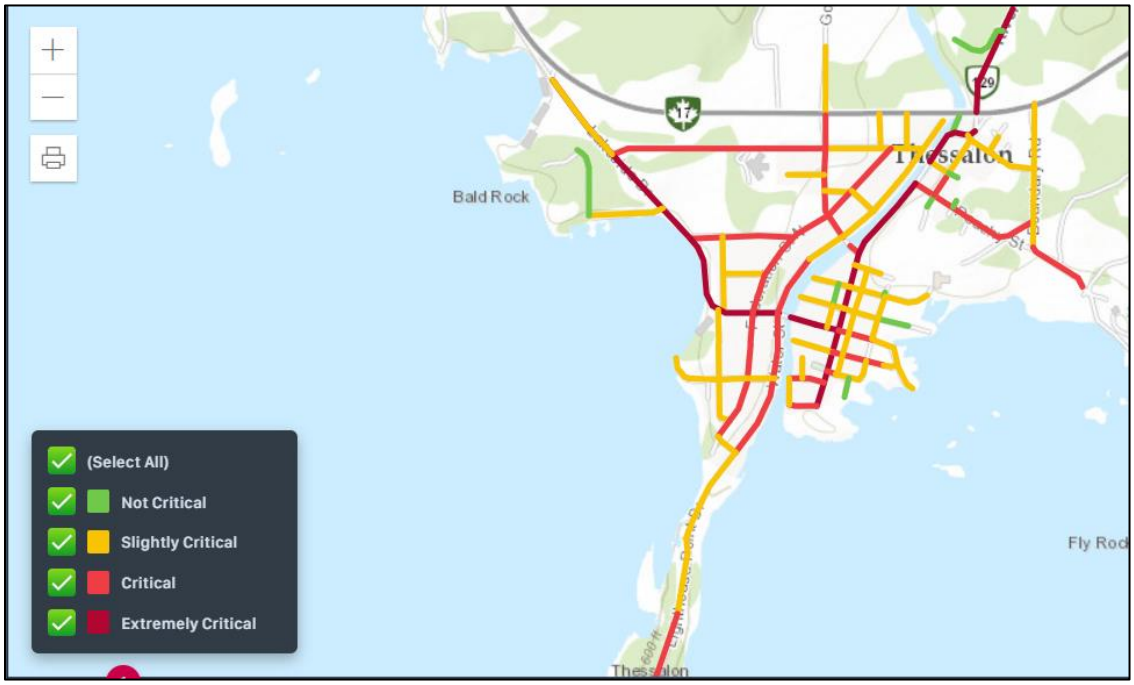


Figure 18: Road Network Criticality Map

Risk

The Risk settings for Roads are done as described in section 4. Figure 19 shows the Risk levels of the road system:

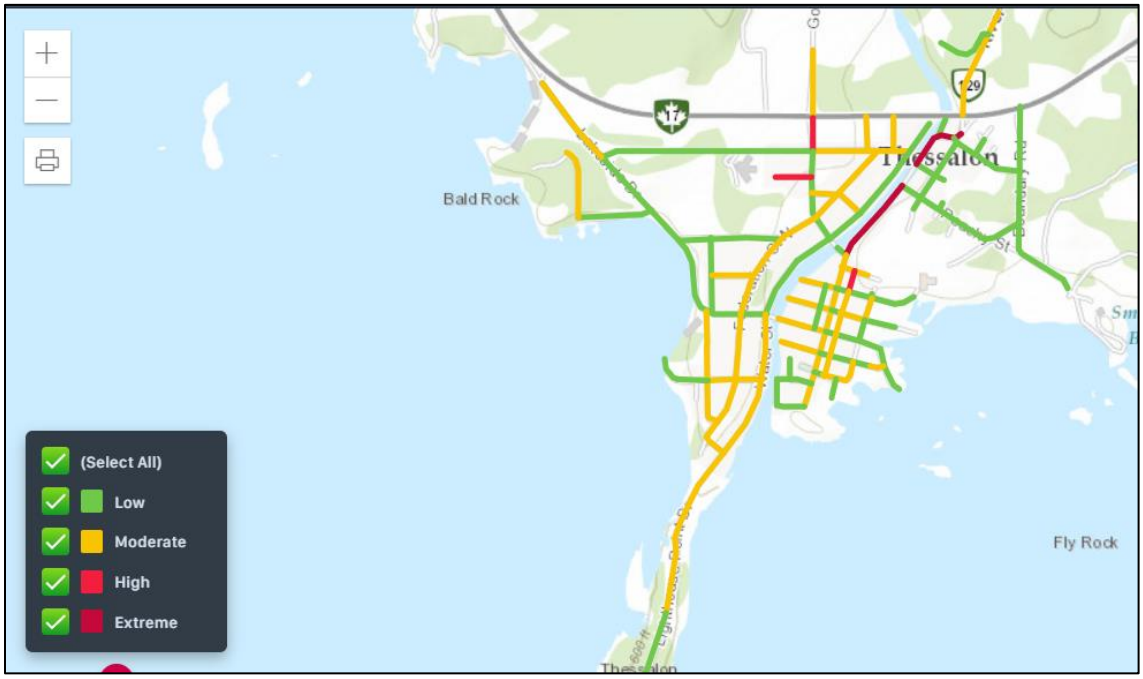


Figure 19: Road Network Risk Map

Due to the nature of the Roads assets, there are no risk targets set in the planning.

5.1.4 LEVEL OF SERVICE REQUIREMENTS

The Town targets to maintain the Network condition for roads at the current Network PCI of 66, which is just within the "Good" condition state, during the entire 10-year plan period. In addition, the Municipality does not want to have more than 15% of their roads in poor condition, i.e. below a condition rating of 50. The Level of Service Settings are as follow:

LOS Constraints

Acceptable Performance					
Name	**Perf. Class**	**Perf. Attribute**	**Constraint**	**Violation**	**Penalty**
Minimum Performance	Network	PCI	>= 66 by 2021	Soft	Normal
Max Percentage at Performance Threshold					
Name	**Perf. Class**	**Perf. Attribute**	**Constraint**	**Violation**	**Penalty**
Max PCI < 50	Network	PCI	15.0% <= 50 by 2030	Hard	NA

5.1.5 LIFECYCLE MANAGEMENT STRATEGY

A number of treatment options are available for all surface types, including Routine Maintenance, Preventive Maintenance, Minor and Major Rehabilitation and Reconstruction treatments. The treatment costs are based on contractor costs for the region and cost data provided by the municipality. The treatment options and their unit costs are summarized here:

Treatment Methods

Treatment	Description	Unit Cost
ST-Slurry	Slurry Seal	3.50 $/m²
ST-SST	Single Surface Treatment (Chip Seal)	4.00 $/m²
ST-DST	Double Surface Treatment (Chip Seal)	6.50 $/m²
ST-DST SAMI	Double Surface Treatment (Chip Seal) & SAMI	8.50 $/m²
ST-FDR & DST	Full Depth Reclamation (FDR) + Double Surface Treatment	10.00 $/m²
ST-FDR & DST & SAMI	Full Depth Reclamation (FDR) + Double Surface Treatment + SAMI	12.00 $/m²
ST-FDR & Ovly	Full Depth Reclamation (FDR) + One lift Overlay	27.50 $/m²
ST-FDR & 2Ovly	Full Depth Reclamation (FDR) + Two Lift Overlay	51.50 $/m²
ST-Recon & Ovly	Full Depth Reconstruction (350 Gran B, 150 Gran A, 90 HMA)	198.20 $/m²
ST-Recon &2 Ovly	Full Depth Reconstruction (350 Gran B, 150 Gran A, 140 HMA)	222.20 $/m²
HMA-Crack Seal	Crack Sealing	0.25 $/m²
HMA-Slurry	Slurry Seal	3.50 $/m²
HMA-ST	Single Surface Treatment (Chip Seal)	4.00 $/m²
HMA-DST	Double Surface Treatment (Chip Seal)	6.50 $/m²
HMA-DST SAMI	Double Surface Treatment with SAMI	8.50 $/m²
HMA-EnhSurf	Enhanced Thin Surfacings (Microsurfacing, Thin HMA Overlay)	4.00 $/m²
HMA-Enh2Surf	Enhanced Double Thin Surfacings (Cape Seal, Double Microsurfacing)	6.50 $/m²

HMA-Ovly	One Lift Overlay / Mill and One Lift Overlay	24.00 $/m²
HMA-2Ovly	Two Lift Overlay / Mill and Two Lift Overlay	48.00 $/m²
HMA-FDR & 2Ovly	Full Depth Reclamation (FDR) + Two Lift Overlay	51.50 $/m²
HMA-FDARR & 2Ovly	Full depth asphalt removal and replacement (Two Lifts HMA)	53.00 $/m²
HMA-FDARR & 3Ovly	Full depth asphalt removal and replacement (Three Lifts HMA)	77.00 $/m²
HMA-Recon 90HMA	Full Depth Reconstruction (350 Gran B, 150 Gran A, 90 HMA)	198.20 $/m²
HMA-Recon 140HMA	Full Depth Reconstruction (350 Gran B, 150 Gran A, 140 HMA)	222.20 $/m²
Re-Gravelling (50 mm or 2 in)	Re-Gravelling (50 mm or 2 in)	6400.00 $/Km
Re-Gravelling (100 mm or 4 in)	Re-Gravelling (100 mm or 4 in)	8200.00 $/Km
Rehabilitation	Rehabilitation	10000.00 $/Km
Grading	Grading	120.00 $/Km
Drainage Maintenance	Drainage Maintenance	1200.00 $/Km
Dust Control	Dust Control	1000.00 $/Km
Upgrade to ST	Upgrade to ST	31500.00 $/Km
Re-Gravelling HT (100 mm or 4 in)	Re-Gravelling in High Traffic (100 mm or 4 in)	8200.00 $/Km
Rehabilitation HT	Rehabilitation in High Traffic	10000.00 $/Km
Grading-2Times	Grading-2Times	240.00 $/Km
Grading-3Times	Grading-3Times	360.00 $/Km
Grading-4Times	Grading-4Times	480.00 $/Km

Utilization of Preventive Maintenance Treatments

In 2018 Infrastructure Solutions Inc. conducted the most comprehensive Canadian survey of municipal road maintenance practices ever undertaken. The 171 survey participants represented 45,000 km of paved road, 15% of Canada's population, and a wide range of municipalities by region and population. The survey was designed to identify the extent to which municipalities apply preventive maintenance treatments, to attain practical observations about treatment options and lifecycle gains and clarify user perceptions about what constitutes best road maintenance practices. The results are truly disturbing.

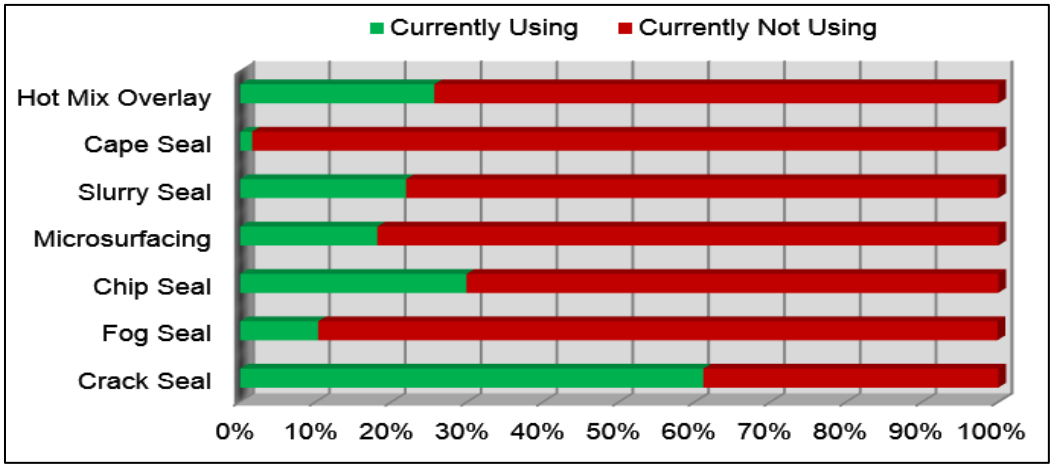


Figure 20: Current Application of Preventive Maintenance Across Canadian Municipalities

The survey established that 98% of respondents perceive preventive maintenance as an important and cost-effective approach to extend the service life of their pavements and to save the municipality significant capital investment in the long run. The survey further establishes that a majority of the municipalities do not apply preventive maintenance treatments (Figure 3) and have a widely-varied understanding of when these treatments should be applied.

Respondents were asked what percentage of their municipality they believe is currently being maintained according to best practices. Figure 4 shows the survey's cumulative response on the application of chip seal, micro-surfacing, and slurry seal to paved roads. For every major surface treatment type, less than 20% of municipal road networks are maintained in accordance with what respondents believe to be best practice.

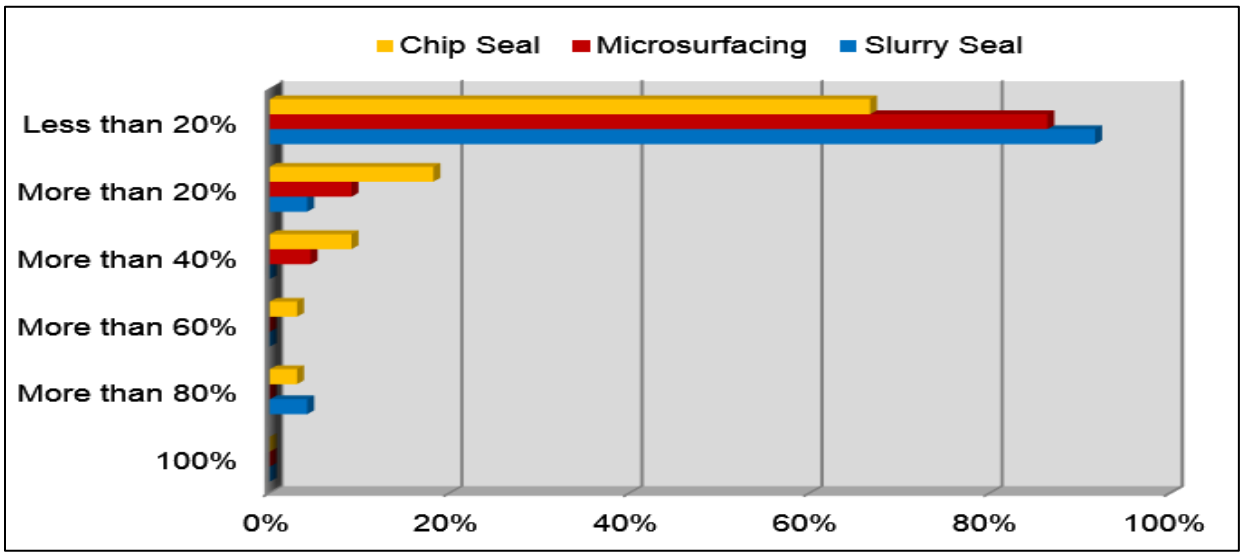


Figure 21: Application of Preventive Treatments According to Best Practices

This contradiction between the clearly appreciated benefits of preventive maintenance and the inadequate application of preventive treatments in practice has deep roots. Municipalities may be overly reactive to community requests. Councils surely follow the advice of Roads Needs Studies, where engineering companies recommend repairing worst roads first for safety and other reasons, assuming an unlimited municipal budget. Deteriorated water or wastewater lines might necessitate road reconstruction for line replacement and take precedence over maintenance. Smaller municipalities often use Excel or simplistic pavement management programs which typically recommend projects based on a simple ranking process. Finally, many municipalities still operate on an ad hoc basis, arbitrarily selecting roads which need rehabilitation or reconstruction work without undertaking any analytical process whatsoever. Whatever the circumstance, tax dollars are being poured into potholes unnecessarily.

5.1.6 BUDGET CONSTRAINTS

A Target Scenario was run to establish required funding levels to maintain a PCI of 66 to the end of the 10-year plan. An annual Capital budget of $110k and a Routine Maintenance Budget of $10,000 is required to achieve this goal.

Budget Constraints

Total Capital Budget					
Name	**Subset**	**Settings**	**From**	**To**	**AGF**
Network Capital Budget	NA	<= $110,000	2021	2030	0.0%

Total Routine Maintenance Budget					
Name	**Subset**	**Settings**	**From**	**To**	**AGF**
Maintenance Budget	NA	<= $10,000	2021	2030	0.0%

The $110k capital budget is fully utilized each year. The Capital Expenditures are shown here:

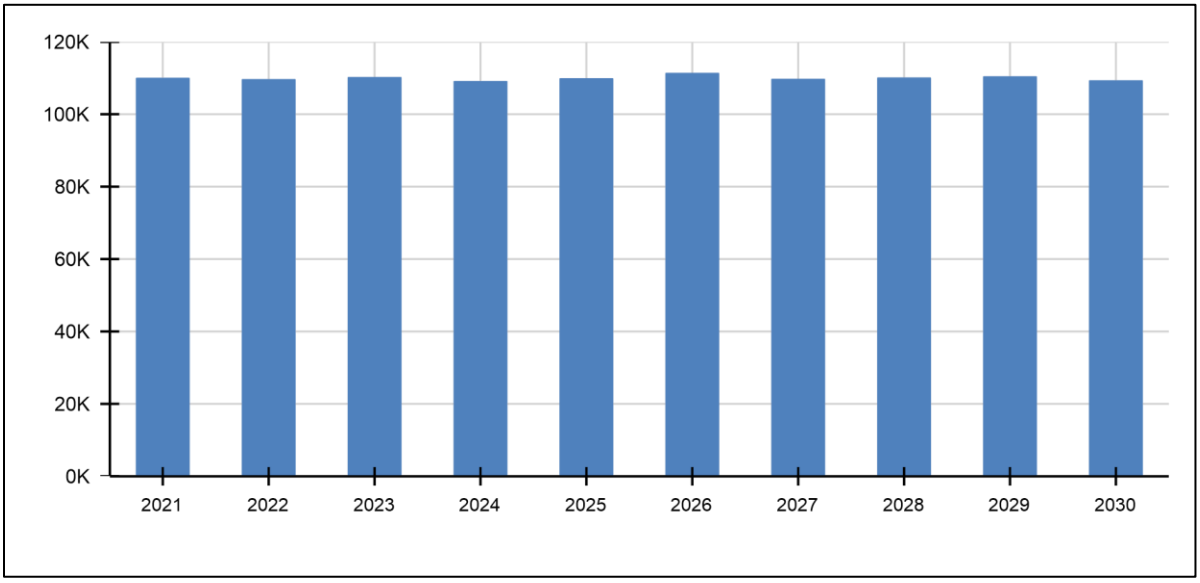


Figure 22: Roads Capital Expenditures

The recommended routine maintenance Budget is shown here.

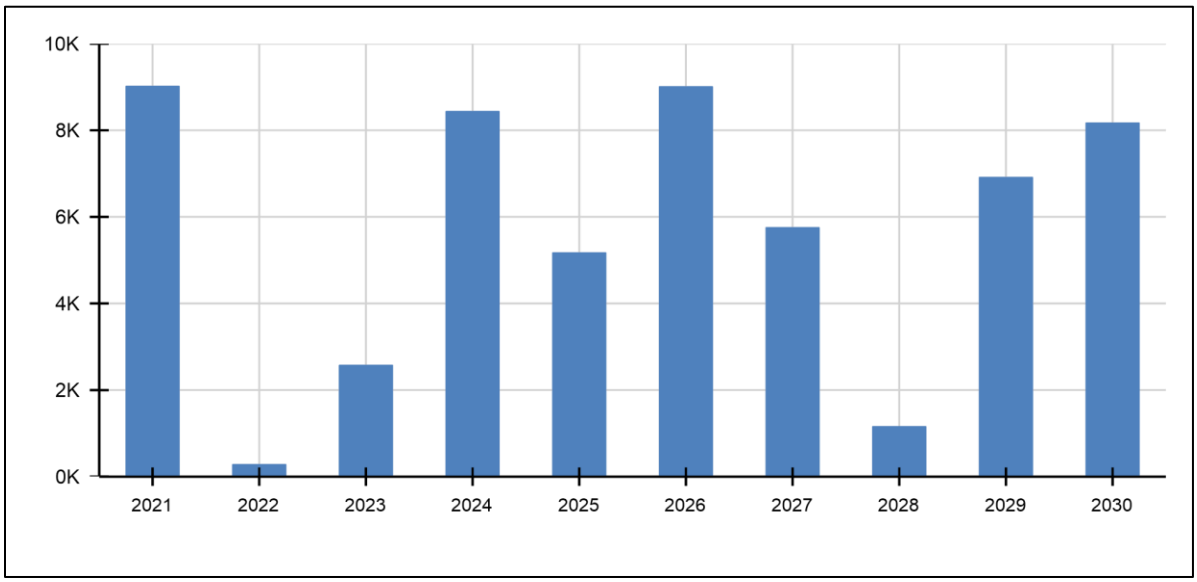


Figure 23: Roads Routine Maintenance Expenditures

5.1.7 OPTIMIZED CAPITAL PLANNING RESULTS

Optimization analysis has been performed for the Road network to produce a workable capital plan considering municipal constraints and objectives, while maximizing network overall performance to achieve the highest possible investment efficiency.

The Optimization Analysis Settings are as follows:

Scenario	
Name:	AMP Budget 110k/year
Description:	Budget 110k/yr, Maintenance $10k/yr
Year:	2021

Optimization Settings	
Optimization Mode	Standard
Planning Horizon (Years)	10
Include Priorities	Yes
Operational Efficiency	No
Estimate Current Condition	True

Optimization Objective

Type	Min/Max	Weight (Sum = 1)	Performance Attribute
Maximize Network Performance	Max	1	NA

Network Optimization Results

Figure 24 shows the network overall network performance throughout the plan period:

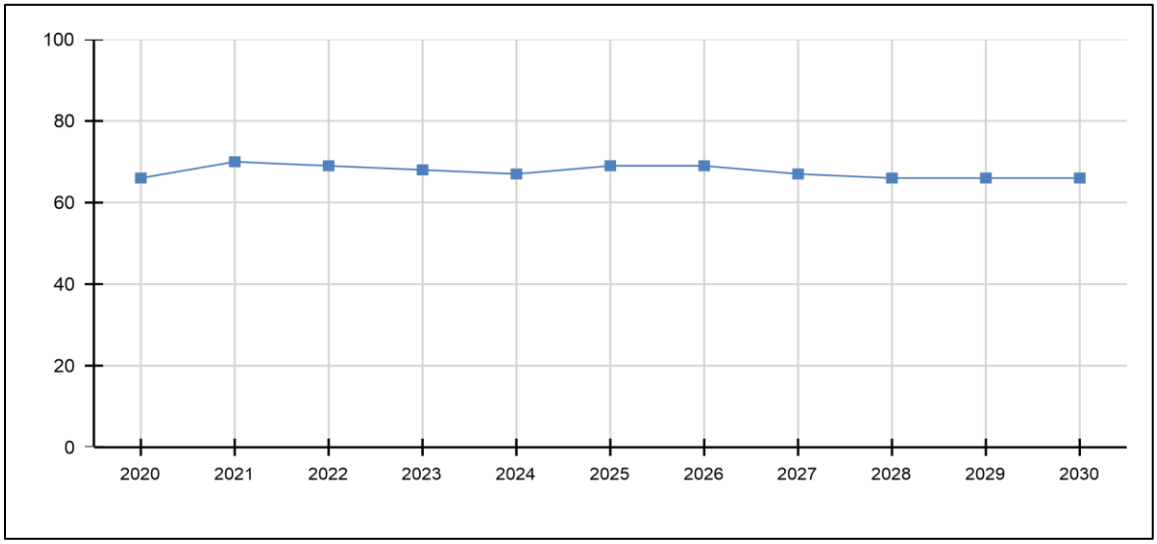


Figure 24: Roads Overall Network Performance

Over the next 10 years, the performance of the Road network is maintained at the current condition of 66.

Figure 25 shows the condition state distribution for each year of the plan:

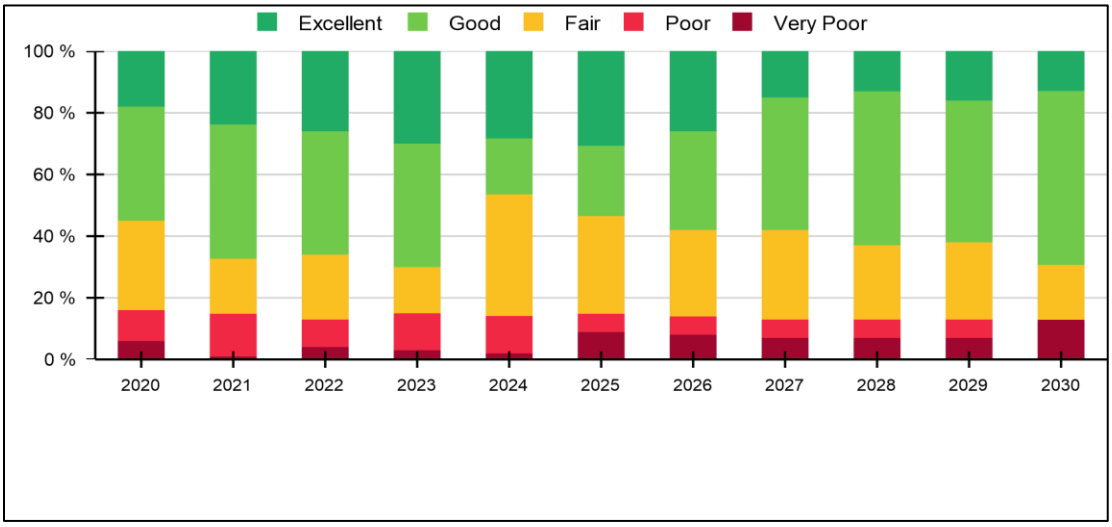


Figure 25: Roads Annual Network Condition Status

As shown in this figure, at the beginning of the plan 6% is in very poor, 10% in poor, 29% in fair, 37% in good, and 18% in excellent condition. At the end of the 10-year plan 13% of sections will be in very poor, 18% in fair 57% in good, and 13% in excellent condition, a significant improvement.

5.1.8 RECOMMENDED PROJECTS

An overview of the annual capital projects is shown in Figure 26. The road treatment costs are based on contractor costs for the region and cost data provided by the Municipality. The detailed capital Investment plan specifying which road section is scheduled for which suggested treatment, in which year, and at what budgeted cost is presented in Appendix A, the Capital Investment Plan the Municipality.

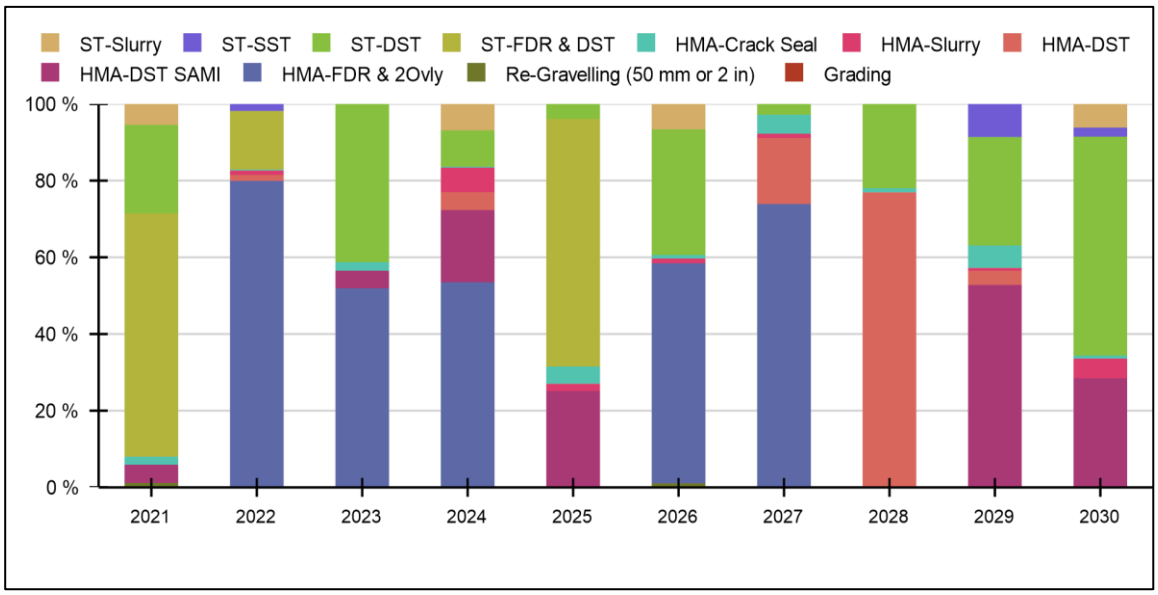


Figure 26: Roads Capital Project Overview

5.1.9 GRAVEL ROADS

DOT™ Transportation software being provided to the Municipality includes an GRMS (Gravel Road Management System). The Gravel Road Management System is fully integrated into the DOT™ Roads module, and the interventions are included in the capital planning results. The GRMS was designed to meet the following criteria:

- manage inventory, condition data, and maintenance history of the gravel roads in conjunction with the paved roads;
- establish refined priority policies using network-wide priority settings based on various physical attributes, such as traffic, functional class, roadside environment, in addition to socio-economic factors for individual road segments;
- specify detailed routine maintenance polices based on local knowledge or pre-set schedules;
- identify when gravel roads should be upgraded to a hard surface;
- compare the longer-term impacts of multiple scenarios with different policy and budget settings; and
- generate a 10-year capital plan with road lists, budgeted costs, annual schedules, and map visualizations.

Decision to Upgrade to Surface Treatment

A key component of the analysis module of a GRMS is to determine if surface treating (i.e., chip sealing, oiling or similar) a gravel road is a sensible option. A financial analysis (i.e., discounted cash flow analysis) can be performed based on the initial cost of upgrading and the cost of subsequent maintenance activities in both cases. Figure 15 shows an example of a financial analysis on two gravel road segments. First segment is 476 m long with AADT of 250 and the other segment is 973 m long with AADT of 50. The analysis uses an inflation rate of 1.5% and a nominal discount rate of 3%. In the first case (AADT of 250), the cost of maintenance as a gravel road (i.e., the cost of re-gravelling, drainage maintenance, grading, and dust control) over the next 20 years in today's dollars is estimated at about $69,000. By surface treating this segment the 20-year maintenance costs are reduced to about $37,000 (i.e., the initial cost of a double chip seal with subsequent slurry seals and single chip seal treatments). It is, therefore, more cost effective to chip seal this segment. In the second case (AADT of 50), however, the cost of maintaining the segment with a gravel surface is around $22,000 less compared to surface treatment.

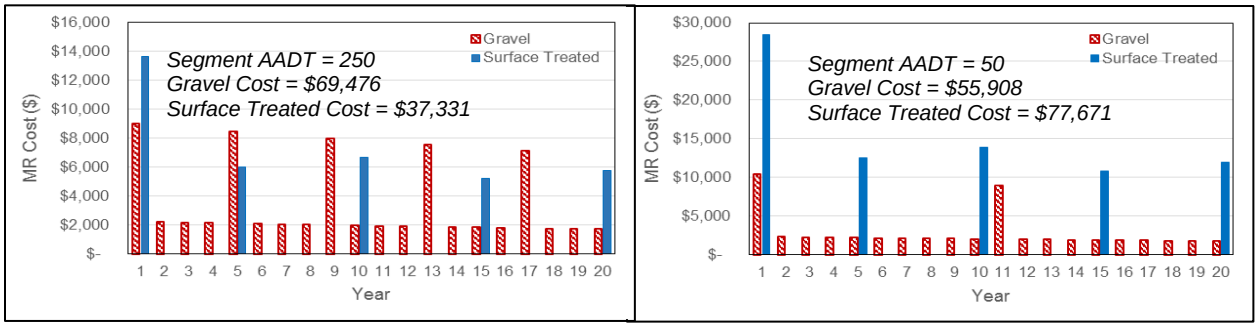


Figure 27: Financial analysis of upgrading gravel roads to surface treated

Performing financial analysis indicates that traffic is a major determinant of the time of upgrade for a gravel road. In addition to financial analysis, other considerations that should factor in the decision are described below:

- **Structural Capacity**: When a gravel road is upgraded, the surface treatment acts as a sealant and reduces moisture penetration. It also prevents surface gravel loss, eliminates dust generation, and increases user satisfaction by providing a smoother ride and better appearance. A surface treatment, however, does not improve the structural capacity of a gravel road. A gravel road with structural or subgrade defects, needs to be structurally enhanced or rehabilitated before upgrading to surface treatment. The cost of rehabilitation and stabilization should be added to the initial cost of surface treatment as part of the financial analysis. Upgrading a gravel road with structural defects can significantly reduce the service life of the surface treatment and result in poor performance.

- **Drainage**: Similar to structural capacity, adequate drainage provision of a surface treated road is imperative to achieving satisfactory long-term performance. Surface treated roads are less forgiving to frost damage than gravel surfaces. Poor drainage conditions will reduce the useful life of a surface treatment and make it expensive to maintain.

- **Traffic Characteristics**: Types of traffic can significantly affect the performance of surface treated roads. In some cases, a gravel road can be an agricultural or mining access road that experiences heavy or overloaded trucks on a regular basis. In general, if a gravel road serves heavy traffic, upgrading to surface treated can become an expensive decision since heavy trucks are more damaging to a surface treated road and the cost of rehabilitation is higher. In this case, it may be better to retain the gravel surface and upgrade to a superior load-bearing hot mix asphalt pavement when sufficient funds are available.

- **Road Geometry**: When a gravel road is upgraded to surface treated, it encourages drivers to drive faster and therefore operational speed increases. It may also increase traffic volumes as more motorists decide to use it. Substandard geometric features such as horizontal and vertical alignments, sight distances, lane widths, shoulder widths, superelevations, in addition to lack of signage, can result in safety hazards and a higher risk of accidents. It might be necessary to improve the geometric features of a road before upgrading to surface treatment and the cost of these improvements should be taken into account as part of a financial analysis.

- **Opinions of Local Residents**: While it is usually assumed that local residents will support an upgrade to surface treatment, this is not always the case. Local users may prefer to retain a gravel road rather than encouraging more traffic, higher speeds and greater use of the route by commuters. It should also be noted that from a context sensitivity perspective, gravel surfacing may be more compatible with the road environment and community setting.

5.2 BRIDGES

The Town of Thessalon has a total of 2 Bridges. Element level data was provided by the Town, so an element-based analysis was done. There are a total of 80 Bridge Elements.

5.2.1 BRIDGE GEOMETRICS AND ATTRIBUTES

The following summarizes the Bridge Element Groups within the Municipality, weighed by Replacement Cost:

Element Group	Replacement Cost	Percentage
Approaches	340,620	9.3%
Barriers	74,310	2.0%
Beams/Main Longitudinal Elements	480,500	13.1%
Bracing	35,000	1.0%
Coatings	442,768	12.0%
Decks	1,138,706	31.0%
Foundations	500,000	13.6%
Joints	22,060	0.6%
Sidewalks/curbs	31,920	0.9%
Trusses/Arches	242,001	6.6%
Abutments	364,070	9.9%
Accessories	2,500.0	0.1%

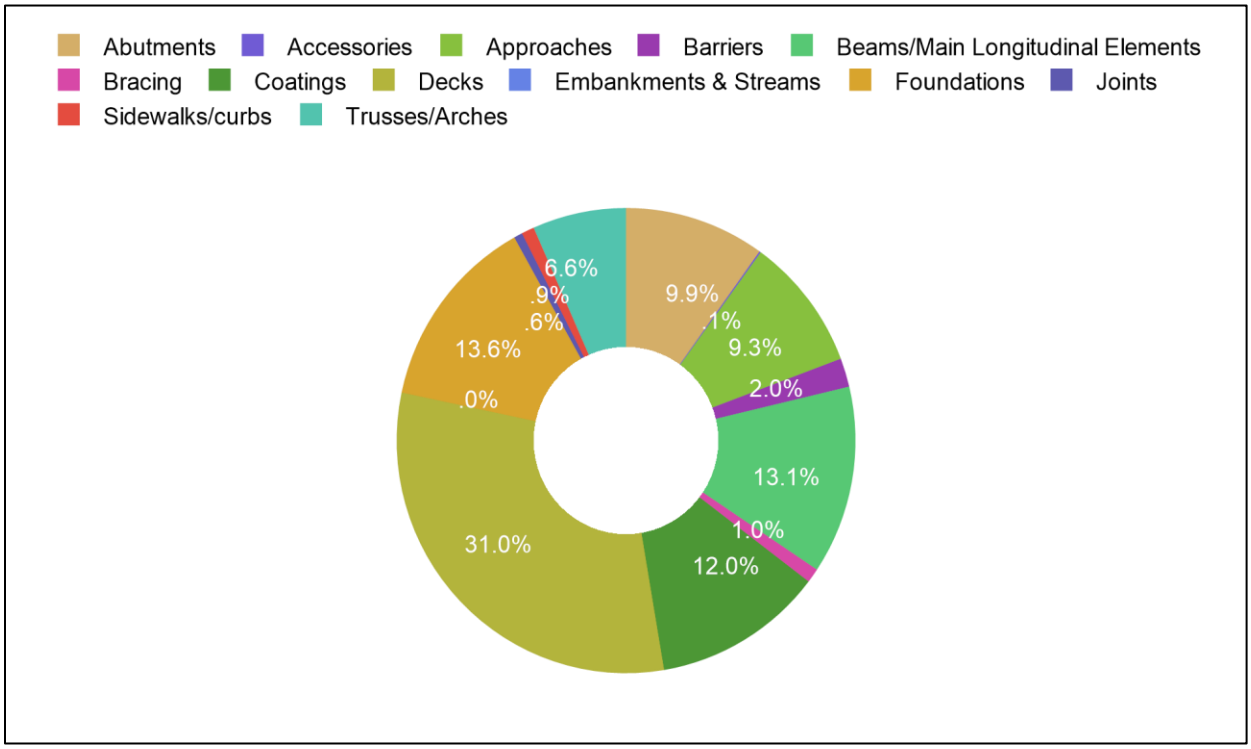


Figure 27: Bridge Element Groups

5.2.2 CONDITION ASSESSMENT APPROACH

The state of the infrastructure for Bridges is determined through a condition based analysis. The five (5) Condition States are defined as follows:

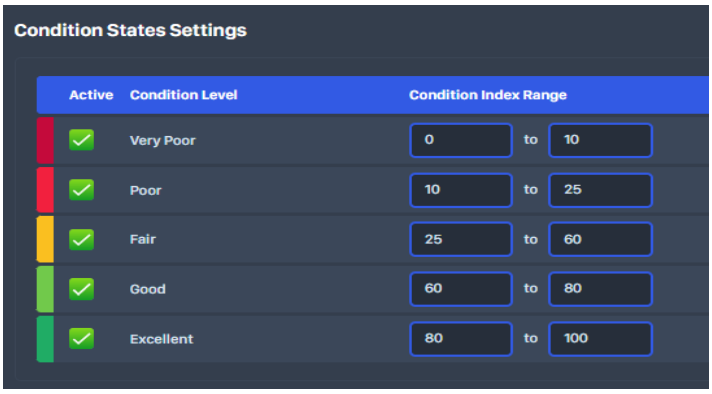


Figure 28: Bridge Condition State Ranges

Bridges condition assessments done in 2015. Detailed geometric and design data with element data is provided on the inspection sheets, together with an overall Structural Condition Rating, and an overall Sufficiency Rating. Condition data was provided for the bridge elements, so detailed element classification of bridges was analyzed.

Since the assessments are from 2015, DOT™ is used to calculate the estimated current condition ratings by applying built-in degradation curves. Based on this methodology, the overall estimated 2020 condition of the Bridge Network is 48.1, with John Fullerton Bridge at 47.7, and Government Rd. Bridge at 48.7. This represents an overall “Fair” condition state.

Title	Condition	Condition State
2020 Est. Network Condition Overall	48.1	Fair
John Fullerton Bridge	47.7	Fair
Government Rd Bridge	48.7	Fair

The following summarizes the Est. 2020 Network Bridge Element condition states, weighed by replacement cost:

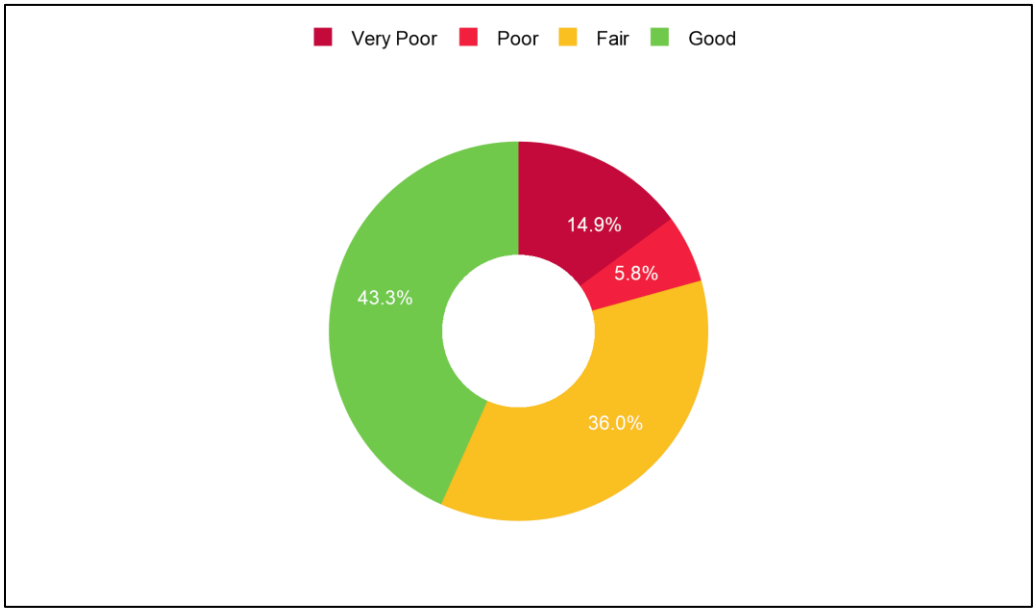


Figure 29: Bridge Network Condition

The Condition Status by Bridge Element Group are shown in Figure 30:

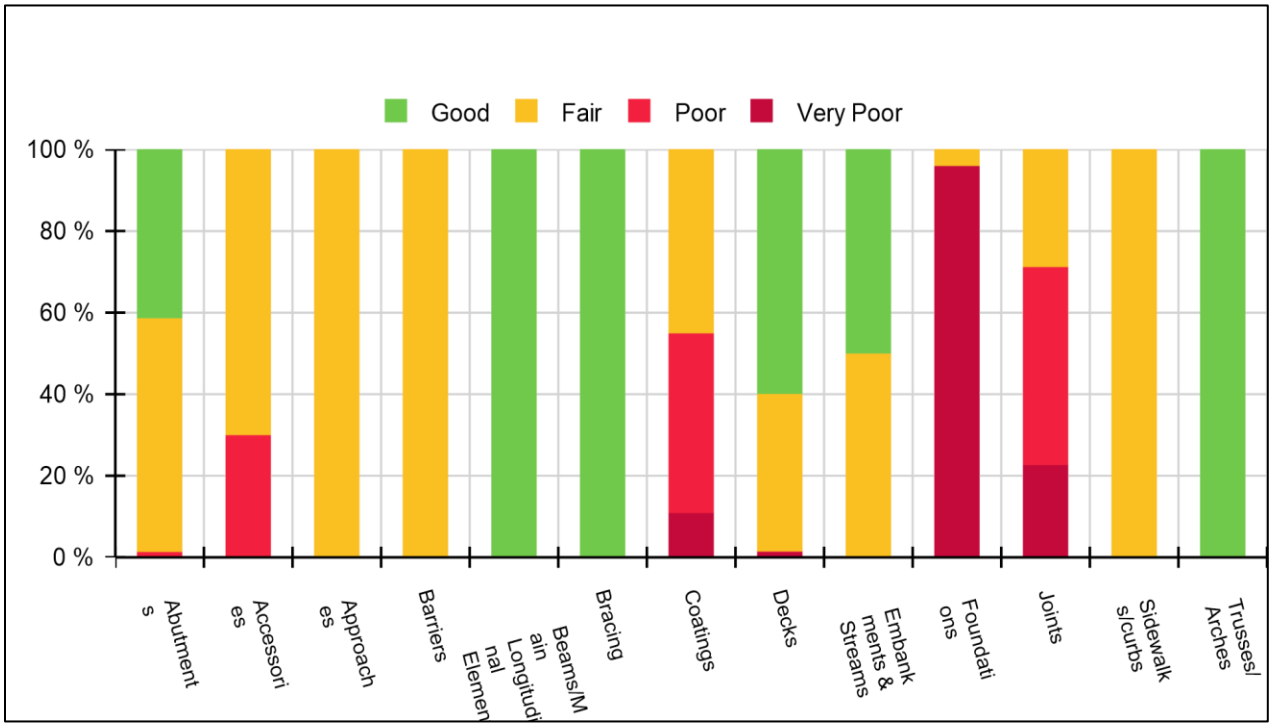


Figure 30: Bridge Network Condition by Bridge Element Group

The Condition States by Bridge Element Material are shown in Figure 31:

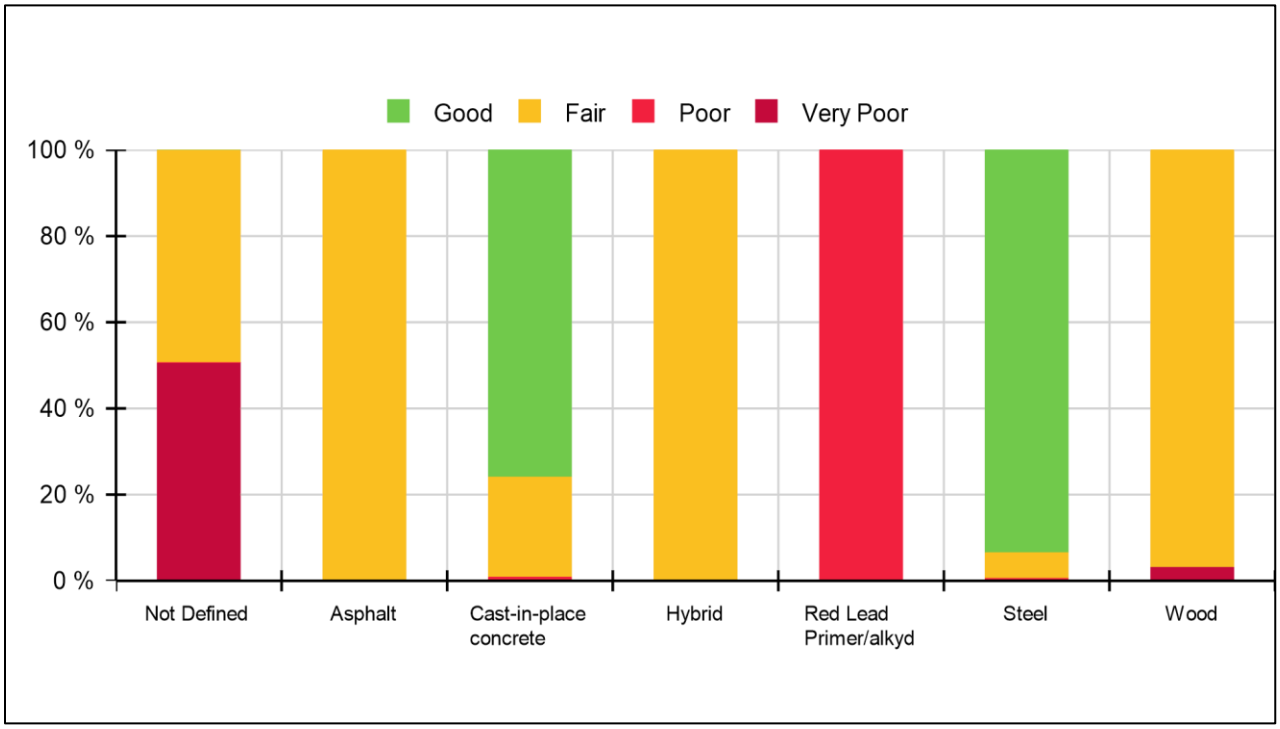


Figure 31: Bridge Network Condition by Bridge Element Material

The Map view of the condition state of the 2 Bridges is shown in Figure 32.

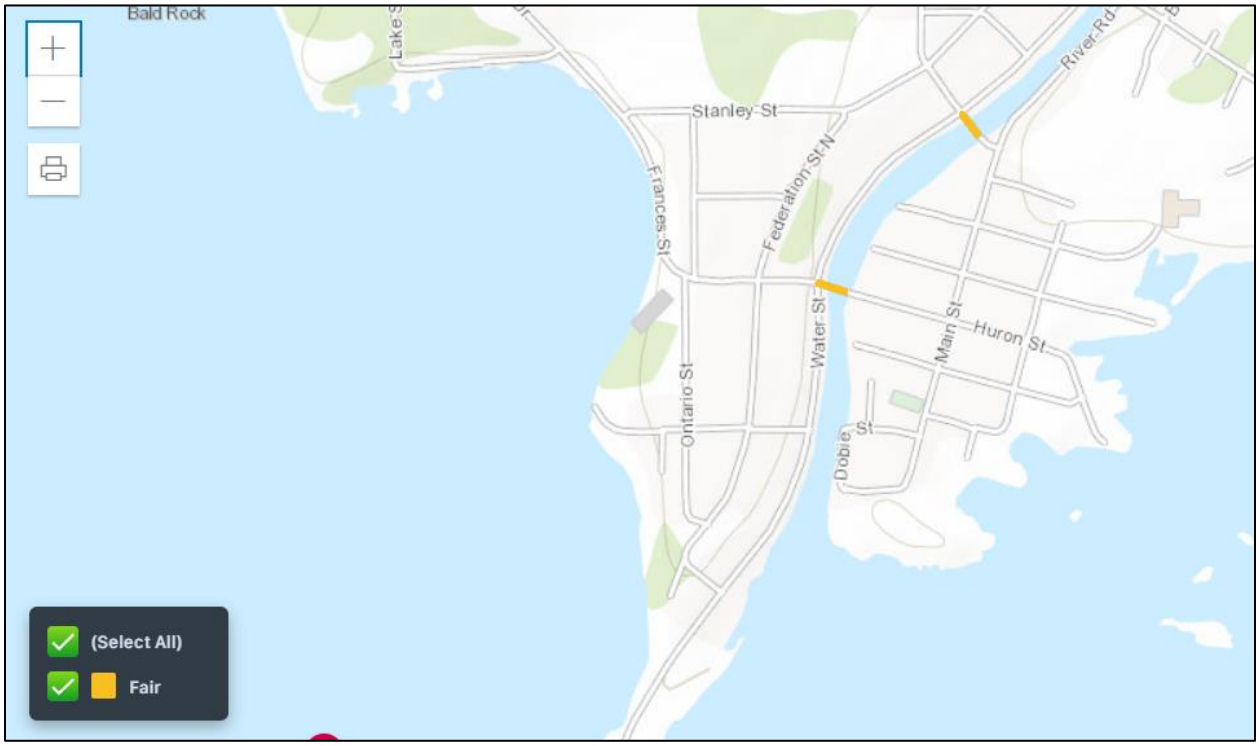


Figure 32: Bridge Current Network Condition Map

5.2.3 CRITICALITY AND RISK CRITERIA

Criticality

Based on the Data Attributes available, the Criticality settings were applied based on Element Group and Traffic (AADT). Socio-economic factors were not included at this time.

Criticality Settings

Element Group	6
Abutments	40
Accessories	20
Approaches	40
Barriers	40
Beams/Main Longitudinal Elements	90
Bracing	70
Coatings	20
Culverts	40
Decks	40
Embankments & Streams	20
Foundations	90
Joints	40
Other	20

Piers	70
Retaining walls	70
Sidewalks/curbs	20
Trusses/Arches	70
AADT	**7**
0 - 1000	20
1000 - 5000	40
5000 - 10000	70
10000 and over	90

Risk
The Risk settings for Bridges are done as described in Section 4. There are no risk targets set in the planning.

5.2.4 LEVEL OF SERVICE REQUIREMENTS

The Town targets to eliminate their Bridge Backlog by the end of the plan period

5.2.5 LIFECYCLE MANAGEMENT STRATEGY

With bridge element condition data available, the available treatments are listed below:

Treatment Methods

Treatment	Description	Unit Cost
Seal Concrete (Area)	Seal Concrete (Area)	18.00 $/m²
Steel Protective Coating Repair (Linear)	Steel Protective Coating Repair (Linear)	525.00 $/m
Repair Timber Elements (Area)	Repair Timber Elements (Area)	852.00 $/m²
Concrete Repair (Linear)	Seal/Patch/Repair Superstructure Concrete (Linear)	566.70 $/m
Crack Mitigation (Area)	Fatigue Crack Mitigation (pin-and-hanger replacement, retrofit fracture critical members) (Area)	42622.00 $/m²
Patch/Repair Substructure Concrete (Area)	Patch/Repair Substructure Concrete (Area)	4262.00 $/m²
Steel Member Repair (Area)	Steel Member Repair (Area)	2132.00 $/m²
Clean/Flush Drains	Clean and Flush Drains	70.00 $/m²
Clean Joints	Clean Joints	21.00 $/m
Clean/Wash Bridge	Clean/Wash Bridge	42.00 $/m²
Crack Sealing	Deck/Parapet/Rail Sealing and Crack Sealing	43.00 $/m
Polymer Overlay	Polymer Overlay	70.00 $/m²
Polymer-Modified Asphalt Overlay	Polymer-Modifed Asphalt Overlay	140.00 $/m²
Seal Concrete (Linear)	Seal Concrete (Linear)	9.00 $/m

Bearing Restoration	Bearing Restoration (cleaning, lubrication, resetting, replacement)	3900.00 $/ea.
Channel Cleaning / Debris Removal	Channel Cleaning / Debris Removal	19500.00 $/ea.
Concrete Deck Repair	Concrete Deck Repair (see halo effect below) in Conjunction with Overlays, CP Systems or ECE Treatment	1399.00 $/m²
Deck Overlays	Deck Overlays (thin polymer epoxy, asphalt with waterproof membrane, rigid overlays)	280.00 $/m²
Drains Repair/Replace	Deck Drains, Repair/Replace	650.00 $/ea.
ECE/CP	Electrochemical Extraction (ECE)/Cathodic Protection (CP)	70.00 $/m²
Crack Mitigation (Linear)	Fatigue Crack Mitigation (pin-and-hanger replacement, retrofit fracture critical members) (Linear)	21311.00 $/m
Joint Repair	Joint Repair/Replace/Elimination	6393.00 $/m
Joint Seal Replacement	Joint Seal Replacement	2131.00 $/m
Machinery Cleaning	Movable Bridge Machinery Cleaning/Lubrication/Repair	32500.00 $/ea.
Patch/Repair Substructure Concrete (Linear)	Patch/Repair Substructure Concrete (Linear)	2131.00 $/m
Pile Preservation	Pile Preservation (jackets/wraps/CP)	3900.00 $/ea.
Protective Coating Elements	Protective Coat Concrete/Steel Elements	420.00 $/m²
Protective Coating Substructure	Protective Coat/Concrete/Steel Substructure	852.00 $/m
Repair/Replace Approach Slabs	Repair/Replace Approach Slabs	490.00 $/m²
Scour Countermeasure	Scour Countermeasure (installation/repair)	65000.00 $/ea.
Concrete Repair (Area)	Seal/Patch/Repair Superstructure Concrete (Area)	1889.00 $/m²
Painting Steel Elements	Spot/Zone/Full Painting Steel Elements	128.00 $/m
Painting Steel Substructure	Spot/Zone/Full Painting Steel Substructure	128.00 $/m
Steel Member Repair (Linear)	Steel Member Repair (Linear)	1066.00 $/m
Repair Timber Elements (Linear)	Patch/Repair Timber Elements (Linear)	426.00 $/m
Coating Repair	Concrete Protective Coating Repair	140.00 $/m²
Coating Patching	Concrete Protective Coating Patching	350.00 $/m²
Masonry Bridge Rail Repair	Masonry Bridge Rail Repair	107.00 $/m
Seal Concrete Column	Seal Concrete Column	975.00 $/ea.
Repair Concrete Column	Repair Concrete Colum	6500.00 $/ea.
Gusset Plate Repair	Gusset Plate Repair	3250.00 $/ea.
Steel Beam Repair	Steel Beam Repair	1066.00 $/m
Protective Coating Beams	Protective Coating Beams	213.00 $/m
Secondary Cable Replacement	Secondary Cable Replacement	32500.00 $/ea.

Pin Replacement	Pin Replacement	45500.00 $/ea.
Seal Deck	Seal Deck	28.00 $/m²
Replace Concrete Top Flange	Replace Concrete Top Flange	2099.00 $/m²
Replace Concrete Culvert	Replace Concrete Culvert	426.00 $/m
Crack Sealing Deck/Slab	Crack Sealing Deck/Slab	140.00 $/m²
Concrete Deck Replacement	Concrete Deck Replacement	910.00 $/m²
Concrete Floor Beam Repair	Concrete Floor Beam Repair	1705.00 $/m
Concrete Girder/Beam Repair	Concrete Girder/Beam Repair	1492.00 $/m
Concrete Stringer Repair	Concrete Stringer Repair	1492.00 $/m
Protective Coating Steel Column	Protective Coating Steel Column	650.00 $/ea.
Repair Steel Colum	Repair Steel Colum	6500.00 $/ea.
Replace Steel Culvert	Replace Steel Culvert	2131.00 $/m
Steel Deck Repair	Steel Deck Repair	8396.00 $/m²
Steel Deck Replacement	Steel Deck Replacement	1399.00 $/m²
Steel Protective Coating Repair	Steel Protective Coating Repair	1050.00 $/m²
Protective Coating Steel (linear)	Protective Coating Steel (linear)	852.00 $/m
Repair Timber Column	Repair Timber Column	1950.00 $/ea.
Timber Deck Repair	Timber Deck Repair	3498.00 $/m²
Timber Deck Replacement	Timber Deck Replacement	2099.00 $/m²
Animal/Pest Control	Animal/Pest Control	420.00 $/m²
Erosion Control at Bridges	Erosion Control at Bridges	84.00 $/m²
Replace Plastic Culvert	Replace Plastic Culvert	1279.00 $/m
Joint Armour Replacement	Joint Armour Replacement	1119.00 $/m²
Plastic Element Replacement	Plastic Element Replacement	2799.00 $/m²
Reslope Soil/gravel surface	Reslope Soil/gravel surface	28.00 $/m²
Channel excavation	Channel excavation (small quantity)	429.00 $/m²
Re-attachment of utilities	Re-attachment of utilities	26000.00 $/ea.

5.2.6 BUDGET CONSTRAINTS

Routine Maintenance of up to 75k/year applied as a budget constraint, but no Capital budget limit is specified.

Total Routine Maintenance Budget					
Name	**Subset**	**Settings**	**From**	**To**	**AGF**
RM $75k/year	NA	<= $75000	2021	2030	0.0%

5.2.7 OPTIMIZED CAPITAL PLANNING RESULTS

Optimization analysis has been performed for the Bridges, on the basis of an unlimited capital budget and with a routine maintenance of $75k/year. The Optimization Analysis Settings are as follows:

Scenario	
Name:	AMP 10-year All Elements
Description:	Unlimited Capital Budget, Routine Maintenance $75k/yr
Year:	2021

Optimization Settings	
Optimization Mode	Target Optimization
Planning Horizon (Years)	10
Include Priorities	Yes
Operational Efficiency	No
Estimate Current Condition	True
Condition Variation	0.0%
Project Size Limit	0
Rollover	1

Optimization Objective

Type	Min/Max	Weight (Sum = 1)	Performance Attribute
Minimize Backlog	Min	1	NA

Network Optimization Results

Figure 33 shows the network overall network performance throughout the plan period:

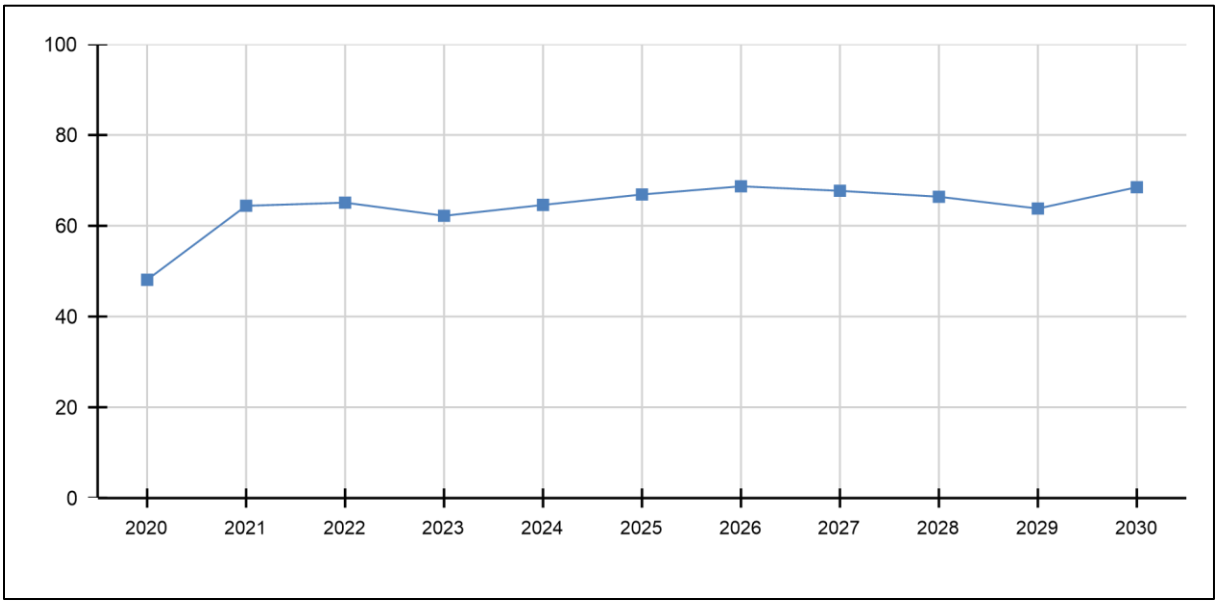


Figure 33: Bridge Network Performance

Over the next 10 years, the performance of the Bridge network increases from 48.1 to 68.5 at the end of plan.

Figure 34 shows the Network Performance by Bridge Element Type:

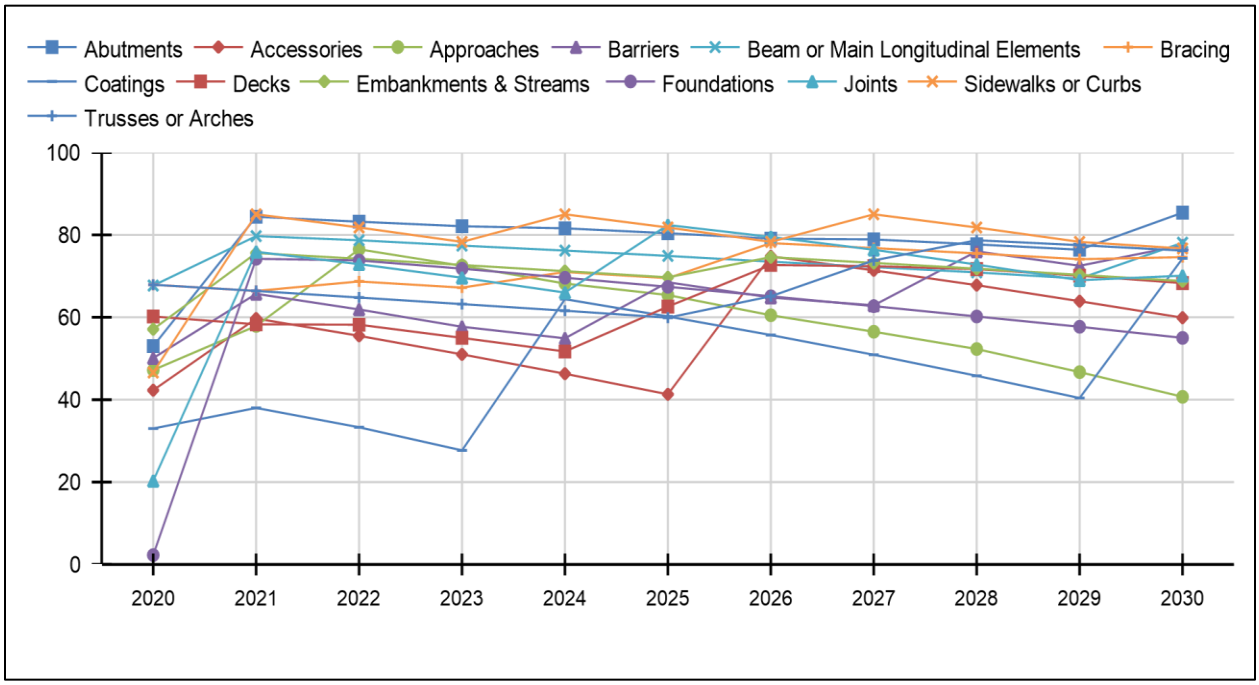


Figure 34: Bridge Network Performance by Bridge Element Type

Figure 35 shows the condition status distribution of the Bridge network for each year of the plan:

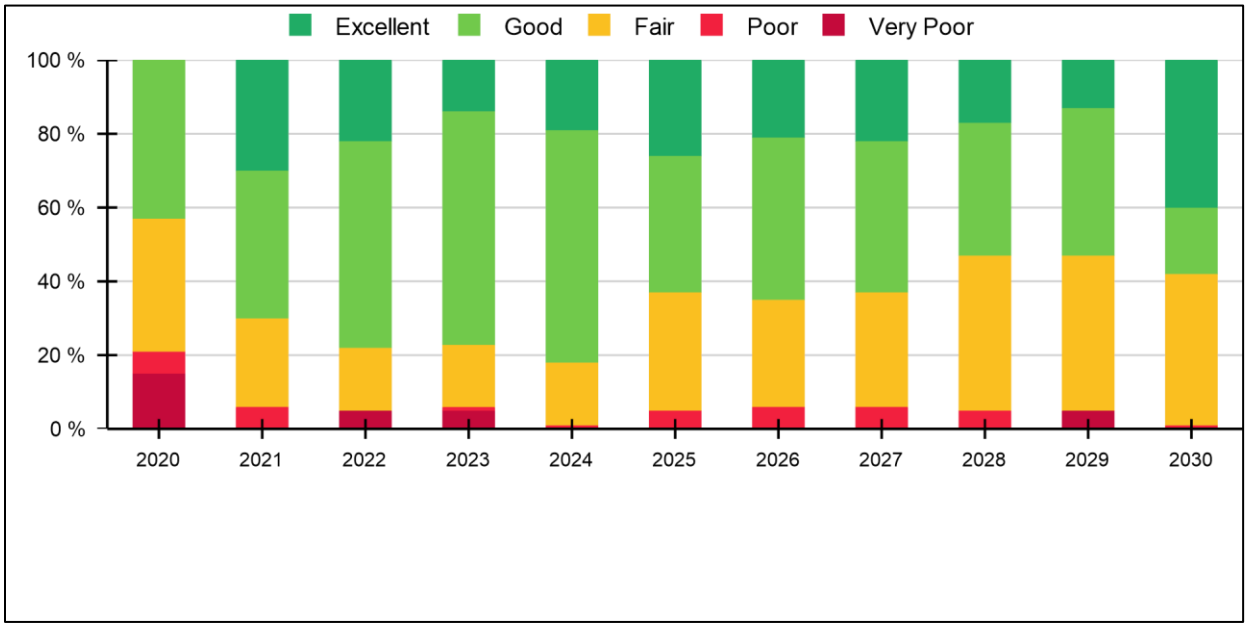


Figure 35: Bridge Annual Network Condition Status

As shown in this figure, at the beginning of the plan 43% is in good, 36% in fair, 6% in poor, and 15% in very poor condition. At the end of the 10-year plan, 40% will be in excellent, 18% in good, 41% in fair, and 1% in poor condition. Also, as per Level of Service target, none of the Bridges are in a deficit position end the end of the plan period.

The capital expenditures for Bridges during the 10 year plan period is shown here:

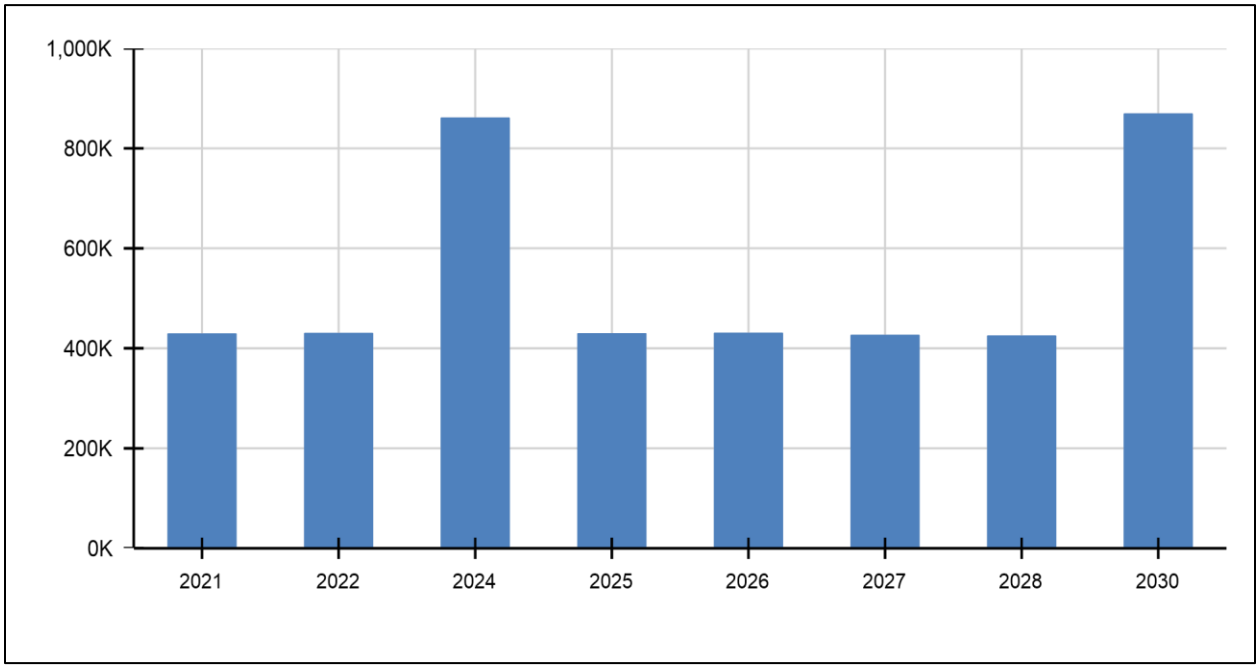


Figure 36: Bridge Annual Capital Expenditures

The projected routine maintenance expenditures for Bridges are shown in Figure 37:

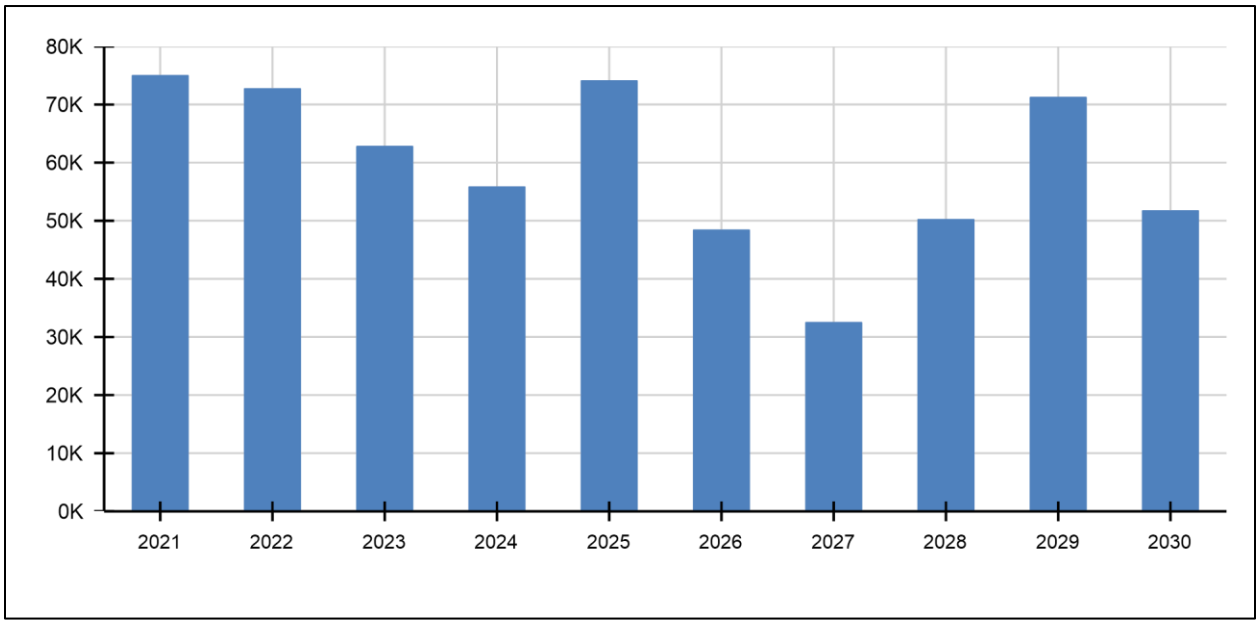


Figure 37: Bridge Routine Maintenance Expenditures

The deficit projection for Bridges is shown in Figure 38:

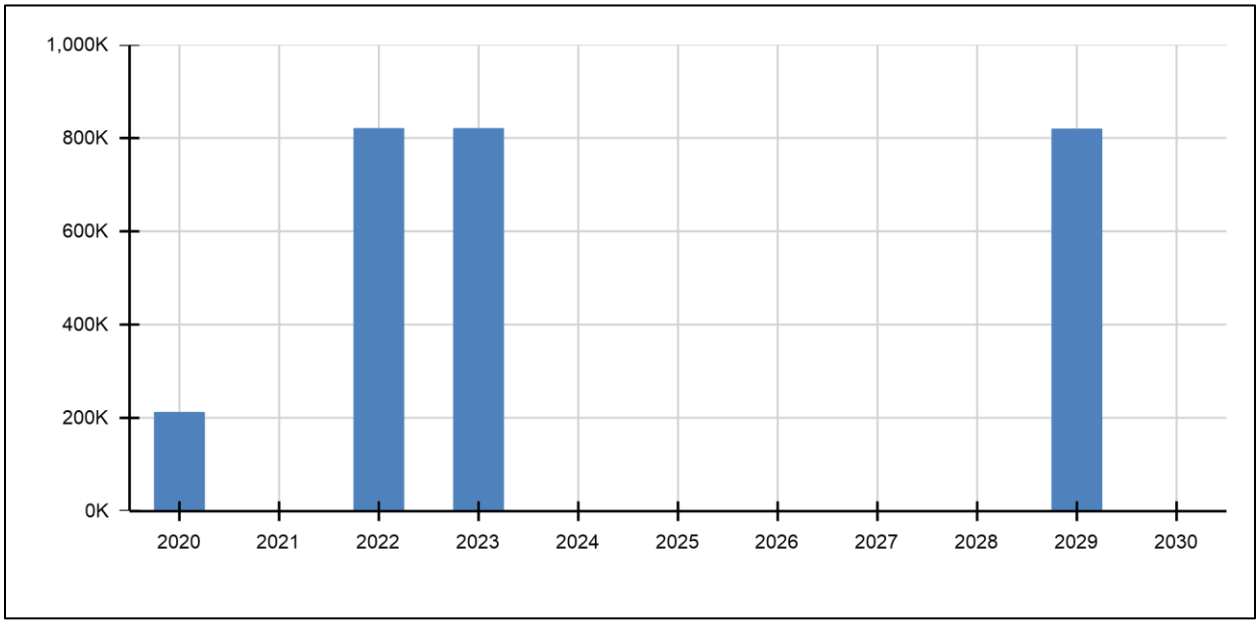


Figure 38: Bridge deficit projection

The deficit (backlog) is eliminated by the end of the plan period.

5.2.8 RECOMMENDED PROJECTS

An overview of the annual capital projects is shown in Figures 39 and 40.

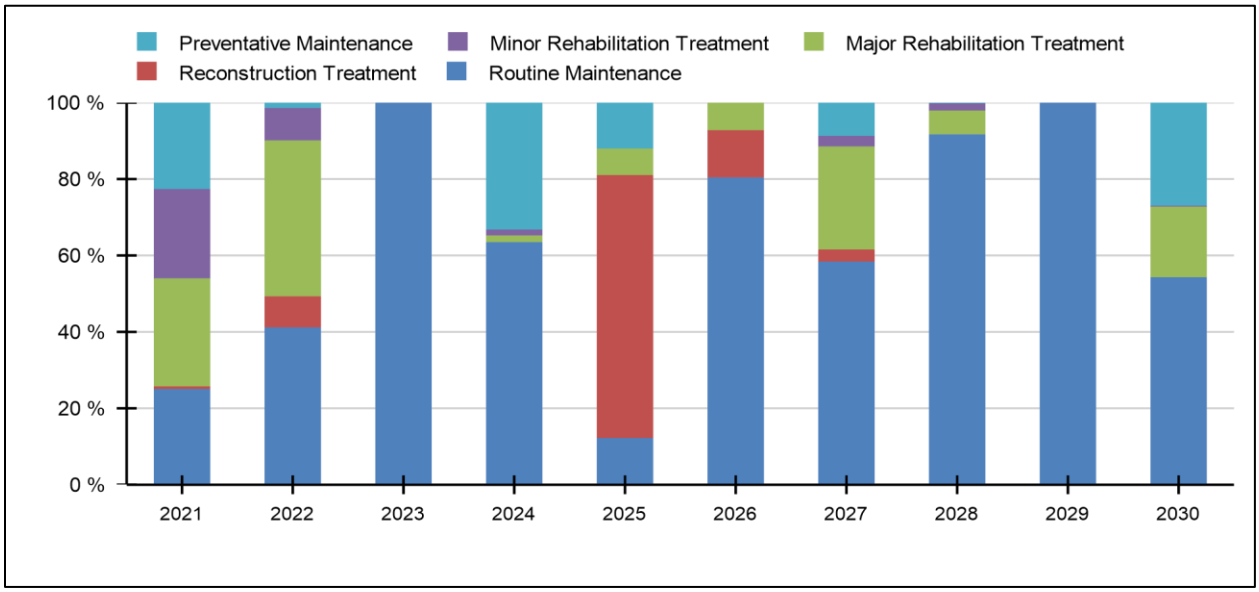


Figure 39: Bridges Recommended Projects by Treatment Type

Treatment	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
Steel Protective Coating Repair (Linear)	48,160	4,532	0	0	0	0	0	0	0	0	**52,692**
Steel Member Repair (Area)	0	0	0	0	0	76,000	106,000	60,000	0	0	**242,000**
Concrete Repair (Linear)	0	0	0	0	0	0	0	2,680	0	0	**2,680**
Seal Concrete (Area)	396,650	0	0	31,920	0	0	35,870	0	0	367,720	**832,160**
Clean Joints	0	6,350	5,000	6,350	5,000	0	11,350	0	11,350	0	**45,400**
Clean/Wash Bridge	245,160	185,340	1,021,770	414,000	15,000	1,054,110	219,660	1,203,150	230,460	1,205,310	**5,793,960**
Seal Concrete (Linear)	34,200	0	0	0	34,200	0	0	0	0	34,200	**102,600**
Bearing Restoration	5,000	0	0	4,000	0	0	5,000	0	0	0	**14,000**
Concrete Deck Repair	129,000	186,000	0	0	8,500	0	5,040	0	0	0	**328,540**
Deck Overlays	0	22,250	0	0	0	0	0	22,250	0	0	**44,500**
ECE/CP	0	2,160	0	0	2,160	0	0	2,160	0	0	**6,480**
Joint Seal Replacement	5,000	0	0	0	0	0	0	0	0	0	**5,000**
Patch/Repair Substructure Concrete (Linear)	480,000	0	0	0	0	0	0	0	0	0	**480,000**
Painting Steel Substructure	277,001	0	0	0	0	0	0	0	0	0	**277,001**
Steel Member Repair (Linear)	470,750	16,700	0	12,000	12,560	17,750	500	21,585	0	409,000	**960,845**
Repair Timber Elements (Linear)	6,400	0	0	6,400	0	0	6,400	0	0	6,400	**25,600**
Crack Sealing Deck/Slab	0	0	10,380	14,220	0	0	10,380	0	661,050	0	**696,030**
Steel Protective Coating Repair	0	0	0	195,175	0	0	0	0	0	194,900	**390,075**
Protective Coating Steel (linear)	10,500	13,060	0	0	17,200	0	0	0	0	0	**40,760**
Repair Timber Column	0	20,000	0	0	0	0	0	0	0	0	**20,000**
Timber Deck Replacement	15,000	40,500	0	0	202,500	162,000	12,960	0	0	0	**432,960**
Erosion Control at Bridges	1	0	0	0	0	0	0	0	0	0	**1**
Joint Armour Replacement	0	0	0	0	6,350	0	0	0	0	0	**6,350**
Reslope Soil/gravel surface	1	0	0	0	0	1	0	0	0	0	**2**
Total	**2,122,823**	**496,892**	**1,037,150**	**684,065**	**303,470**	**1,309,861**	**413,160**	**1,311,825**	**902,860**	**2,217,530**	**10,799,636**

Figure 40: Summary of Recommended Projects by Treatment Method

The detailed capital Investment plan specifying which bridge element is scheduled for which suggested treatment, in which year, and at what budgeted cost is presented in Appendix A, the Capital Investment Plan the Municipality.

5.3 WATERLINES

The Town of Thessalon has a total of 19.5 km of Waterlines, with 0.4 km of Polyethylene pipes, 2.1 km of Ductile Iron pipes, 0.5 km of Asbestos Cement pipes, 12.6 km of PVC pipes, 0.2 km of copper pipes, and 3.8 km of Cast Iron pipes.

5.3.1 WATERLINE ATTRIBUTES

The following summarizes the waterline material types within the Municipality:

Material	Length (km)	Percentage
Polyethylene	0.4	2.0%
Ductile Iron	2.1	10.7%
Asbestos Cement	0.5	2.6%
PVC	12.6	64.3%
Copper	0.2	1.0%
Cast Iron	3.8	19.4%

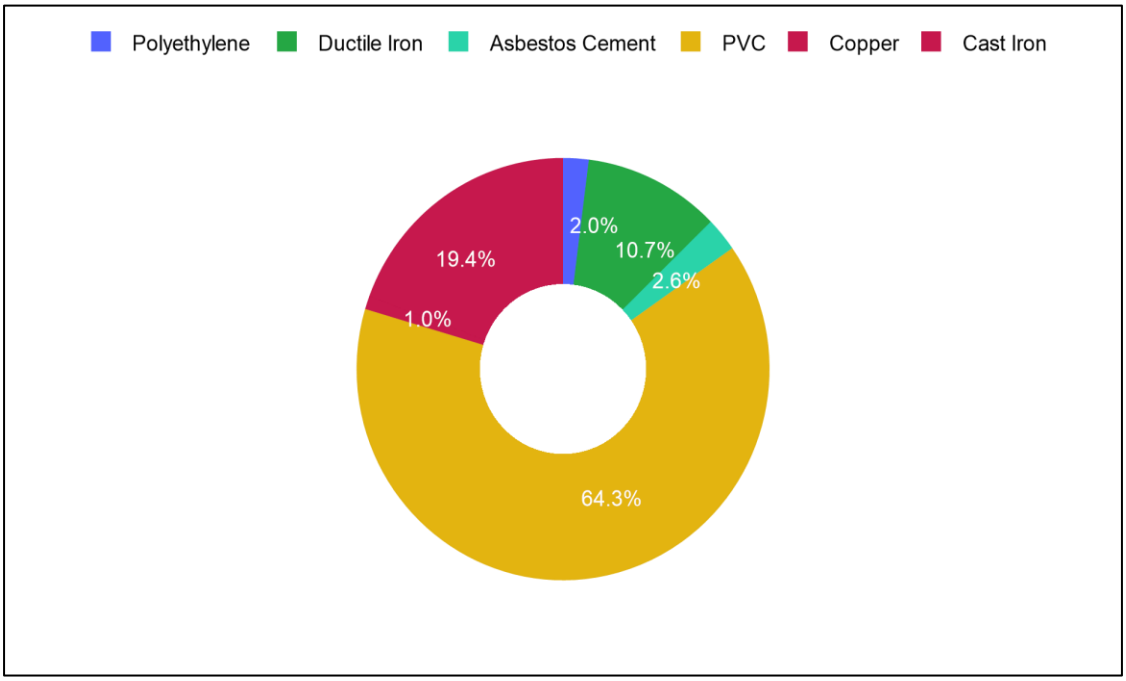


Figure 41: Waterline by Material

5.3.2 CONDITION ASSESSMENT APPROACH

The state of the infrastructure for waterlines is determined through an age-based condition analysis. The four (4) Condition States are defined as follows:

Figure 42: Waterline Condition State Ranges

The age-based condition was calculated to the year 2020, and the current Network Condition (%RSL) of the Waterlines is 44. This represents an overall “Fair” condition state.

Title	Condition	Condition State
Network Overall Condition	44	Fair

The following summarizes the 2020 Network Condition, weighted by section length:

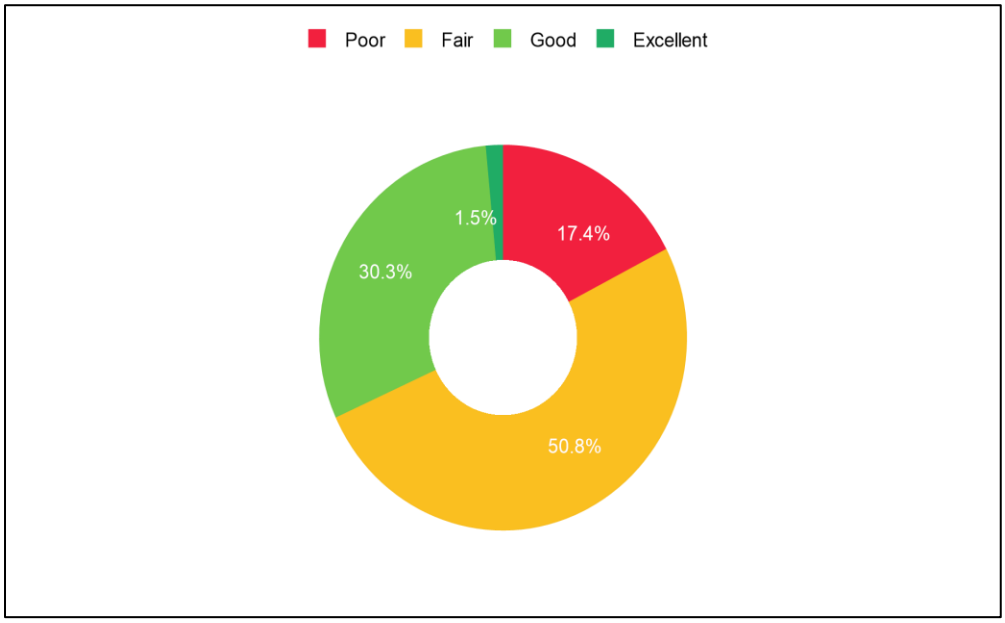


Figure 43: Waterline Network Condition

The Condition States by Material are shown in Figure 44:

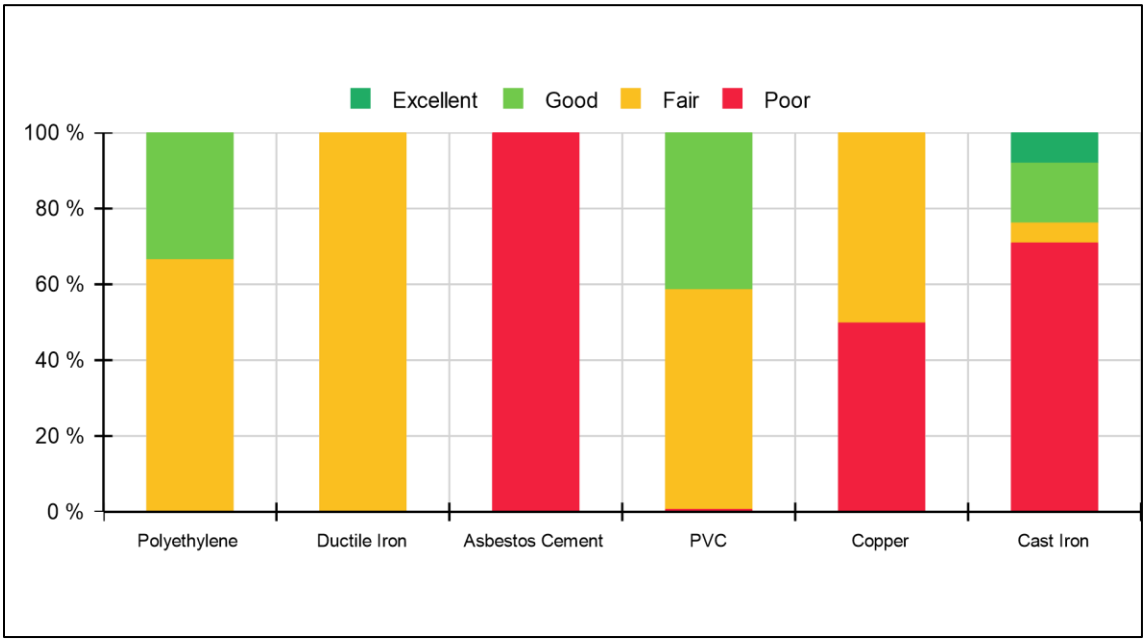


Figure 44: Waterline Network Condition by Material

The Map view of the Waterline condition state is shown in Figure 45.

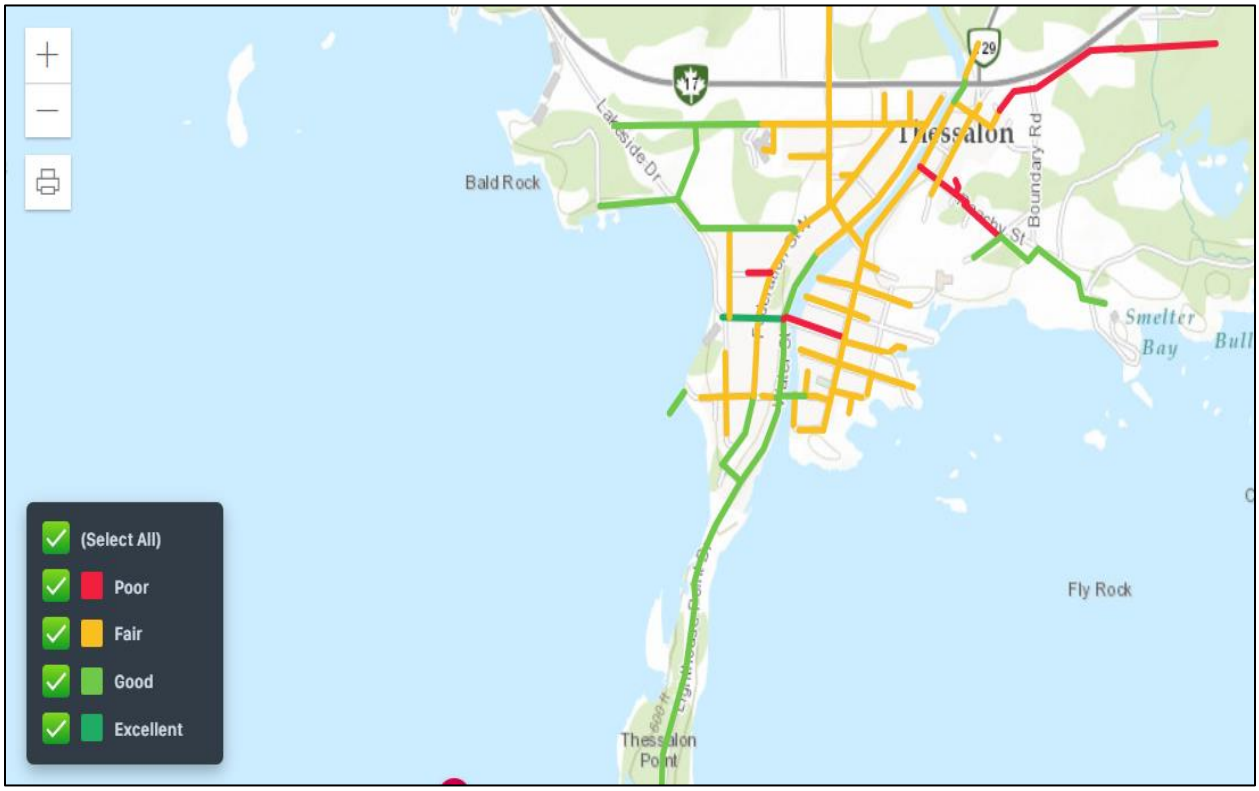


Figure 45: Waterlines Current Network Condition Map

5.3.3 CRITICALITY AND RISK CRITERIA

Criticality

Based on the data attributes available, the Criticality settings were applied based on Asset Status only, with in-service assets being critical. Socio-economic factors were not included.

Criticality Settings

Asset Status	5
Abandoned	0
In-service	50
Removed	0
Unassumed	0
Diameter	**10**
0 - 150	10
150 - 300	40
300 - 450	70
450 and over	100

Figure 46 shows the criticality states of the various road sections:

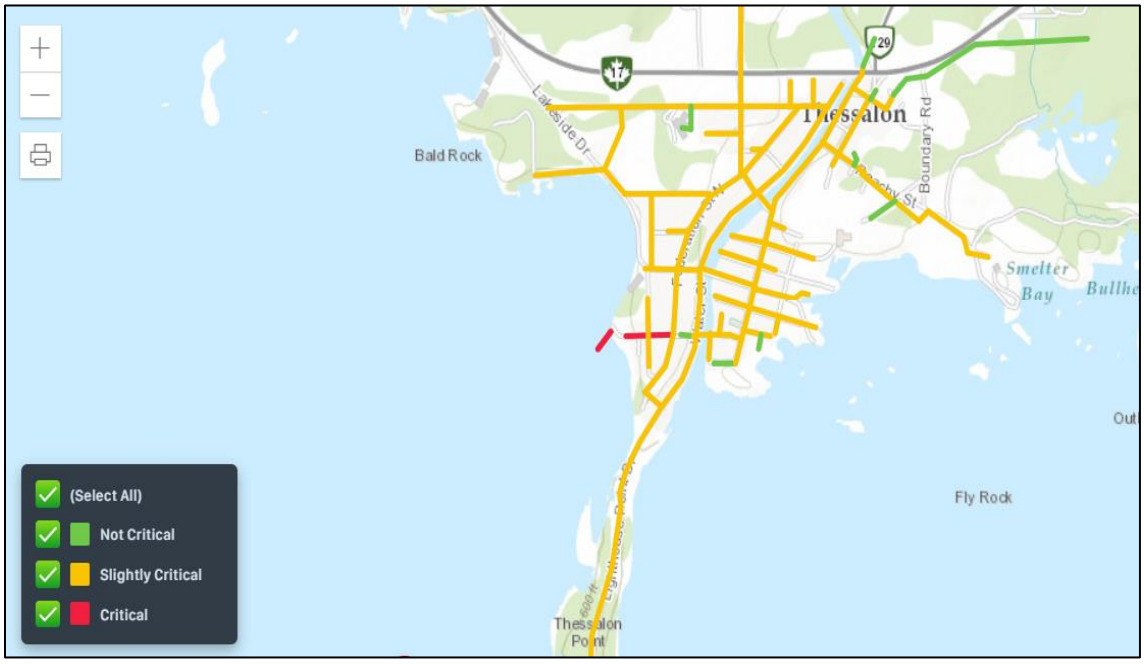


Figure 46: Waterlines Network Criticality Map

Risk

The Risk settings for Waterlines are done as described in Section 4. Due to the lack of data, there are no risk targets set in the planning.

This Figure 47 shows the Risk levels of the road system:

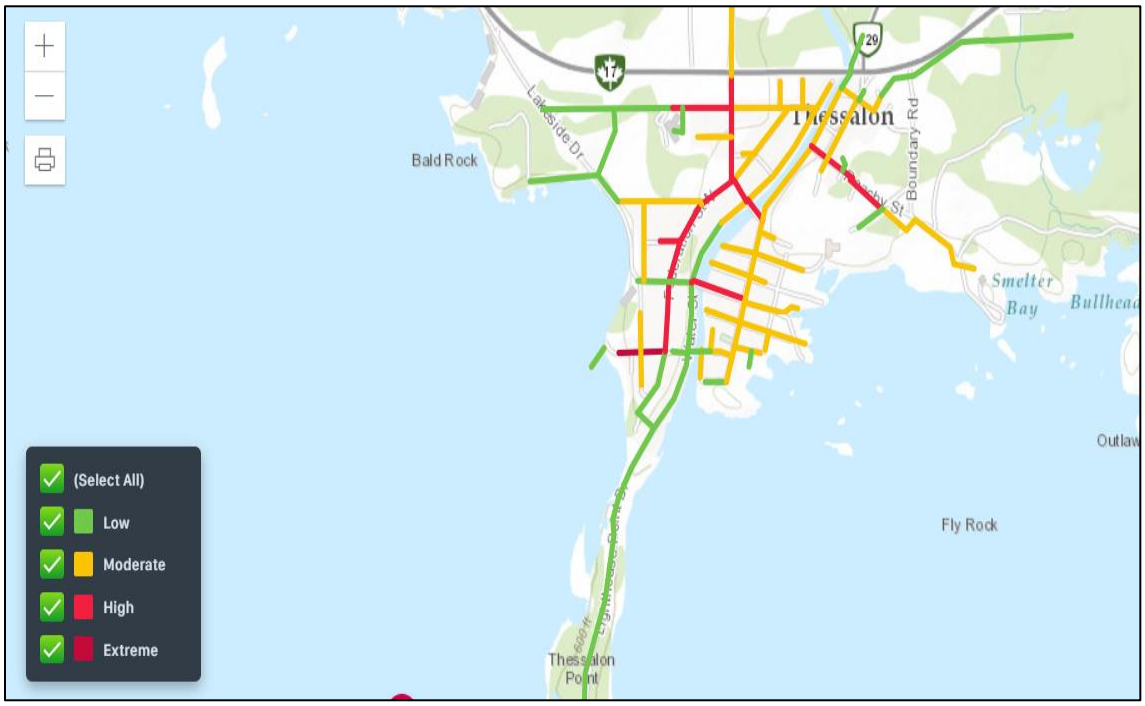


Figure 47: Waterlines Network Risk Map

5.3.4 LEVEL OF SERVICE REQUIREMENTS

The Town targets to replace waterlines before the end of their Service life is reached. The analysis was done based on an end-of-life replacement, with no budget constraint.

5.3.5 LIFECYCLE MANAGEMENT STRATEGY

A single treatment is available for Waterlines, and it is a replacement treatment.

Treatment Methods

Treatment	Description	Unit Cost	Inflation Rate	Cost Estimation Year
Replacement	Replacement Treatment	100.00 %	0.0%	2021

5.3.6 OPTIMIZED CAPITAL PLANNING RESULTS

Optimization analysis has been performed for the Waterlines, on the basis of a straight end-of-life replacement.

The Optimization Analysis Settings are as follows:

Scenario

Name:	End of life replacement 10 years
Description:	
Year:	2021

Optimization Settings

Optimization Mode	Standard
Planning Horizon (Years)	10
Include Priorities	Yes
Operational Efficiency	No
Estimate Current Condition	True
Condition Variation	0.0%
Project Size Limit	0
Rollover	0

Optimization Objective

Type	Min/Max	Weight (Sum = 1)	Performance Attribute
Maximize Network Performance	Max	1	NA

Network Optimization Results

Figure 48 shows the Waterline network overall network performance throughout the plan period:

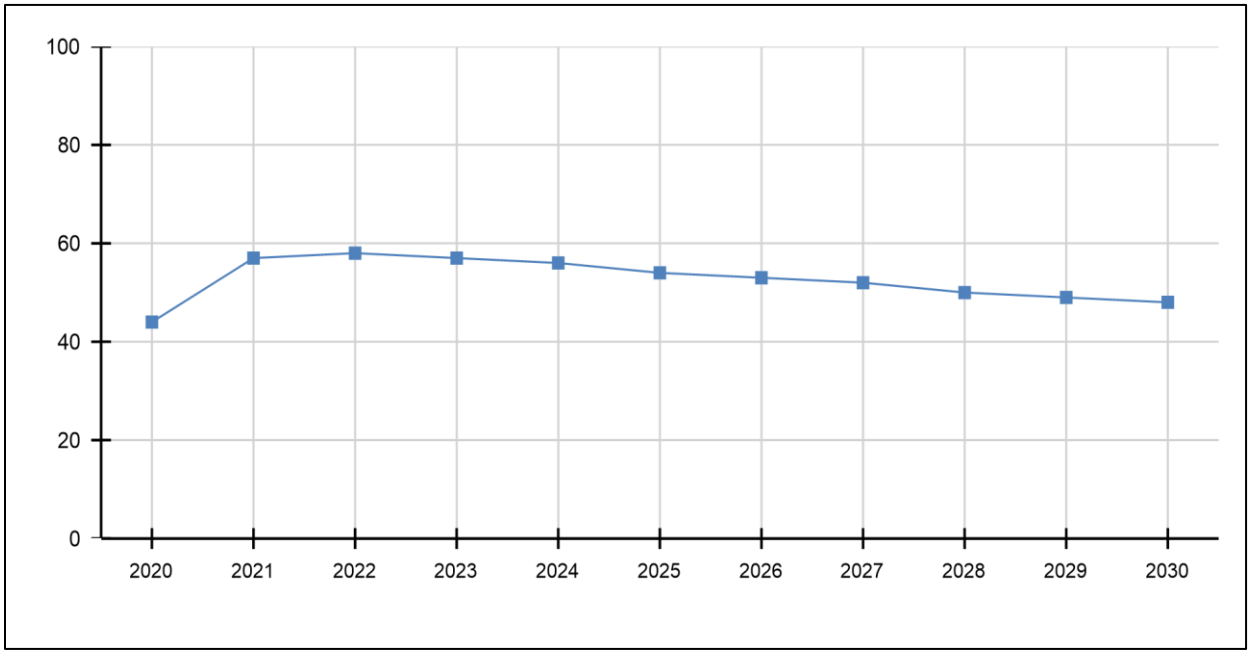


Figure 48: Waterlines Network Performance

Over the next 10 years, as the pipes age, the performance of the waterline network increase from 44 to 48 at the end of plan.

Figure 49 shows the condition status distribution of the waterline network for each year of the plan:

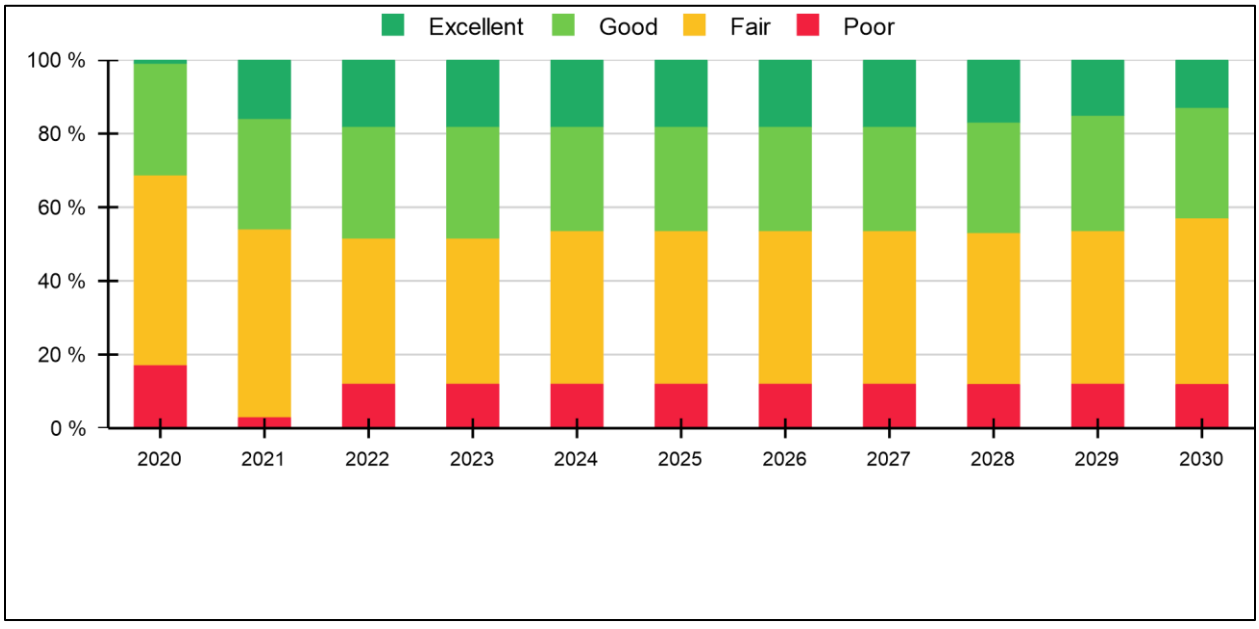


Figure 49: Waterlines Annual Network Condition Status

As shown in this figure, at the beginning of the plan 1% is in excellent, 30% in good, 51% in fair, and 18% in poor condition. At the end of the 10-year plan 13% of Waterlines will be in excellent, 30% in good, 45% in the fair, and 12% in poor condition.

The projected capital expenditures for Bridges are shown in Figure 50:

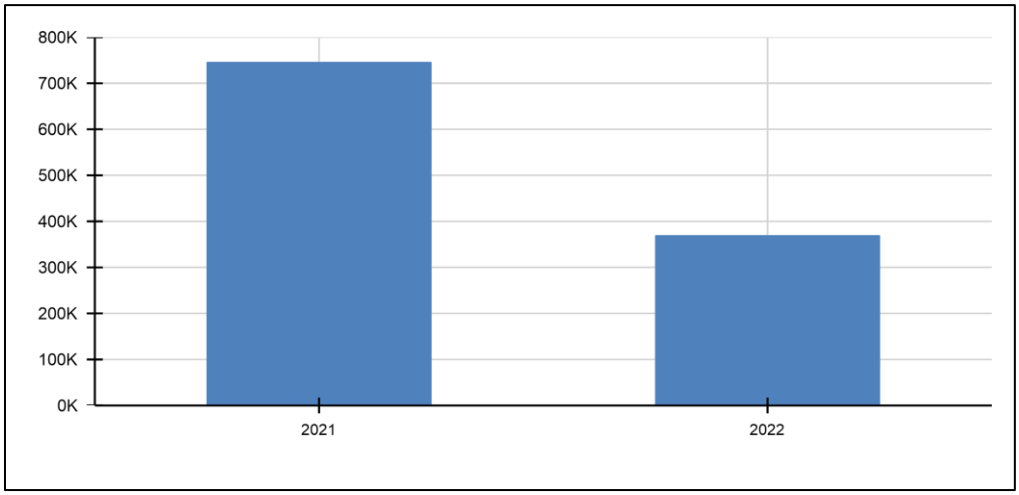


Figure 50: Waterlines Capital Expenditures

The 2020 backlog of $745,683 was taken care of in the first year of the plan, and there is no deficit throughout the plan period.

5.4 HYDRANTS

The Town of Thessalon has 99 Hydrants in its inventory. Condition data for the Hydrants were not available, so an age-based condition (% Remaining Service Life) was calculated.

5.4.1 CONDITION ASSESSMENT APPROACH

The state of the infrastructure for Hydrants is determined through an age-based analysis. The five (5) Condition States are defined as follows:

Active	Condition Level	Condition Index Range		
✓	Very Poor	0	to	10
✓	Poor	10	to	25
✓	Fair	25	to	40
✓	Good	40	to	55
✓	Excellent	55	to	100

Figure 51: Hydrants Condition State Ranges

The age-based condition was calculated to the year 2020, and the current Network Condition (%RSL) is 44. This represents an overall “Good” condition state.

Title	Condition	Condition State
Network Overall Condition	44	Good

The Map view of the condition state is shown in Figure 52.

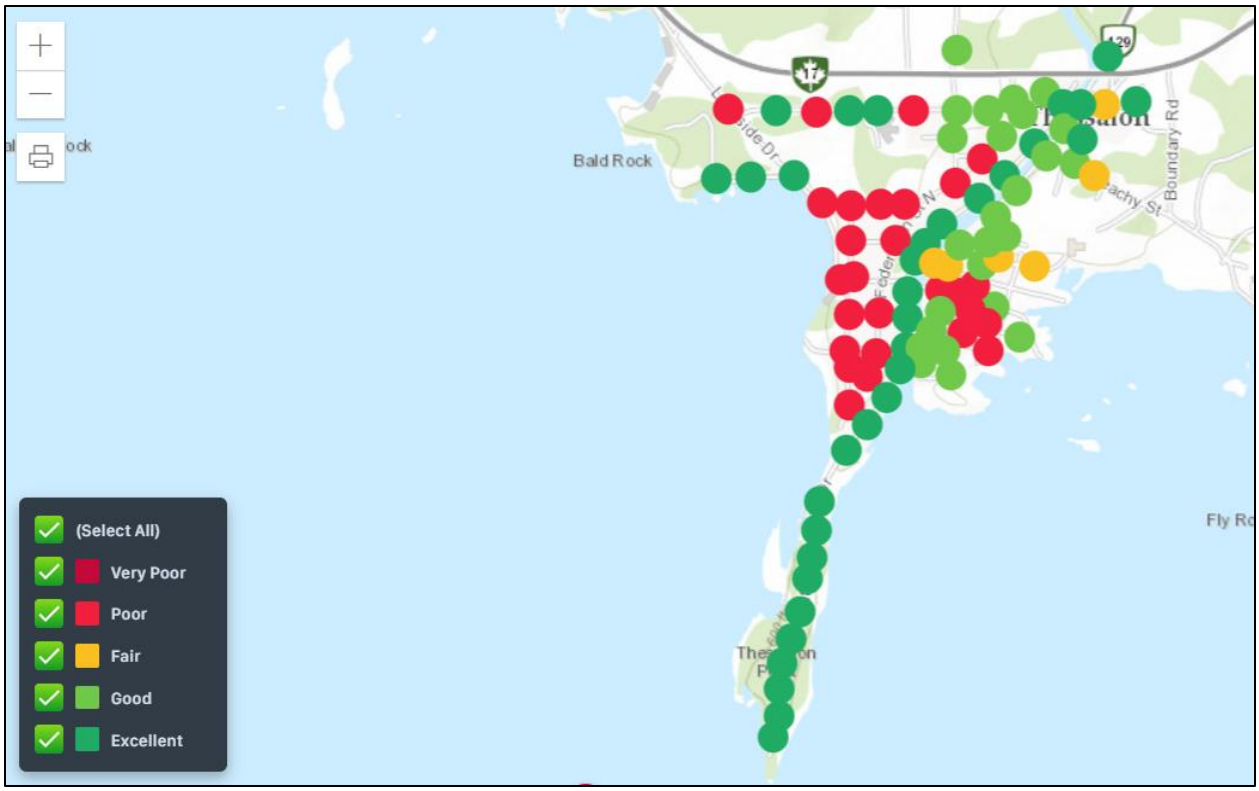


Figure 52: Hydrants Current Network Condition Map

5.4.2 CRITICALITY AND RISK CRITERIA

Criticality

Based on the data attributes available, the Criticality settings were applied based on Asset Status only, with in-service assets being critical. Socio-economic factors were not included.

Criticality Settings

Asset Status	5
Abandoned	0
In-service	50
Removed	0
Unassumed	0

Risk
The Risk settings for Hydrant are done as described in Section 4. Due to the lack of data, there are no risk targets set in the planning.

5.4.3 LEVEL OF SERVICE REQUIREMENTS

The Town targets to replace Hydrants before the end of their Service life is reached. The analysis was done based on an end-of-life replacement, with no budget constraint.

5.4.4 LIFECYCLE MANAGEMENT STRATEGY

A single treatment is available for Hydrants, and it is a replacement treatment.

Treatment Methods

Treatment	Description	Unit Cost	Inflation Rate	Cost Estimation Year
Replacement	Replacement	100.00 %	0.0%	2020

5.4.5 OPTIMIZED CAPITAL PLANNING RESULTS

Optimization analysis has been performed for the Hydrants, and it is a straight end-of-life replacement.

The Optimization Analysis Settings are as follows:

Scenario

Name:	End of life replacement 10 years
Description:	
Year:	2021

Optimization Settings

Optimization Mode	Standard
Planning Horizon (Years)	10
Include Priorities	Yes
Operational Efficiency	No
Estimate Current Condition	True
Condition Variation	0.0%
Project Size Limit	0
Rollover	0

Optimization Objective

Type	Min/Max	Weight (Sum = 1)	Performance Attribute
Maximize Network Performance	Max	1	NA

Network Optimization Results

Figure 53 shows the Hydrant overall network performance throughout the plan period:

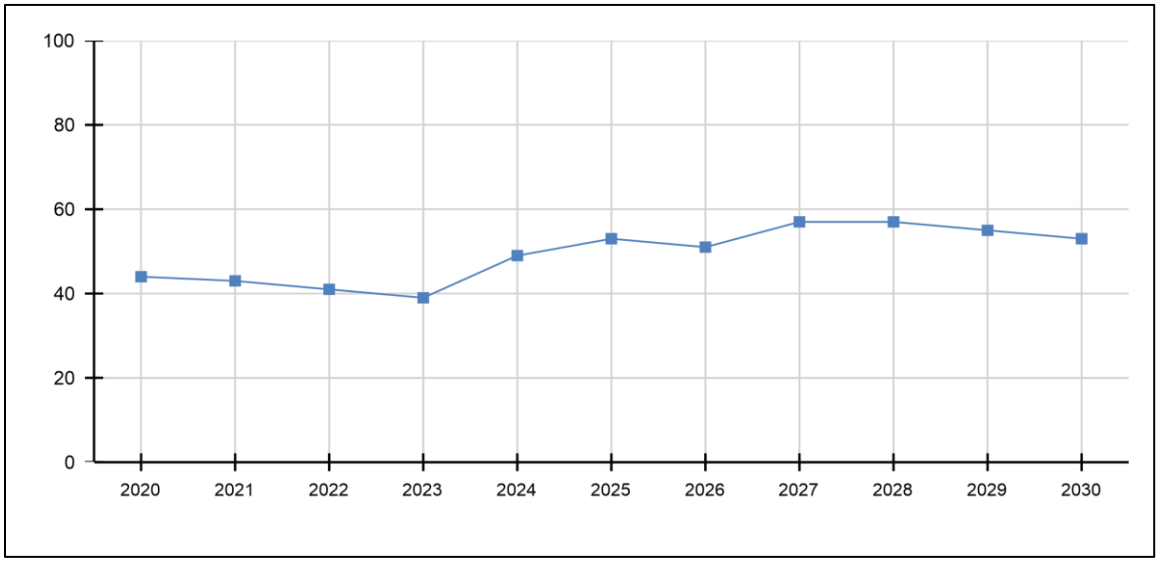


Figure 53: Overall Hydrant Network Condition Status

Over the next 10 years, as the assets age, the performance of the Hydrant network increases from 44 to 53 at the end of plan.

Figure 54 shows the condition status distribution of the Hydrant network at each year of the plan:

Figure 54: Annual Network Condition State - Hydrants

As shown in this figure, at the beginning of the plan 36% is in excellent, 27% in good, 6% in fair, 29% in poor condition, and 1% in very poor condition. At the end of plan, 42% is in excellent, 18% in good, 7% in fair, and 32% in poor condition.

The projected capital expenditures for Hydrants are shown in Figure 55:

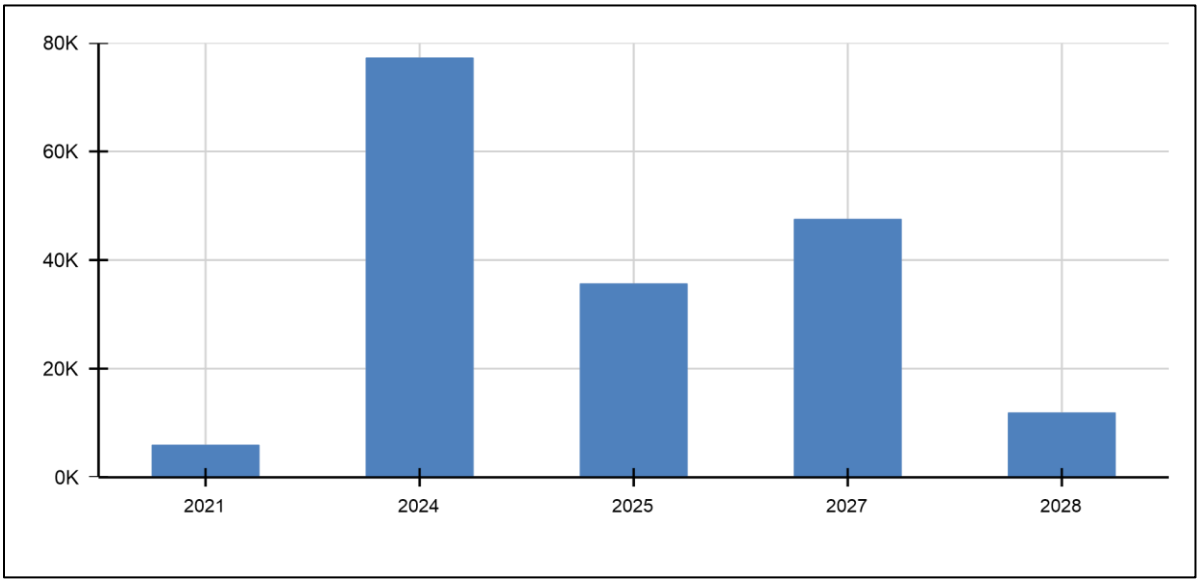


Figure 55: Hydrants Capital Expenditures

The 2020 backlog of $5,940 was taken care of in the first year of the plan, and there is no deficit throughout the plan period.

5.5 SEWERLINES

The Town of Thessalon has a total of 17.3 km of Sewerlines, with 2.1 km of PVC pipes, 0.8 km of High-Density Polyethylene pipes, 2.1 km of Ductile Iron pipes, and 12.5 km of Asbestos Cement pipes.

5.5.1 SEWERLINE ATTRIBUTES

The following summarizes the Sewerline types within the Municipality:

Type	Length (km)	Percentage
Gravity	14.0	80.9%
Forced	3.3	19.1%

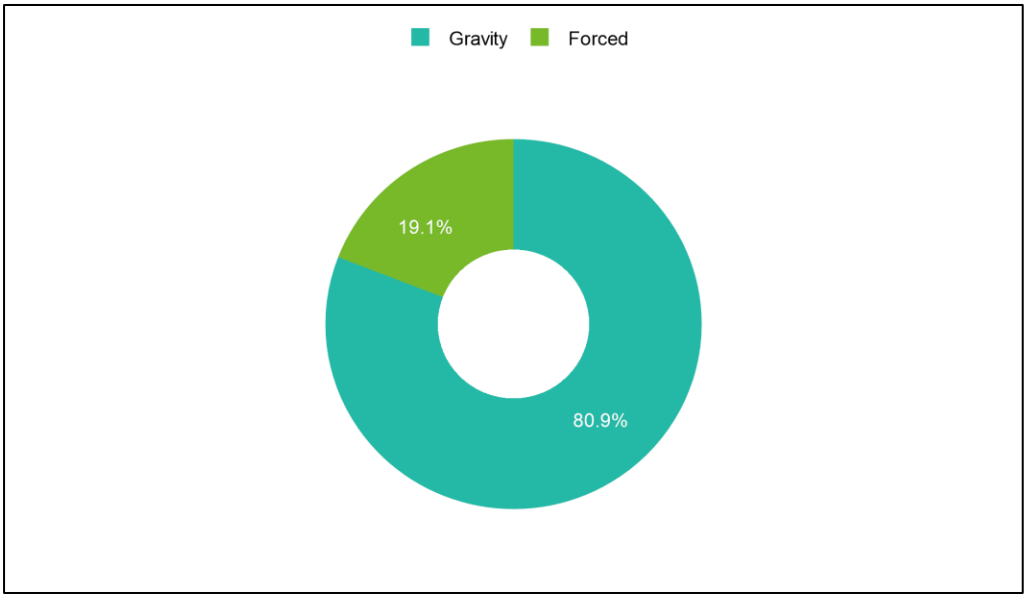


Figure 56: Sewerlines by Type

5.5.2 CONDITION ASSESSMENT APPROACH

The state of the infrastructure for Sewerlines is determined through an age-based condition analysis. The four (4) Condition States are defined as follows:

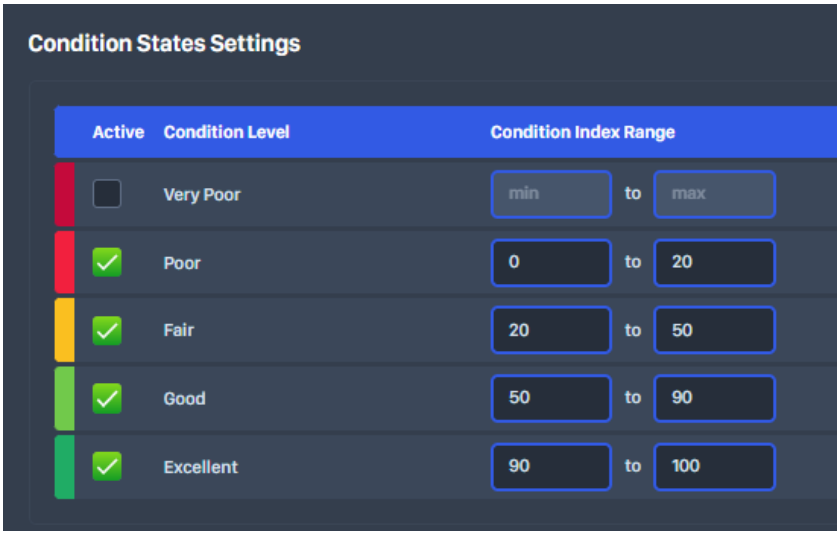


Figure 57: Sewerline Condition State Ranges

The age-based condition was calculated to the year 2020, and the current Network Condition (%RSL) of the sewerlines is 48. This represents an overall “Fair” condition state.

Title	Condition	Condition State
Network Overall Condition	48	Fair

The following summarizes the 2020 Network Condition, weighted by section length:

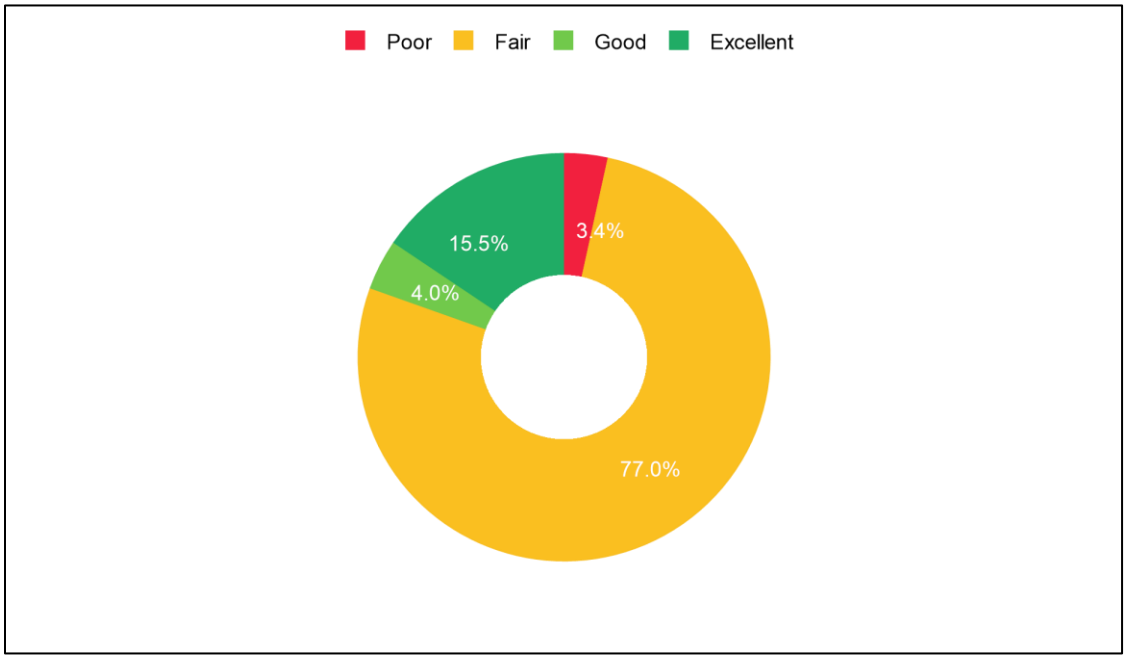


Figure 58: Sewerline Network Condition

The Condition States by Sewerline Type are shown in Figure 59:

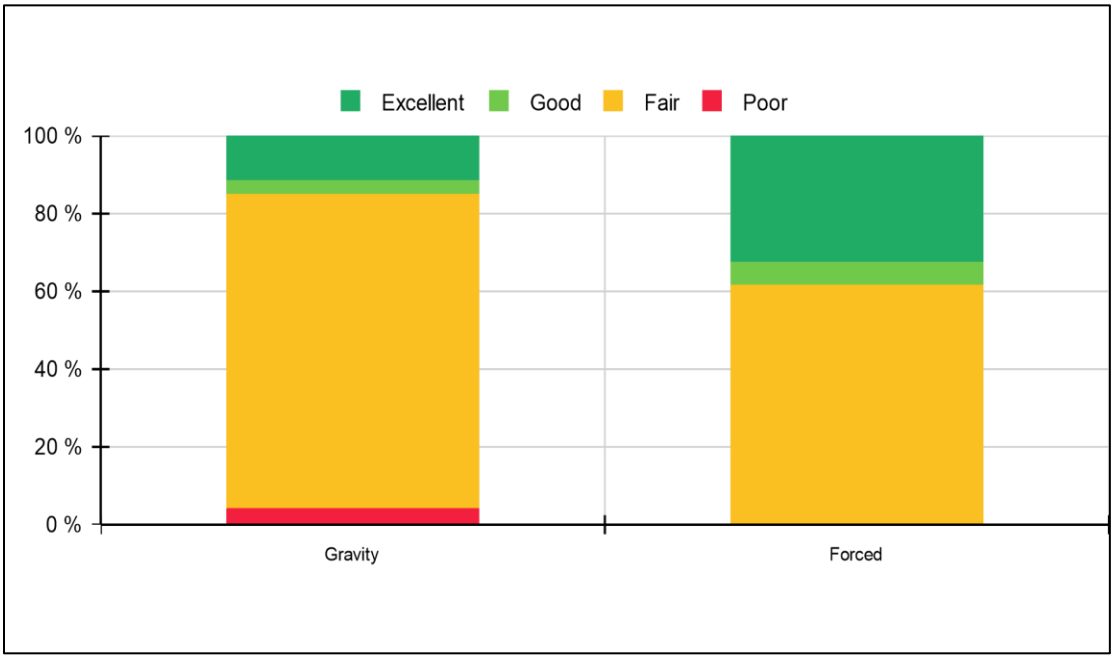


Figure 59: Sewerline Network Condition by Type

The Map view of the Sewerline condition state is shown in Figure 60.

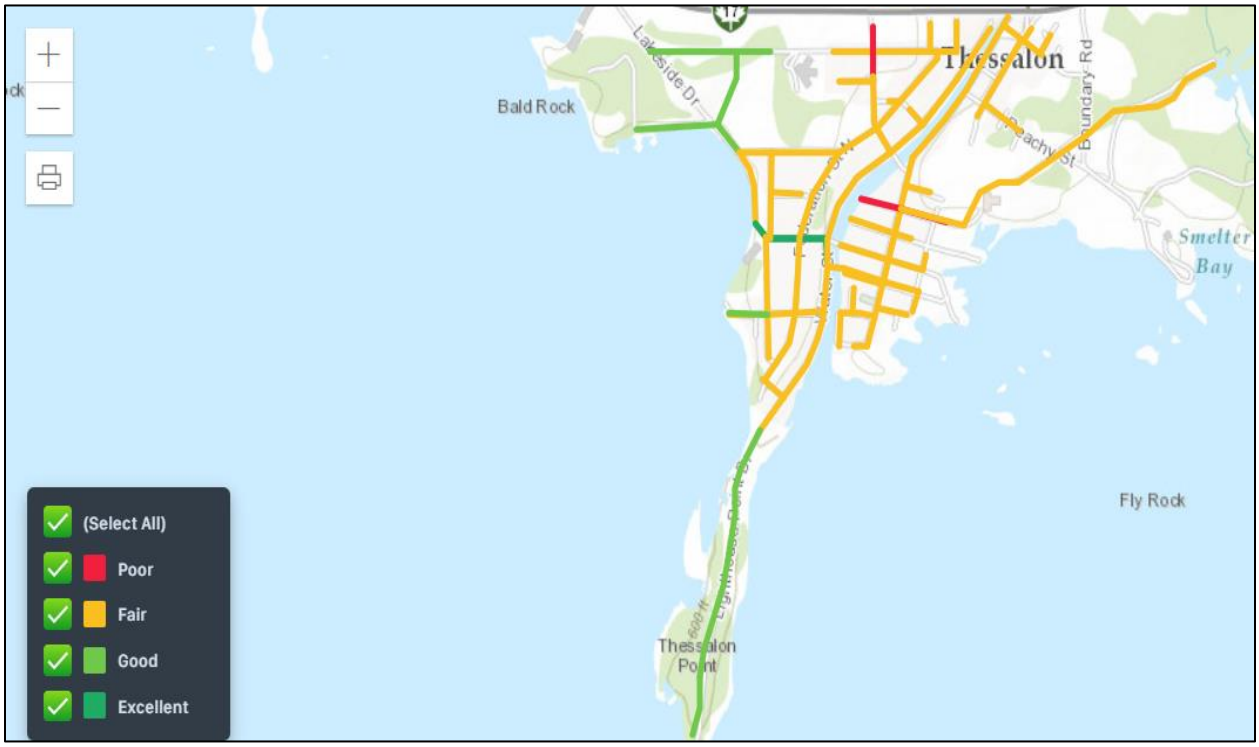


Figure 60: Condition Map View of Sewerline Network

5.5.3 CRITICALITY AND RISK CRITERIA

Criticality
Based on the data attributes available, the Criticality settings were applied based on asset status and pipe diameter. Socio-economic factors were not included.

Criticality Settings	
Asset Status	**5**
Abandoned	0
In-service	50
Removed	0
Unassumed	0
Diameter	**10**
0 - 125	11
125 - 250	45
250 and over	100

Risk
The Risk settings for Sewerlines are done as described in Section 4. Due to the lack of data, there are no risk targets set in the planning.

5.5.4 LEVEL OF SERVICE REQUIREMENTS

The Town targets to replace Sewerlines before the end of their service life is reached. The analysis was done based on an end-of-life replacement, with no budget constraint.

5.5.5 LIFECYCLE MANAGEMENT STRATEGY

Treatments based on pipe material are available for Sewerlines, and they are open trench replacement treatments.

Treatment Methods

Treatment	Description	Unit Cost
Open Trench Replacement (Concrete)	Open Trench Replacement	100.00 %
Open Trench Replacement (Steel)	Open Trench Replacement	100.00 %
Open Trench Replacement (PE)	Open Trench Replacement	100.00 %
Open Trench Replacement (PVC)	Open Trench Replacement	100.00 %
Open Trench Replacement	Open Trench Replacement	100.00 %

5.5.6 OPTIMIZED CAPITAL PLANNING RESULTS

Optimization analysis has been performed for the Sewerlines, on the basis of a straight end-of-life replacement.

The Optimization Analysis Settings are as follows:

Scenario

Name:	End of life replacement 10 years
Description:	
Year:	2021

Optimization Settings

Optimization Mode	Standard
Planning Horizon (Years)	10
Include Priorities	Yes
Operational Efficiency	No
Estimate Current Condition	True
Condition Variation	0.0%
Project Size Limit	0
Rollover	0

Optimization Objective

Type	Min/Max	Weight (Sum = 1)	Performance Attribute
Maximize Network Performance	Max	1	NA

Network Optimization Results

Figure 61 shows the Sewerline overall network performance throughout the plan period:

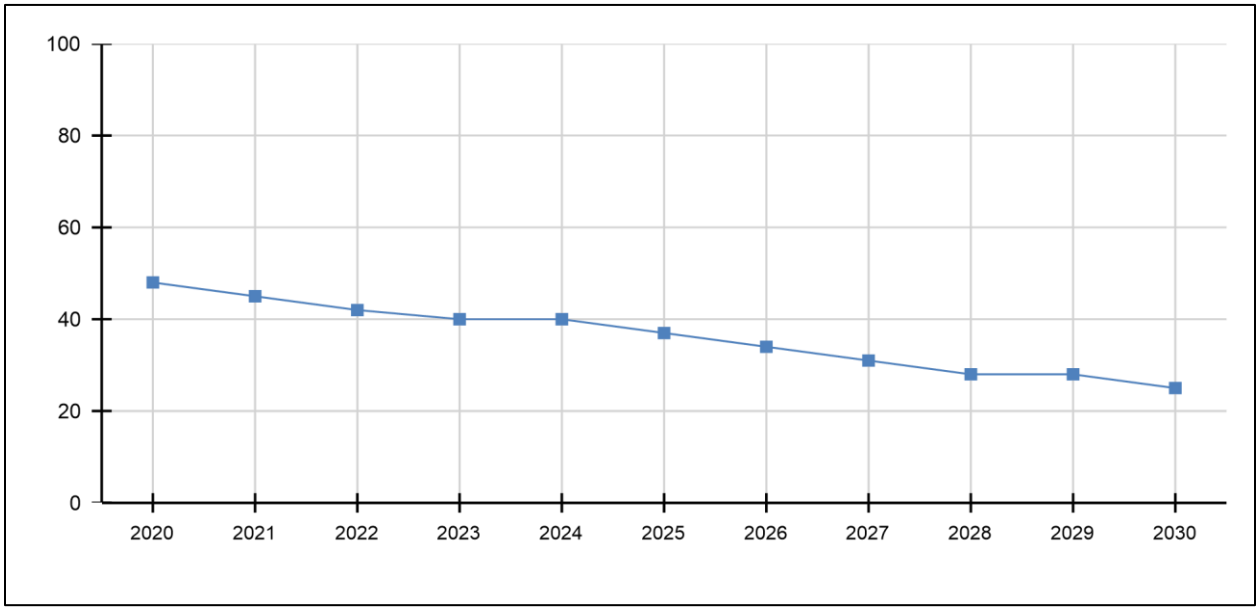


Figure 61: Sewerline Network Performance

Over the next 10 years, as the pipes age, the performance of the Sewerline network declines from 48 to 25 at the end of plan.

Figure 62 shows the condition status distribution of the Sewerline network at each year of the plan:

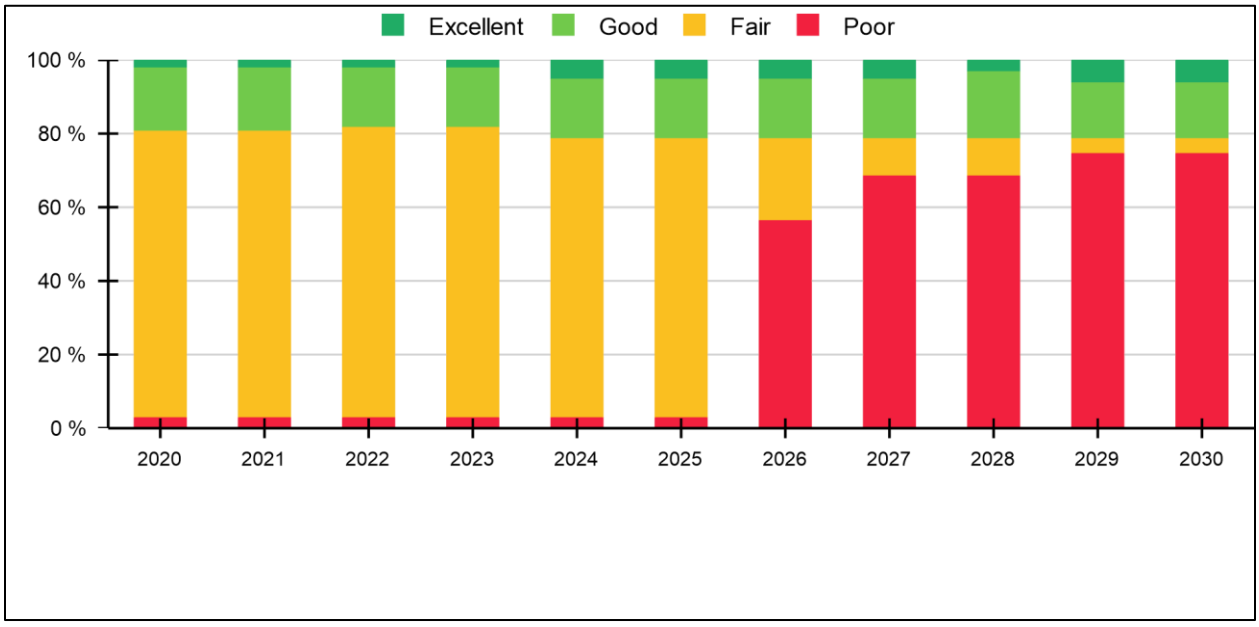


Figure 62: Sewerlines Annual Network Condition Status

As shown in this figure, at the beginning of the plan 2% is in excellent, 17% in good, 77% in fair, and 3% in poor condition. At the end of the 10-year plan 6% will be in excellent, 15% in good, 4% in poor, and 74% in poor condition. Despite most sections being in poor condition, none of the Sewerline sections are in a deficit position throughout the plan period, and a total of $829,341 replacements are scheduled.

The projected capital expenditures for Sewerlines are shown in Figure 63:

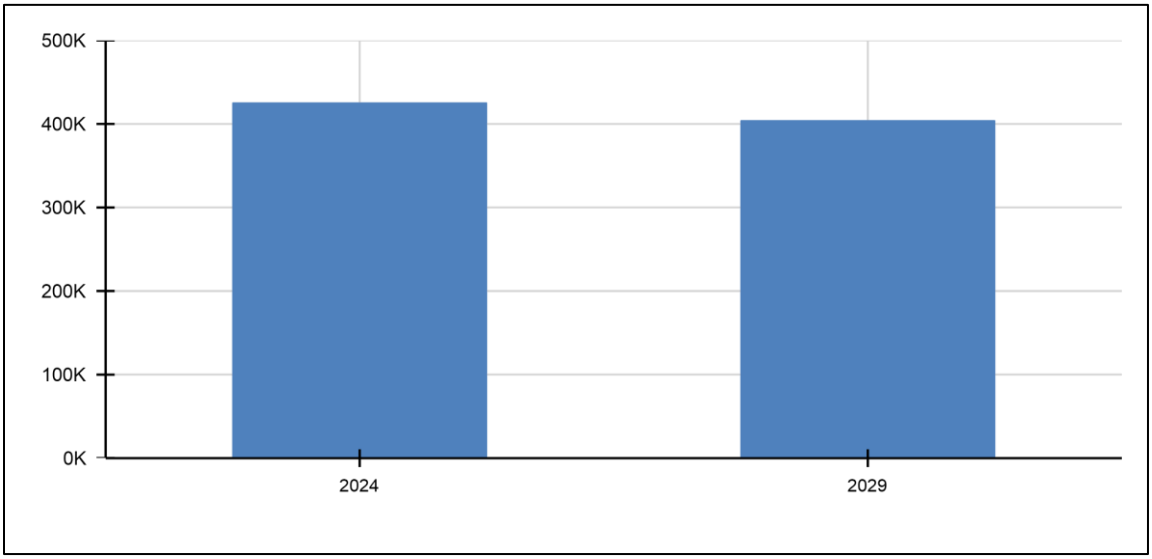


Figure 63: Sewerlines Capital Expenditures

5.6 PUMPING STATIONS (SEWER)

The Municipality of Thessalon has four (4) Pumping Station assets.

5.6.1 CONDITION ASSESSMENT APPROACH

The state of the infrastructure for Pumping Stations is determined through an age-based condition analysis. The four (4) Condition States are defined as follows:

Active	Condition Level	Condition Index Range		
☐	Very Poor	min	to	max
☑	Poor	0	to	23
☑	Fair	23	to	50
☑	Good	50	to	90
☑	Excellent	90	to	100

Figure 64: Pumping Station Condition State Ranges

The age-based condition was calculated to the year 2020, and the current Network Condition (%RSL) of the Lift Stations is 48. This represents an overall “Fair” condition state.

Title	Condition	Condition State
Network Overall Condition	48	Fair

The following summarizes the % Remaining Service Life, weighted by Replacement Cost:

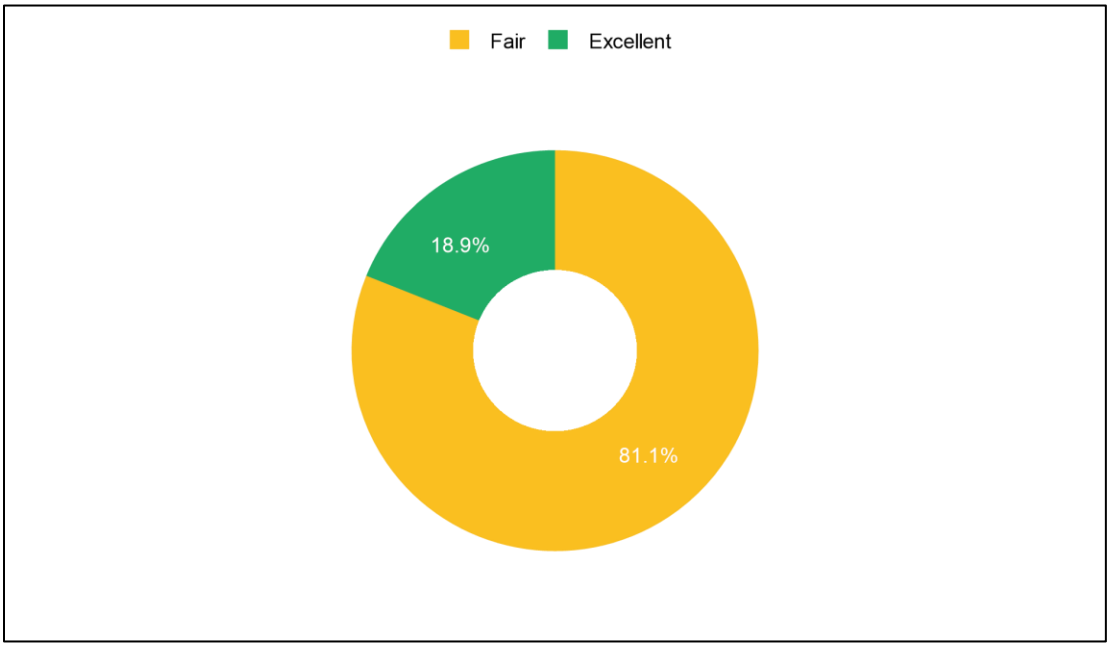


Figure 65: Pumping Station (Sewer) Network Condition

5.6.2 CRITICALITY AND RISK CRITERIA

Criticality
Based on the data attributes available, the Criticality settings were applied based on asset status. Socio-economic factors were not included.

Criticality Settings

Asset Status	5
Abandoned	0
In-service	100
Removed	0
Unassumed	0

Risk
The Risk settings for Lift Stations are done as described in Section 4. Due to the lack of data, there are no risk targets set in the planning.

5.6.3 LEVEL OF SERVICE REQUIREMENTS

The Town targets to replace Pumping Station assets before the end of their Service life is reached. The analysis was done based on an end-of-life replacement, with no budget constraint. It is recommended that more data on the components of the Lift Stations is collected, to do a more accurate Element-based analysis.

5.6.4 LIFECYCLE MANAGEMENT STRATEGY

A single treatment is available for Pumping Stations, and it is a full replacement treatment.

Treatment Methods

Treatment	Description	Unit Cost	Inflation Rate	Cost Estimation Year
Replacement	Replacement	100.00 %	0.0%	2020

5.6.5 OPTIMIZED CAPITAL PLANNING RESULTS

Optimization analysis has been performed for the Pumping Stations, on the basis of a straight end-of-life replacement.

The Optimization Analysis Settings are as follows:

Scenario

Name:	End of the replacement 10 years
Description:	
Year:	2021

Optimization Settings

Optimization Mode	Standard
Planning Horizon (Years)	10
Include Priorities	Yes
Operational Efficiency	No
Estimate Current Condition	True
Condition Variation	0.0%
Project Size Limit	0
Rollover	0

Optimization Objective

Type	Min/Max	Weight (Sum = 1)	Performance Attribute
Maximize Network Performance	Max	1	NA

Network Optimization Results

Figure 66 shows the Pumping Stations overall network performance throughout the plan period:

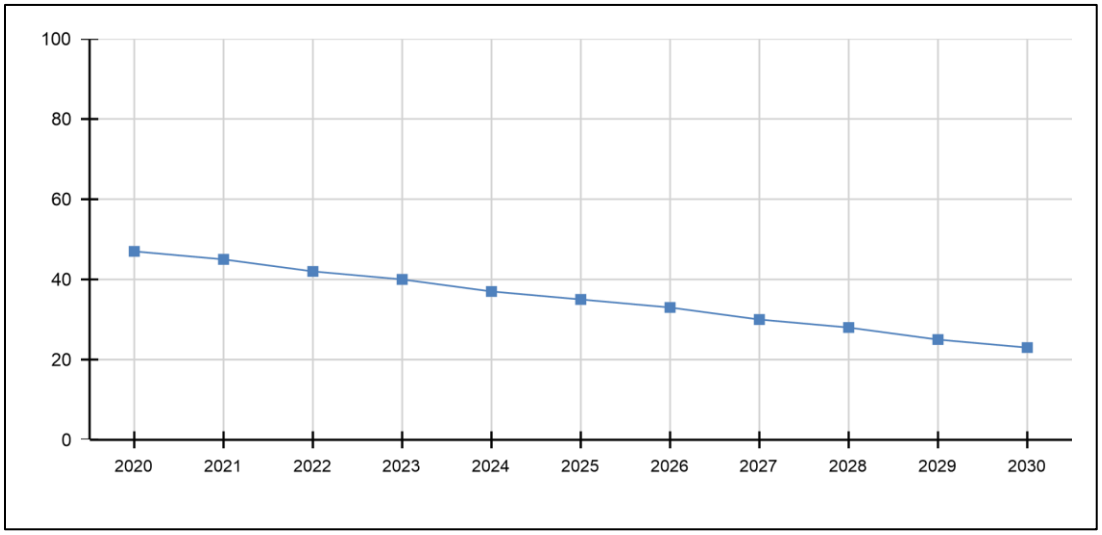


Figure 66: Pumping Stations Network Performance

Over the next 10 years, as the Pumping Station assets age, the network performance declines from 47 to 23 at the end of plan.

Figure 67 shows the condition status distribution of the Pumping Station assets at each year of the plan:

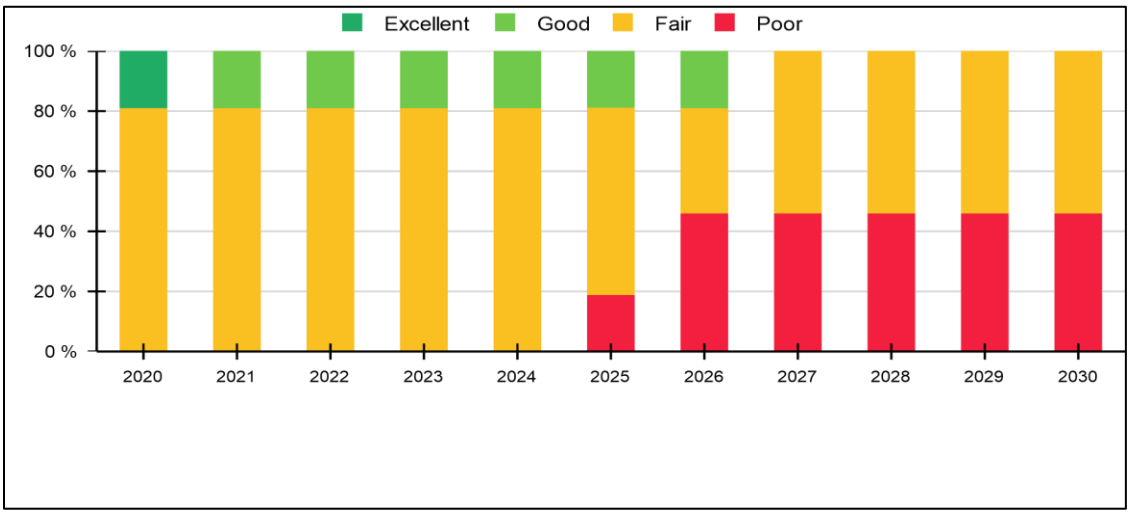


Figure 67: Annual Pumping Station Assets Condition Status

As shown in this figure, at the beginning of the plan 19% is in the excellent, and 81% is in fair condition. At the end of the 10-year plan 54% will be in fair, and 46% will be in poor condition. No replacements are scheduled during the plan period.

5.7 LAGOONS

The Municipality has two (2) Lagoon assets. Component data are not available.

5.7.1 CONDITION ASSESSMENT APPROACH

The state of the infrastructure for Lagoons is determined through an age-based condition analysis. The four (4) Condition States are defined as follows:

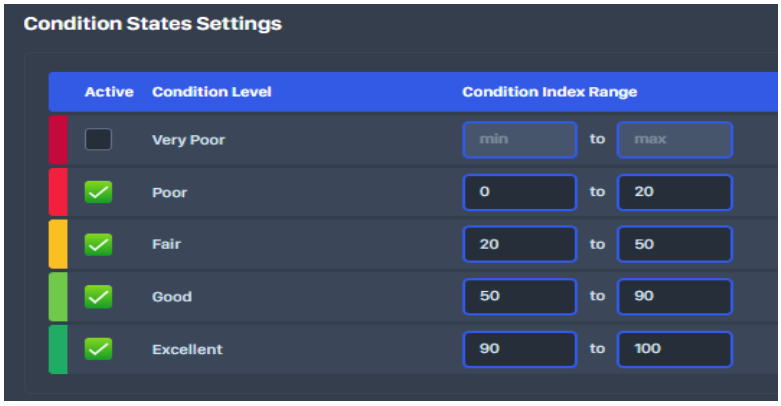


Figure 68: Lagoons Condition State Ranges

The age-based condition was calculated to the year 2020, and the current Network Condition (%RSL) of the Lagoons is 33. This represents an overall "Fair" condition state.

Title	Condition	Condition State
Network Overall Condition	33	Fair

The following summarizes the % Remaining Service Life, weighted by Replacement Cost:

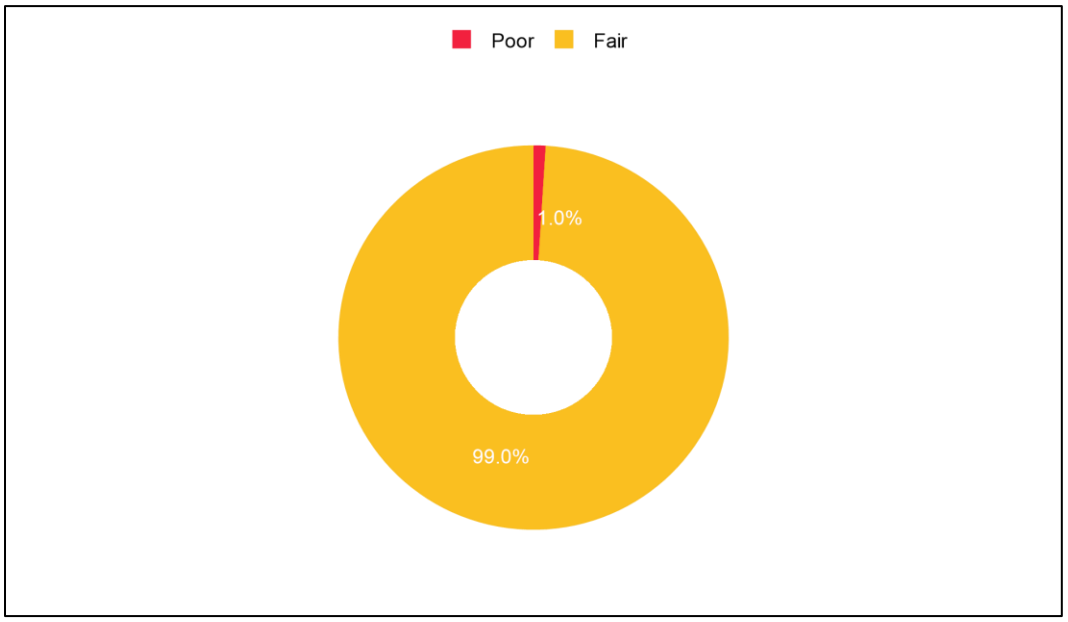


Figure 69: Lagoon Assets Condition

5.7.2 CRITICALITY AND RISK CRITERIA

Criticality
Based on the data attributes available, the Criticality settings were applied based on asset status. Socio-economic factors were not included.

Criticality Settings

Asset Status	5
Abandoned	0
In-service	50
Removed	0
Unassumed	0

Risk
The Risk settings for Lagoon assets are done as described in Section 4. Due to the lack of data, there are no risk targets set in the planning.

5.7.3 LEVEL OF SERVICE REQUIREMENTS

The Town targets to replace Lagoon assets before the end of their Service life is reached. The analysis was done based on an end-of-life replacement, with no budget constraint

5.7.4 LIFECYCLE MANAGEMENT STRATEGY

A single treatment is available for Lagoon assets, and it is a full replacement treatment.

Treatment Methods

Treatment	Description	Unit Cost	Inflation Rate	Cost Estimation Year
Replacement	Replacement	100.00 %	0.0%	2020

5.7.5 OPTIMIZED CAPITAL PLANNING RESULTS

Optimization analysis has been performed for the Lagoons, on the basis of a straight end-of-life replacement.

The Optimization Analysis Settings are as follows:

Scenario

Name:	End of life replacement 10 years
Description:	
Year:	2021

Optimization Settings

Optimization Mode	Standard
Planning Horizon (Years)	10
Include Priorities	Yes
Operational Efficiency	No
Estimate Current Condition	True
Condition Variation	0.0%
Project Size Limit	0
Rollover	0

Optimization Objective

Type	Min/Max	Weight (Sum = 1)	Performance Attribute
Maximize Network Performance	Max	1	NA

Network Optimization Results

Figure 70 shows the Lagoons overall network performance throughout the plan period:

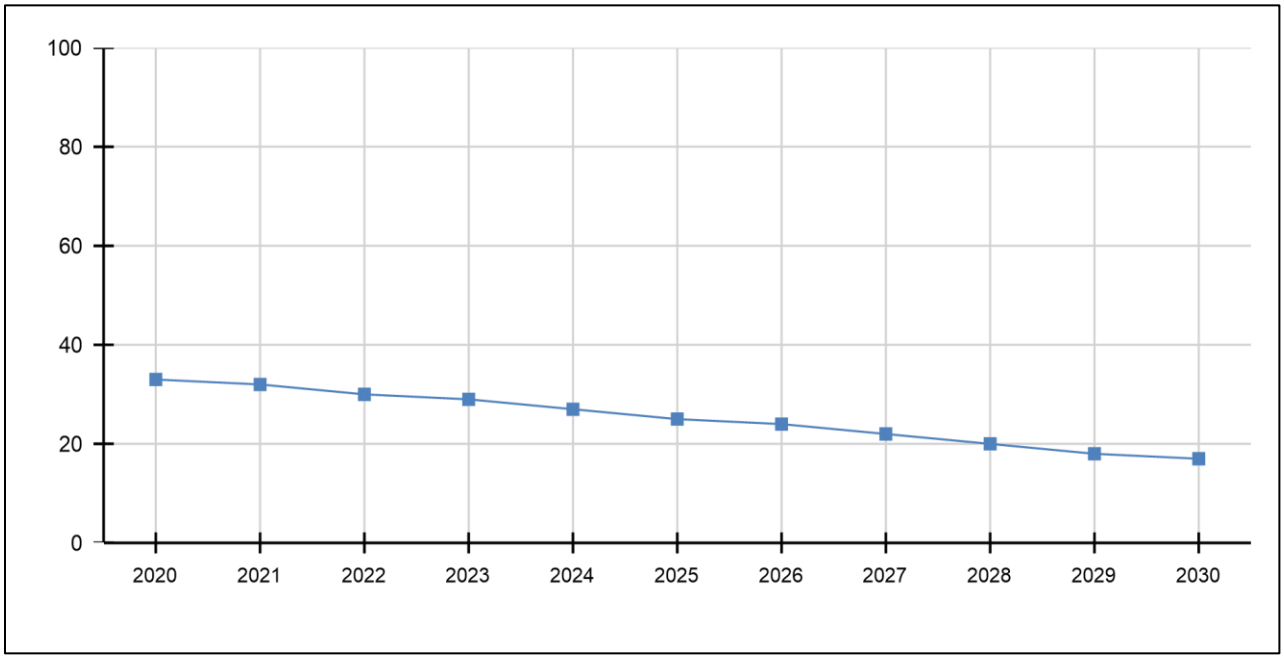


Figure 70: Lagoons Network Performance

Over the next 10 years, as the Lagoons age, the network performance decreases from 33 to 17 at the end of plan.

Figure 71 shows the condition status distribution of the Lagoons network at each year of the plan:

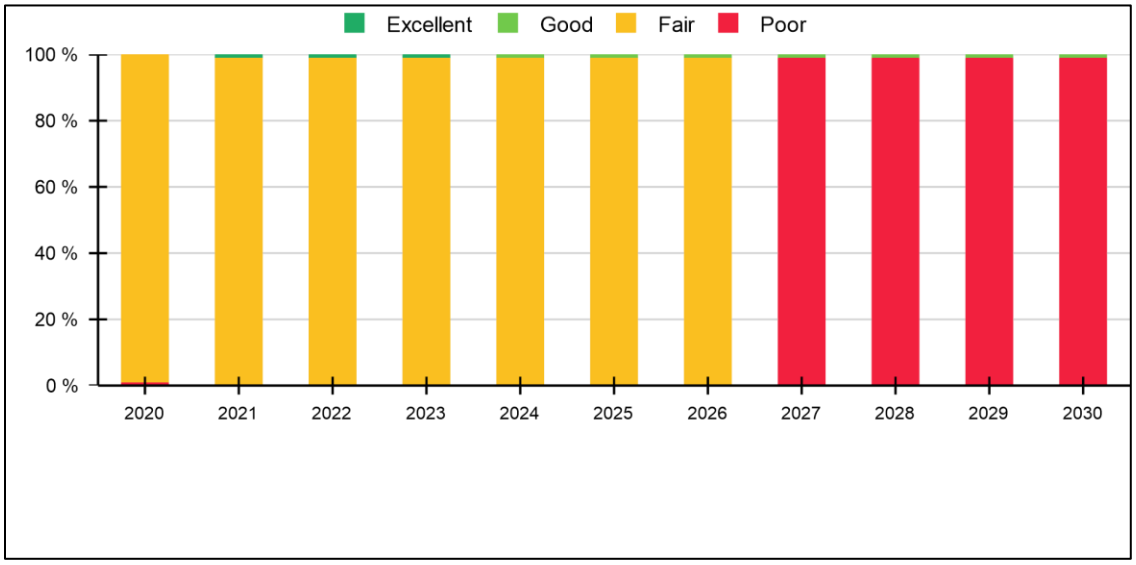


Figure 71: Annual Network Condition Status

As shown in this figure, at the beginning of the plan 99% is in fair, and 1% is in poor condition. At the end of the 10-year plan 1% will be in the good condition, and 99% will be in the poor condition.

The projected Capital expenditures for Lagoons are shown in Figure 72:

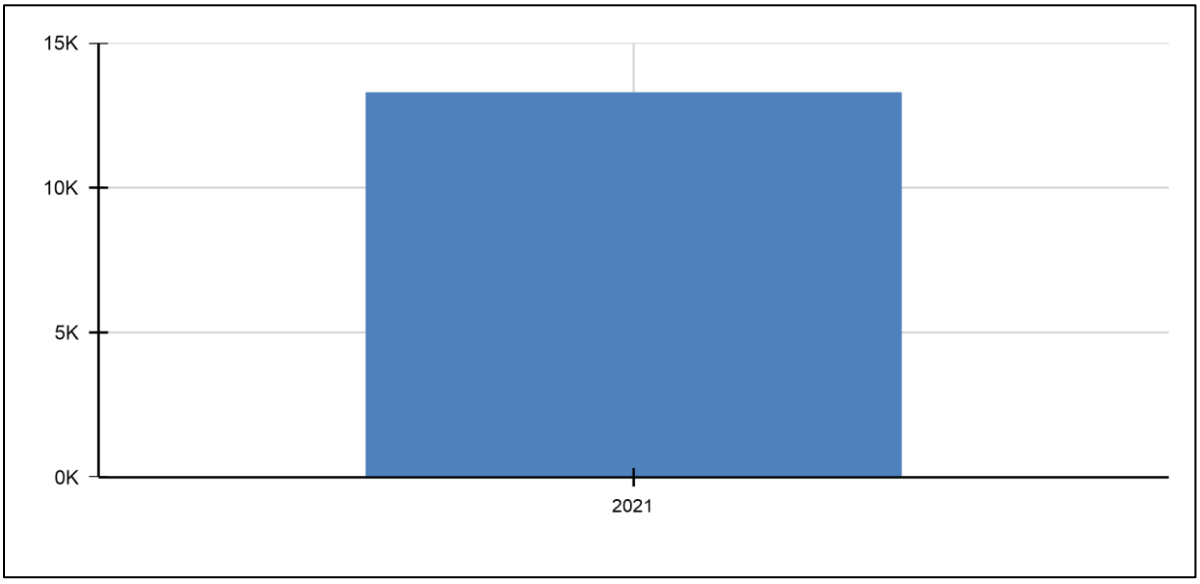


Figure 72: Lagoons Capital Expenditures

The backlog was taken care of in the first year of the plan, and no other capital projects are scheduled during the plan period.

5.8 BUILDINGS

The Town of Thessalon has a total of 19 Building Assets. No data for Building Elements/Components was available, so the buildings are analyzed on the whole.

5.8.1 BUILDINGS ATTRIBUTES

The following summarizes the Buildings by Department within the Municipality:

Department	Replacement Cost	Percentage
General Government	893,332.8	7.20%
Recreation Facilities	7,019,267.8	56.7%
Fire Protection	368,677.4	3.0%
Library	1,404,343.4	11.3%
Transportation services	261,593.3	2.1%
Other	2,442,440.0	19.7%

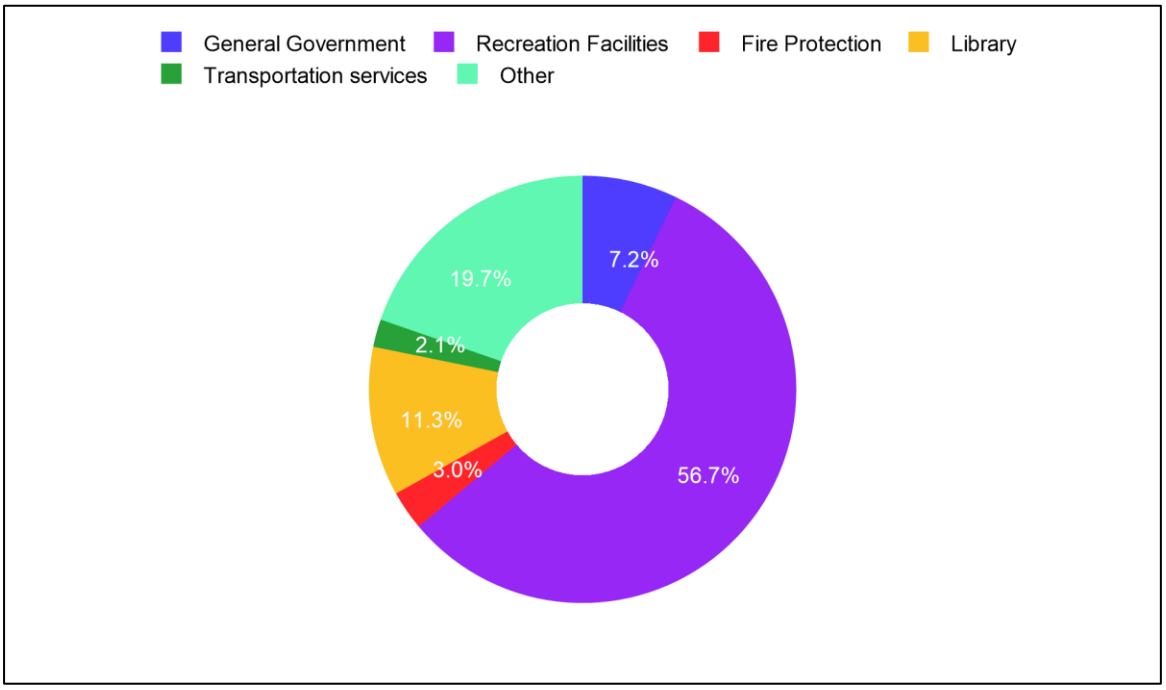


Figure 73: Buildings by Department

5.8.2 CONDITION ASSESSMENT APPROACH

The state of the infrastructure for Buildings is determined through an age-based condition analysis. The five (5) Condition States are defined as follows:

Figure 74: Buildings Condition State Ranges

The age-based condition was calculated to the year 2020, and the current Network Condition (%RSL) of the Buildings is 40. This represents an overall “Fair” condition state.

Title	Condition	Condition State
Network Overall Condition	40	Fair

The following summarizes the 2020 Building Network Condition, weighted by replacement cost:

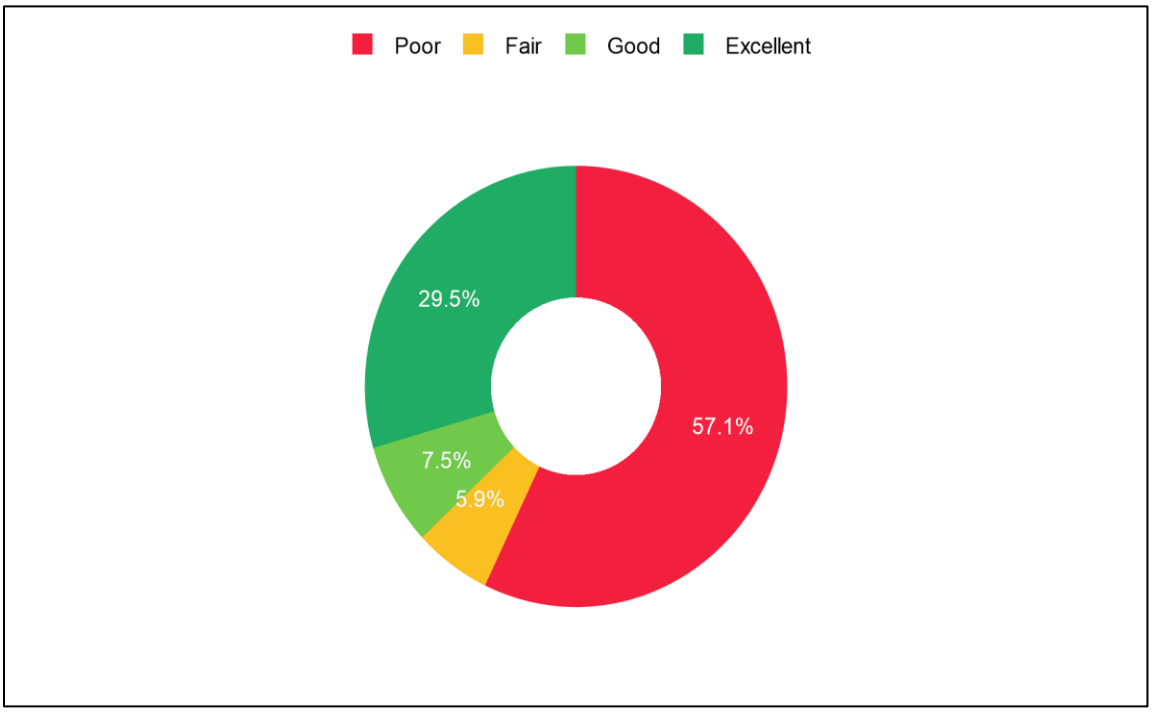


Figure 75: Buildings Network Condition

The Condition States by Department are shown in Figure 76:

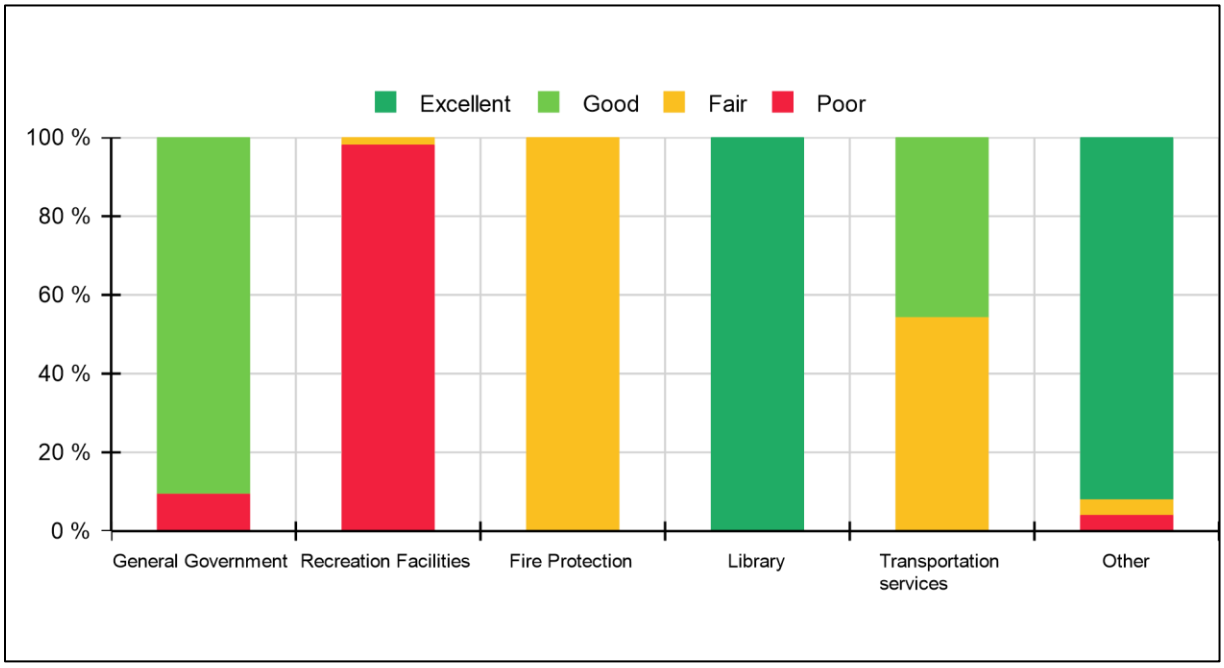


Figure 76: Buildings Network Condition by Department

The Map view of the Building condition states is shown in Figure 77.

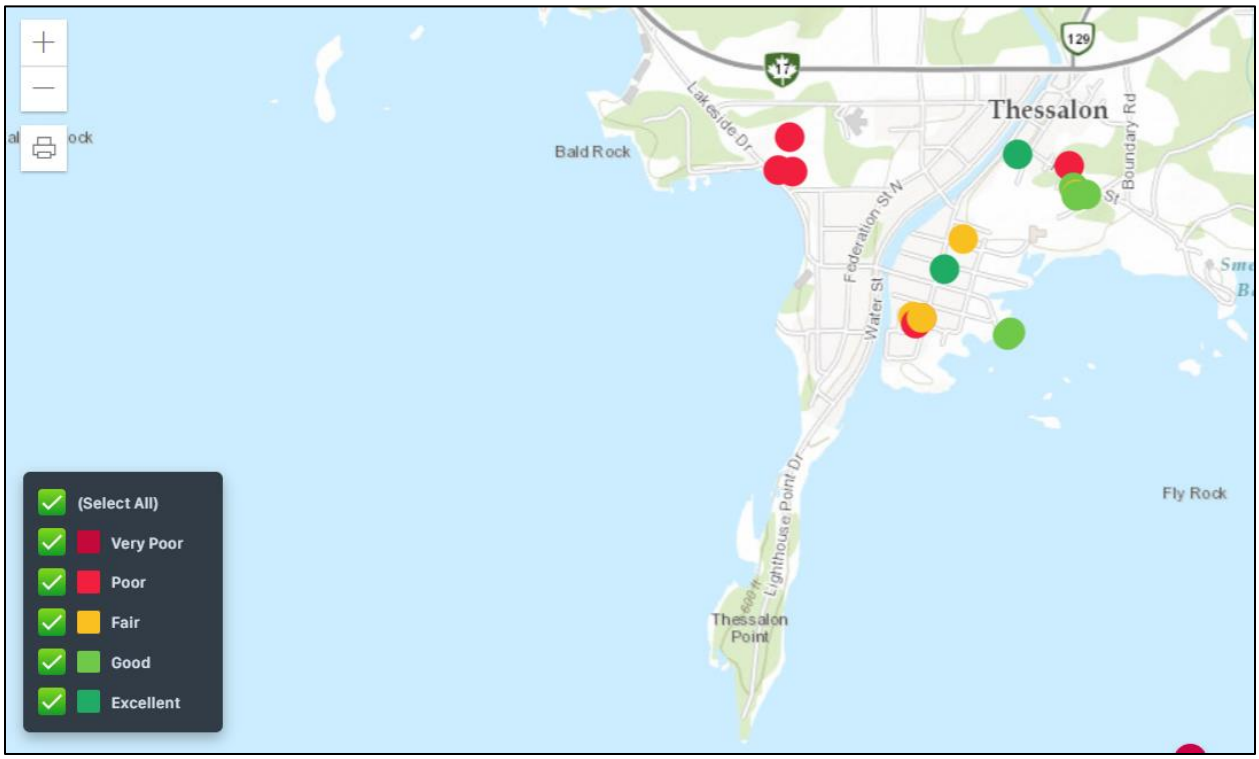


Figure 77: Buildings Current Network Condition Map

5.8.3 CRITICALITY AND RISK CRITERIA

Criticality
Based on the data attributes available, the Criticality settings were applied based on asset status. Socio-economic factors were not included.

Criticality Settings

Asset Status	5
Abandoned	0
In-service	100
Removed	0

Risk
The Risk settings for Buildings are done as described in Section 4. Due to the lack of data, there are no risk targets set in the planning.

5.8.4 LEVEL OF SERVICE REQUIREMENTS

The Town targets to replace Buildings before the end of their Service life is reached. The analysis was done based on an end-of-life replacement, with no budget constraint.

5.8.5 LIFECYCLE MANAGEMENT STRATEGY

A single treatment is available for Buildings, and it is a full replacement treatment.

Treatment Methods

Treatment	Description	Unit Cost	Inflation Rate	Cost Estimation Year
Replacement	Replacement	100.00 %	0.0%	2020

5.8.6 OPTIMIZED CAPITAL PLANNING RESULTS

Optimization analysis has been performed for the Buildings, on the basis of a straight end-of-life replacement.

The Optimization Analysis Settings are as follows:

Scenario

Name:	End of life replacement 10 years
Description:	
Year:	2021

Optimization Settings

Optimization Mode	Standard
Planning Horizon (Years)	10
Include Priorities	Yes
Operational Efficiency	No
Estimate Current Condition	True

Optimization Objective			
Type	**Min/Max**	**Weight (Sum = 1)**	**Performance Attribute**
Maximize Network Performance	Max	1	NA

Network Optimization Results

Figure 78 shows the buildings overall network performance throughout the plan period:

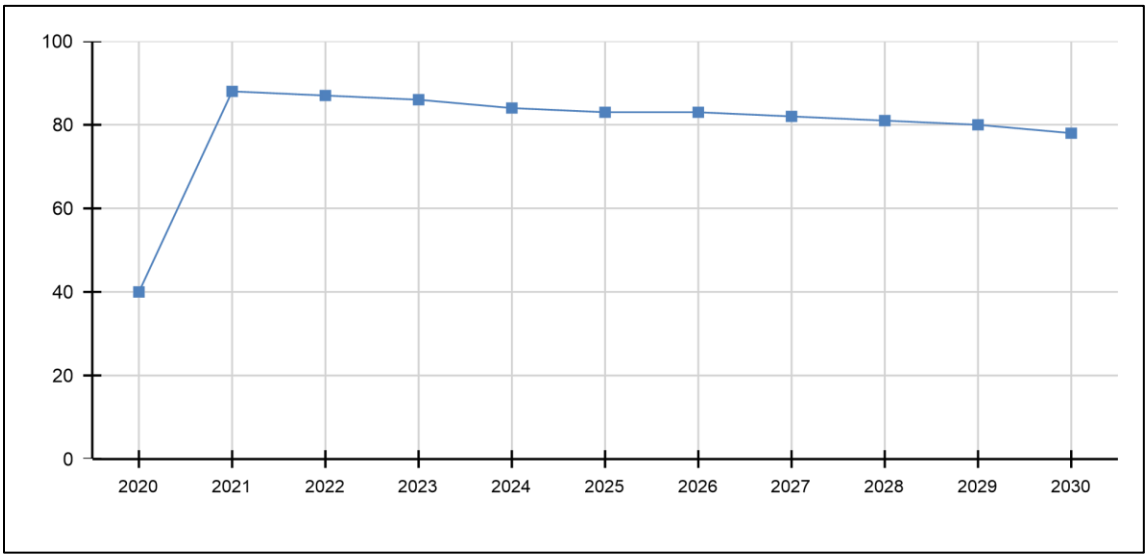


Figure 78: Building Network Performance

Over the next 10 years, the performance of the building network increases from 40 to 78 at the end of plan.

Figure 99 shows the condition status distribution of the building network at each year of the plan:

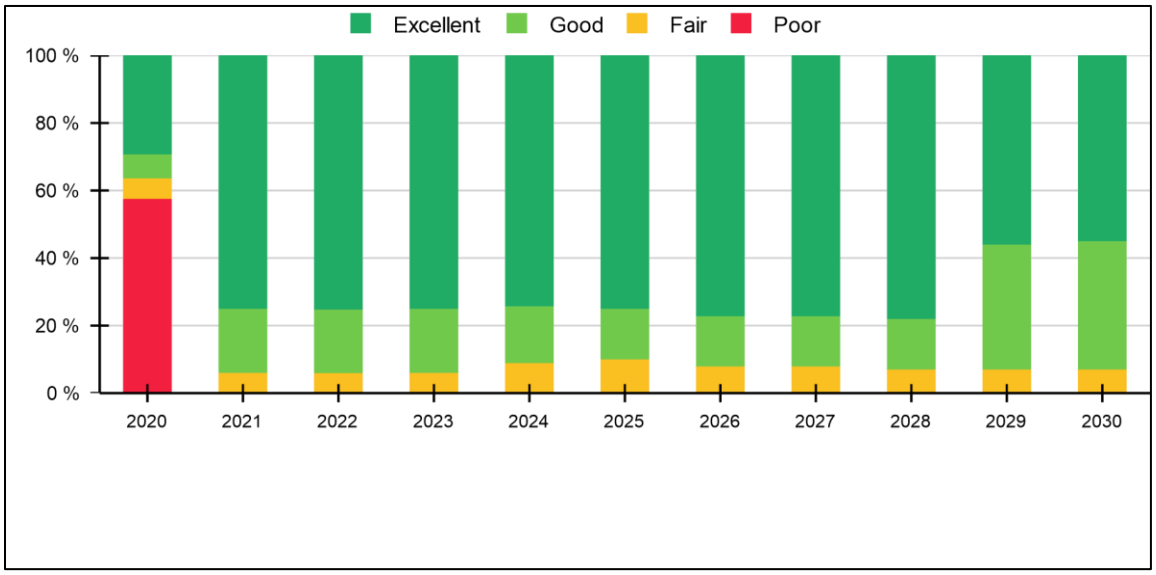


Figure 79: Building Annual Network Condition Status

As shown in this figure, at the beginning of the plan 29% is in excellent, 7% in good, 6% in fair, and 57% in poor condition. At the end of the 10-year plan 55% of the building assets will be in excellent, 38% in good, and 7% in fair condition.

There is a backlog of $ 6,751,866 which is taken care of in the first year of the plan. The following capital expenditures for replacements are scheduled:

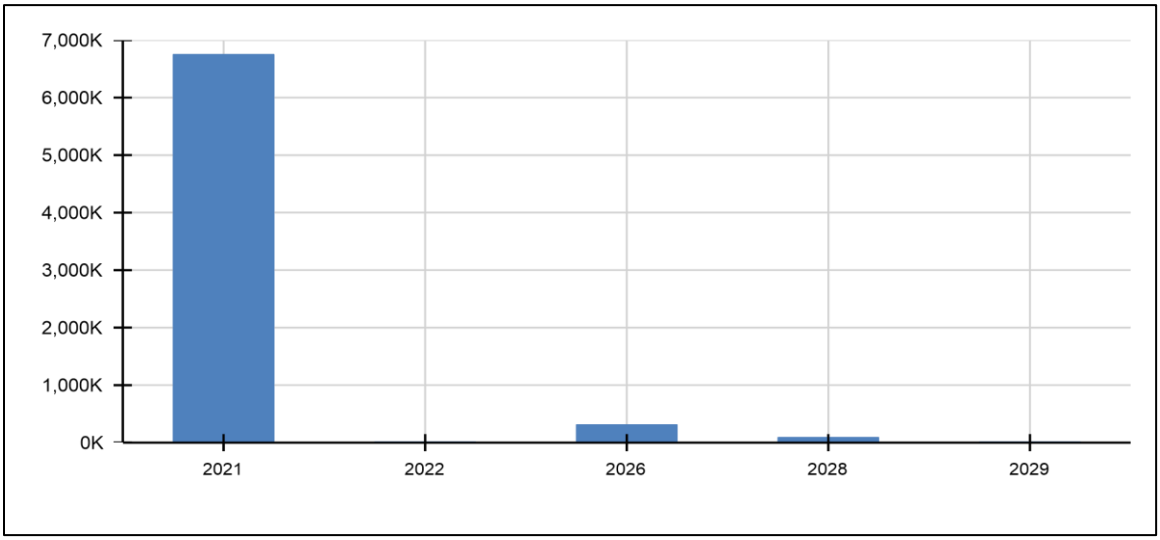


Figure 80: Building Projected Capital Expenditures

These Building replacement projects are based on age triggers. Because no condition assessment, component-based data or renovation history is available, the scheduled replacement projects may not be required as specified. Therefore, these scheduled Building replacements are **not** included in financial forecasting.

5.9 VEHICLES

The Town of Thessalon has a total of 15 Vehicles, classified by Departments Water, Fire and Public Works . Due to the large variation in cost, the Vehicles are weighed by Replacement Cost.

5.9.1 BUILDINGS ATTRIBUTES

The following summarizes the Vehicles by Department within the Municipality:

Department	Replacement Cost	Percentage
Water	8,100.0	0.6%
Fire Department	367,200.0	28.5%
Public Works	915,000.0	70.9%

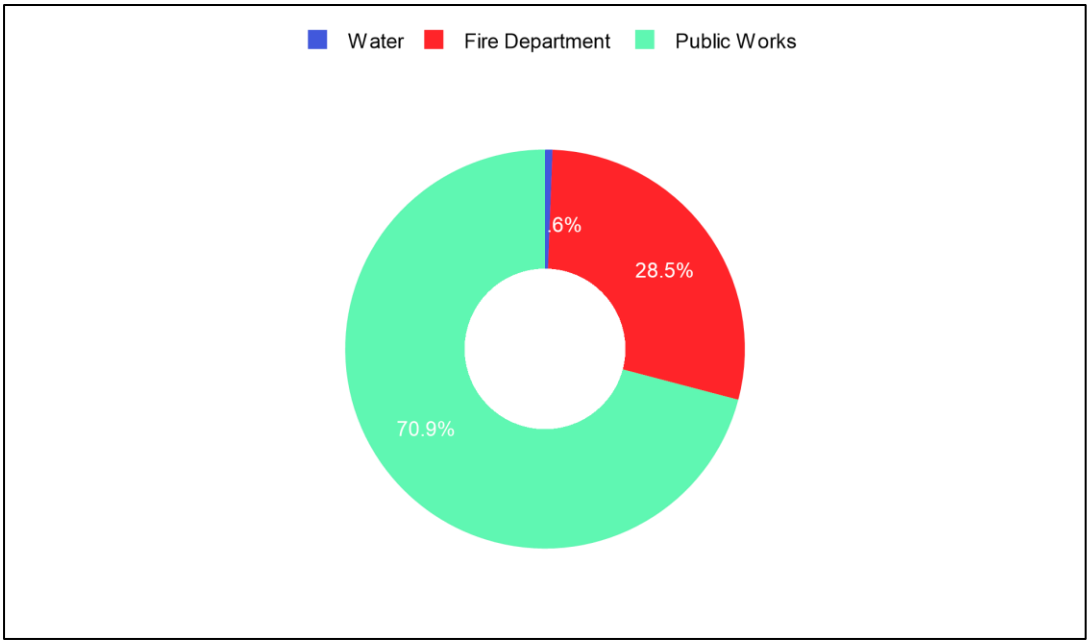


Figure 81: Vehicles by Department

5.9.2 CONDITION ASSESSMENT APPROACH

The state of the infrastructure for Vehicles is determined through an age-based condition analysis. The five (5) Condition States are defined as follows:

Figure 82: Vehicle Condition State Ranges

The age-based condition was calculated to the year 2020, and the current Fleet Condition (%RSL) of the Vehicles is 39. This represents an overall “Fair” condition state.

Title	Condition	Condition State
Network Overall Condition	39	Fair

The following summarizes the 2020 Vehicle Condition, weighed by replacement cost:

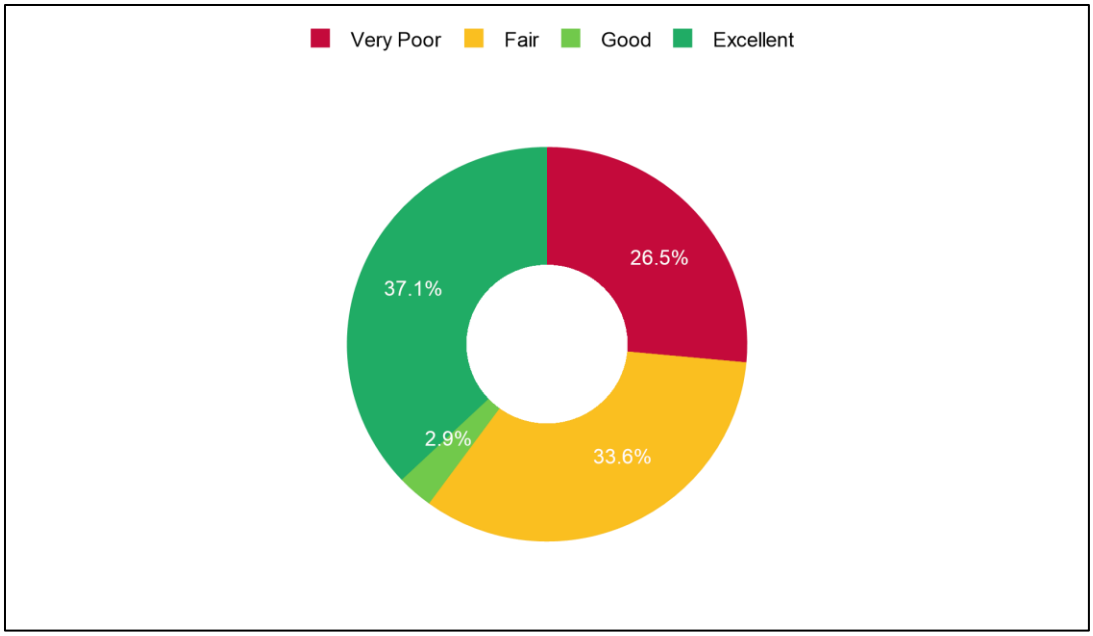


Figure 83: Vehicle Fleet Condition

This Figure shows the Vehicles condition State by Department:

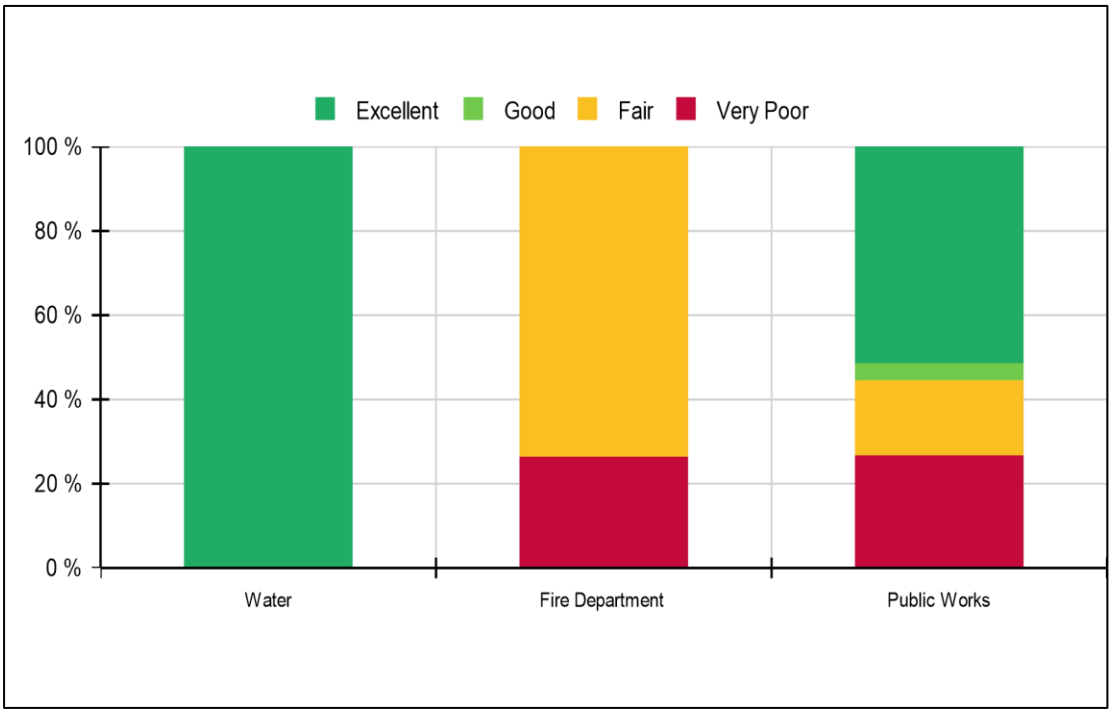


Figure 84: Vehicles Condition by Department

5.9.3 CRITICALITY AND RISK CRITERIA

Criticality
Based on the data attributes available, the Criticality settings were applied based on Asset Status. Socio-economic factors were not included.

Criticality Settings	
Asset Status	**5**
Abandoned	0
In-service	50
Removed	0
Unassumed	0

Risk
The Risk settings for Vehicles are done as described in Section 4. Due to the lack of data, there are no risk targets set in the planning.

5.9.4 LEVEL OF SERVICE REQUIREMENTS

The Town targets to replace Vehicles before the end of their Service life is reached. The analysis was done based on an end-of-life replacement, with no budget constraint.

5.9.5 LIFECYCLE MANAGEMENT STRATEGY

A single treatment is available for Vehicles, and it is a full replacement treatment.

Treatment Methods				
Treatment	**Description**	**Unit Cost**	**Inflation Rate**	**Cost Estimation Year**
Replacement	Replacement	100.00 %	0.0%	2020

5.9.6 OPTIMIZED CAPITAL PLANNING RESULTS

Optimization analysis has been performed for the Vehicles, on the basis of a straight end-of-life replacement.

The Optimization Analysis Settings are as follows:

Scenario	
Name:	End of life replacement 10 years
Description:	
Year:	2021

Optimization Settings	
Optimization Mode	Standard
Planning Horizon (Years)	10
Include Priorities	Yes
Operational Efficiency	No
Estimate Current Condition	True

Optimization Objective			
Type	**Min/Max**	**Weight (Sum = 1)**	**Performance Attribute**
Maximize Network Performance	Max	1	NA

Network Optimization Results

Figure 85 shows the Vehicles overall fleet performance throughout the plan period:

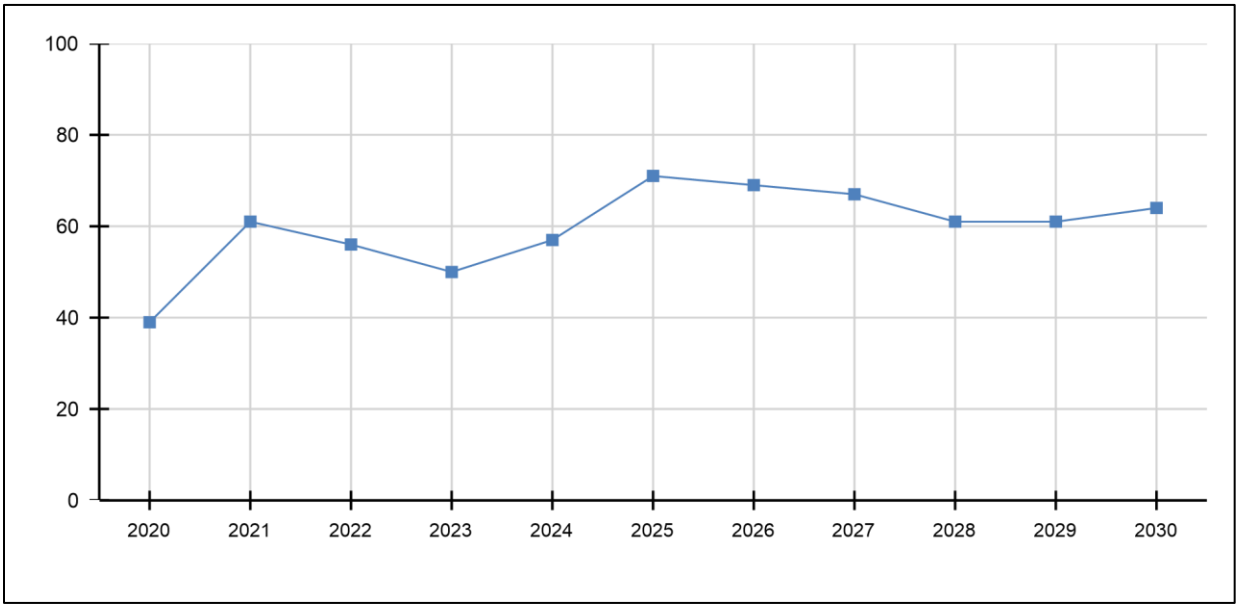


Figure 85: Vehicle Fleet Performance

Over the next 10 years, the performance of the Vehicles network improves from 39 to 64 at the end of plan.

Figure 86 shows the condition status distribution of the Vehicles network at each year of the plan:

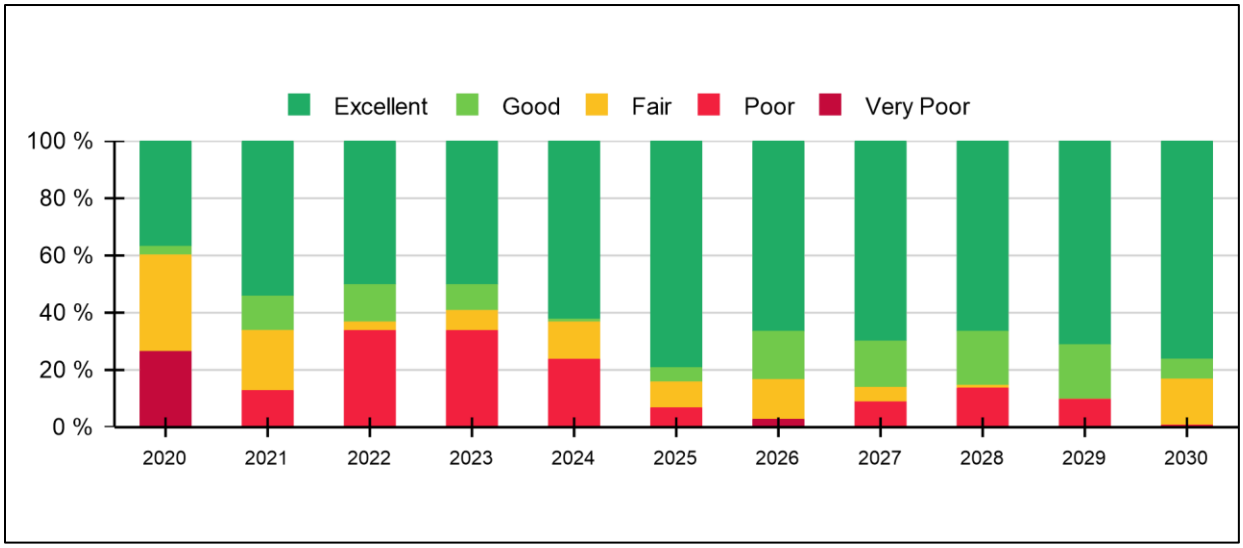


Figure 86: Annual Vehicle Fleet Condition Status

As shown in this figure, at the beginning of the plan 37% is in excellent, 3% in good, 34% in fair, 0% in poor, and 27% in very poor condition. At the end of the 10-year plan 76% will be in excellent, 7% in good, 16% in fair, and 1% will be in poor condition.

The scheduled capital expenditures are shown in Figure 87:

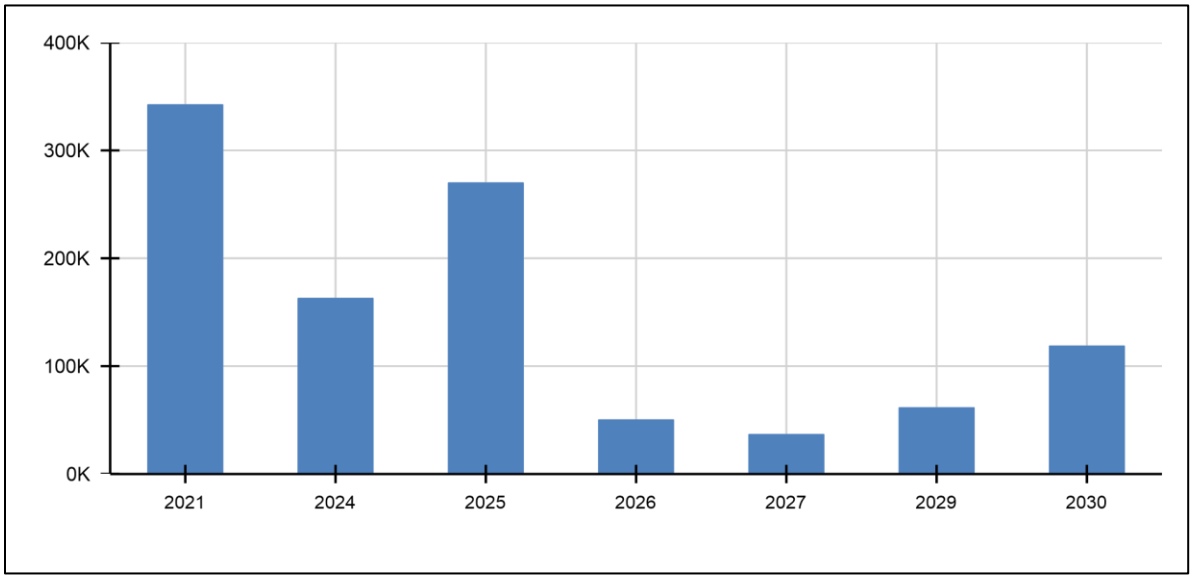


Figure 87: Vehicles Capital Expenditures

The backlog has been cleared in the first year of the capital plan, and there is no deficit position throughout the plan period.

5.10 EQUIPMENT

The Town of Thessalon has a total of 38 Equipment Assets. Due to the large variation in cost, the Equipment assets are weighed by Replacement Cost.

5.10.1 BUILDINGS ATTRIBUTES

The following summarizes the Vehicles by Department within the Municipality:

Department	Replacement Cost	Percentage
Water	13,608.0	1.2%
Arena	418,400.0	35.4%
Fire Department	113,700.0	9.6%
General Government	252,800.0	21.4%
Public Works	224,200.0	19.0%
Marina	21,600.0	1.8%
Park	23,800.0	2.0%
Community Hall	98,000.0	8.3%
Sewer	16,000.0	1.4%

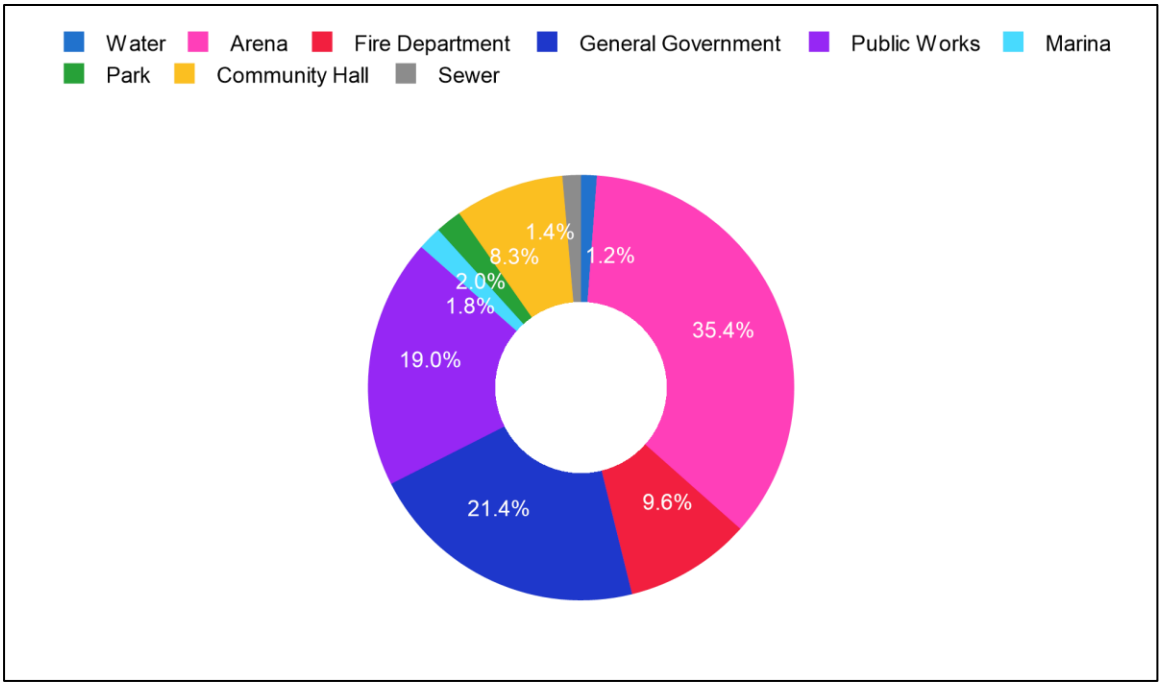


Figure 88: Equipment by Department

5.10.2 CONDITION ASSESSMENT APPROACH

The state of the infrastructure for Equipment Assets is determined through an age-based condition analysis. The five (5) Condition States are defined as follows:

Figure 89: Equipment Condition State Ranges

The age-based condition was calculated to the year 2020, and the current Network Condition (%RSL) of the Equipment Assets, weighed by replacement cost, is 47. This represents an overall "Good" condition state.

Title	Condition	Condition State
Network Overall Condition	47	Good

The following summarizes the 2020 Network Condition States:

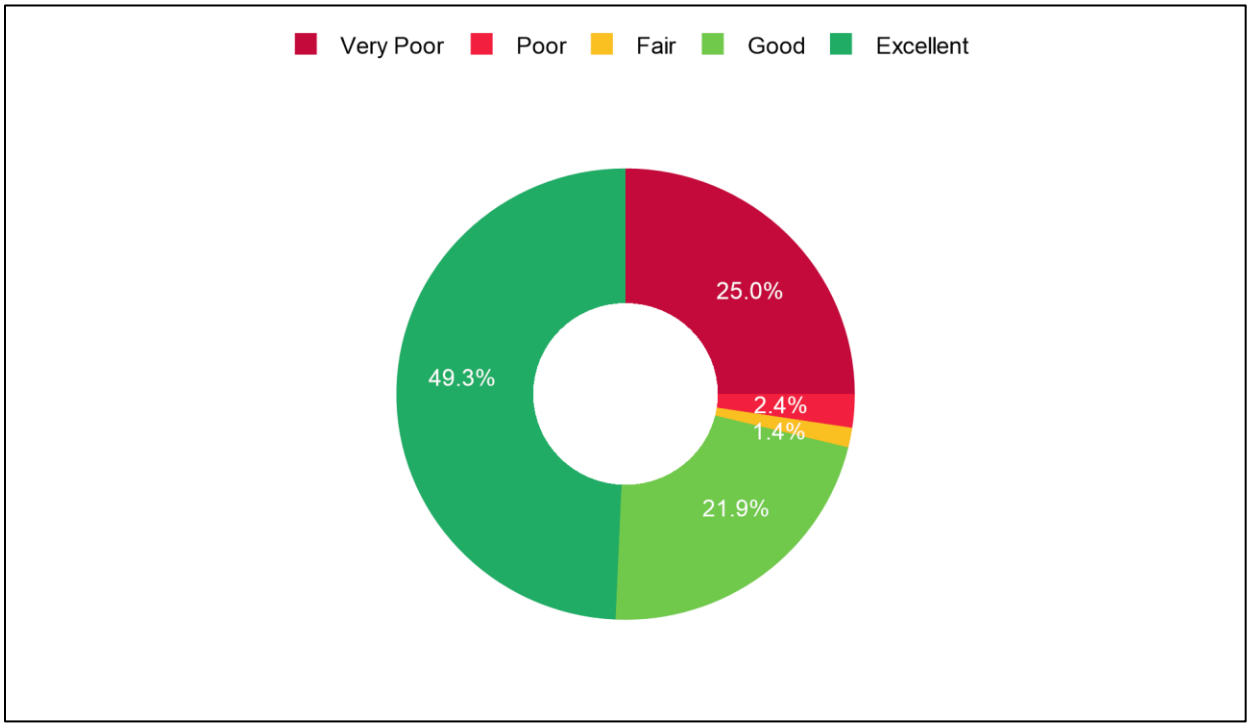


Figure 90: Equipment Assets Network Condition

5.10.3 CRITICALITY AND RISK CRITERIA

Criticality
Based on the data attributes available, the Criticality settings were applied based on asset status. Socio-economic factors were not included.

Criticality Settings

Asset Status	5
Abandoned	0
In-service	50
Removed	0
Unassumed	0

Risk
The Risk settings for Equipment Assets are done as described in Section 4. Due to the lack of data, there are no risk targets set in the planning.

5.10.4 LEVEL OF SERVICE REQUIREMENTS

The Town targets to replace Equipment Assets before the end of their Service life is reached. The analysis was done based on an end-of-life replacement, with no budget constraint.

5.10.5 LIFECYCLE MANAGEMENT STRATEGY

A single treatment is available for Equipment Assets, and it is a full replacement treatment.

Treatment Methods				
Treatment	**Description**	**Unit Cost**	**Inflation Rate**	**Cost Estimation Year**
Replacement	Replacement	100.00 %	0.0%	2020

5.10.6 OPTIMIZED CAPITAL PLANNING RESULTS

Optimization analysis has been performed for the Equipment Assets, on the basis of a straight end-of-life replacement.

The Optimization Analysis Settings are as follows:

Scenario	
Name:	End of life replacement 10 years
Description:	
Year:	2021

Optimization Settings	
Optimization Mode	Standard
Planning Horizon (Years)	10
Include Priorities	Yes
Operational Efficiency	No
Estimate Current Condition	True
Condition Variation	0.0%
Project Size Limit	0
Rollover	0

Optimization Objective			
Type	**Min/Max**	**Weight (Sum = 1)**	**Performance Attribute**
Maximize Network Performance	Max	1	NA

Network Optimization Results

Figure 91 shows the Equipment Assets overall network performance throughout the plan period:

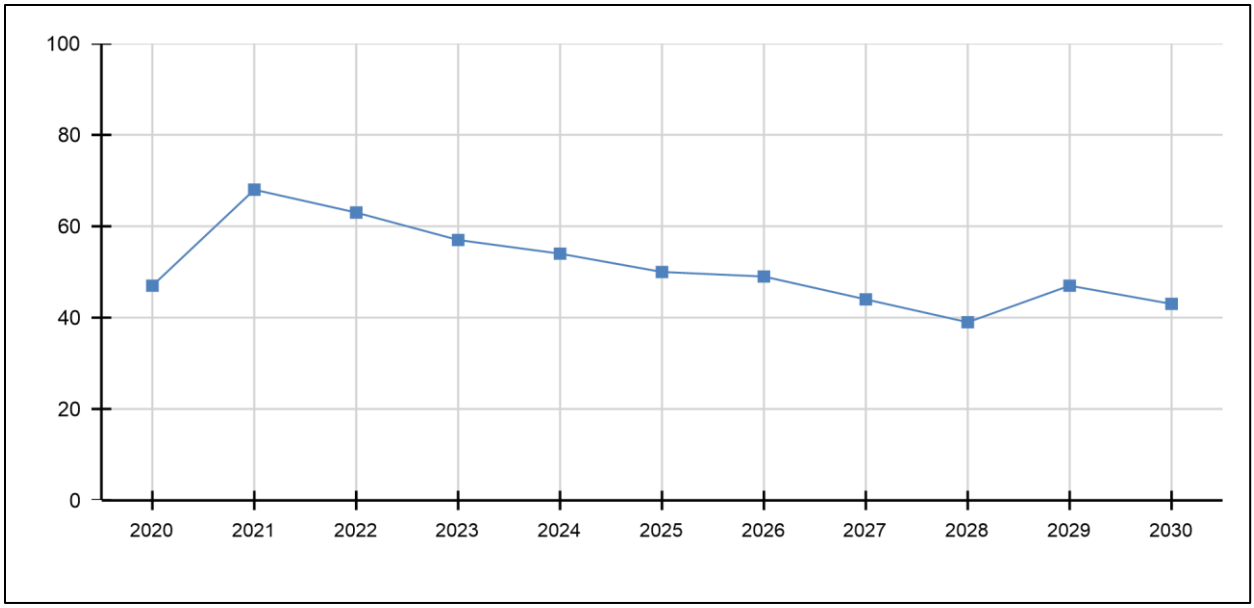


Figure 91: Equipment Network Performance

Over the next 10 years, the performance of the Equipment assets declines from 47 to 43 at the end of plan.

Figure 92 shows the condition status distribution of the Equipment Assets network at each year of the plan:

Figure 92: Equipment Annual Network Condition Status

As shown in this figure, at the beginning of the plan 49% is in excellent, 22% in good, 1% in fair, 2% in poor and 25% in very poor condition. At the end of the 10-year plan 40% will be in excellent, 9% in good, 14% in fair, 20% in poor, and 17% in very poor condition.

The scheduled capital expenditures are shown in Figure 93:

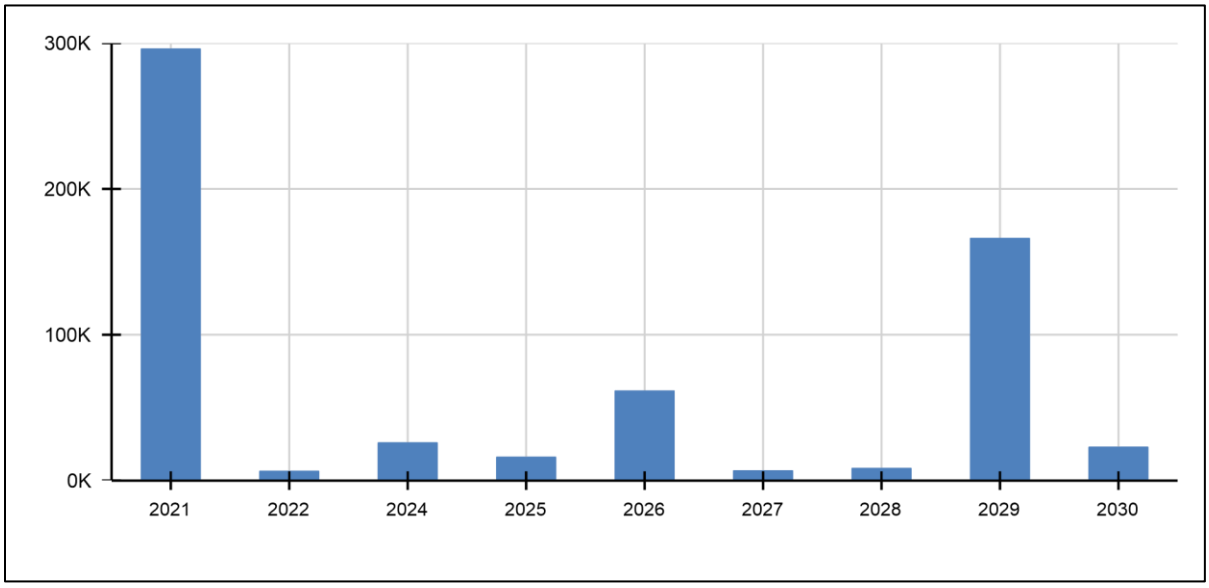


Figure 93: Equipment Capital Expenditures

The backlog has been cleared in the first year of the capital plan, and there is no deficit position during the plan period.

5.11 BALL FIELD DIAMONDS

The Town of Thessalon has a total of 3 Ball Field Diamonds.

5.11.1 CONDITION ASSESSMENT APPROACH

The state of the infrastructure for Ball Fields is determined through an age-based condition analysis. The five (5) Condition States are defined as follows:

Active	Condition Level	Condition Index Range		
✓	Very Poor	0	to	5
✓	Poor	5	to	20
✓	Fair	20	to	60
✓	Good	60	to	80
✓	Excellent	80	to	100

Figure 94: Ball field Diamonds Condition State Ranges

The age-based condition was calculated to the year 2020, and the current Network Condition (%RSL) of the Ball field Diamonds Assets, weighed by replacement cost, is 24. This represents an overall “Fair” condition state.

Title	Condition	Condition State
Network Overall Condition	24	Fair

The following summarizes the 2020 Network Condition States:

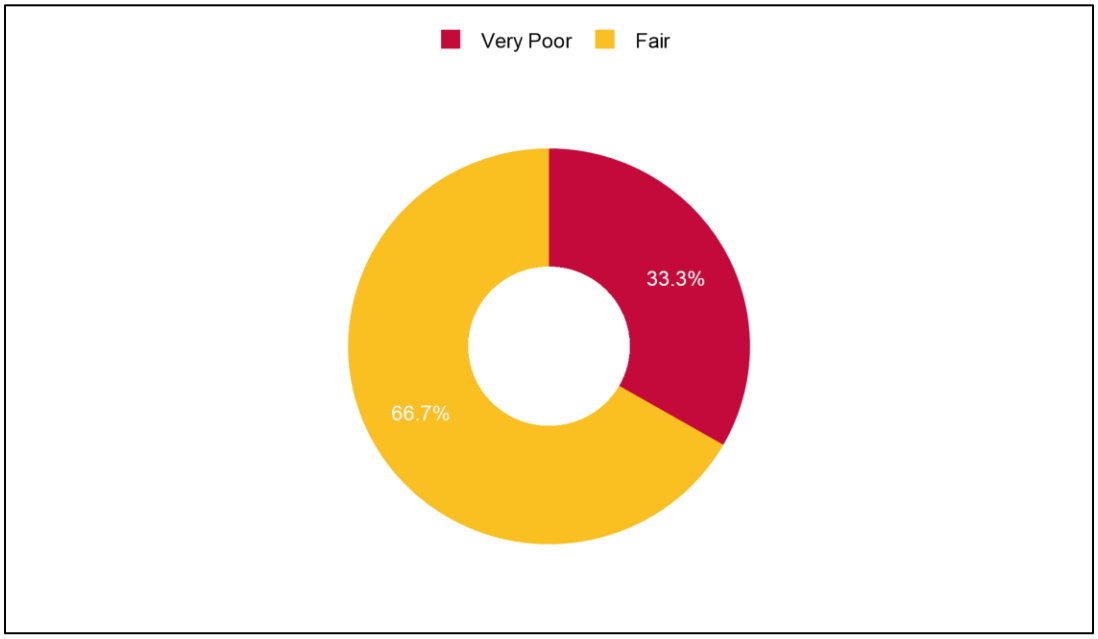


Figure 95: Ball field Diamonds Assets Network Condition

5.11.2 CRITICALITY AND RISK CRITERIA

Criticality
Based on the data attributes available, the Criticality settings were applied based on asset status. Socio-economic factors were not included.

Criticality Settings

Asset Status	5
Abandoned	0
In-service	50
Removed	0
Unassumed	0

Risk
The Risk settings for Ball field Diamonds are done as described in Section 4. Due to the lack of data, there are no risk targets set in the planning.

5.11.3 LEVEL OF SERVICE REQUIREMENTS

The Town targets to replace Ball field Diamonds before the end of their Service life is reached. The analysis was done based on an end-of-life replacement, with no budget constraint.

5.11.4 LIFECYCLE MANAGEMENT STRATEGY

A single treatment is available for Ball field Diamonds, and it is a full replacement treatment.

Treatment Methods

Treatment	Description	Unit Cost	Inflation Rate	Cost Estimation Year
Replacement	Replacement	100.00 %	0.0%	2020

5.11.5 OPTIMIZED CAPITAL PLANNING RESULTS

Optimization analysis has been performed for the Ball field Diamonds Assets, on the basis of a straight end-of-life replacement.

The Optimization Analysis Settings are as follows:

Scenario

Name:	End of life replacement 10 years
Description:	
Year:	2021

Optimization Settings

Optimization Mode	Standard
Planning Horizon (Years)	10
Include Priorities	Yes
Operational Efficiency	No
Estimate Current Condition	True
Condition Variation	0.0%
Project Size Limit	0
Rollover	0

Optimization Objective

Type	Min/Max	Weight (Sum = 1)	Performance Attribute
Maximize Network Performance	Max	1	NA

Network Optimization Results

Figure 96 shows the Ball field Diamonds Assets overall network performance throughout the plan period:

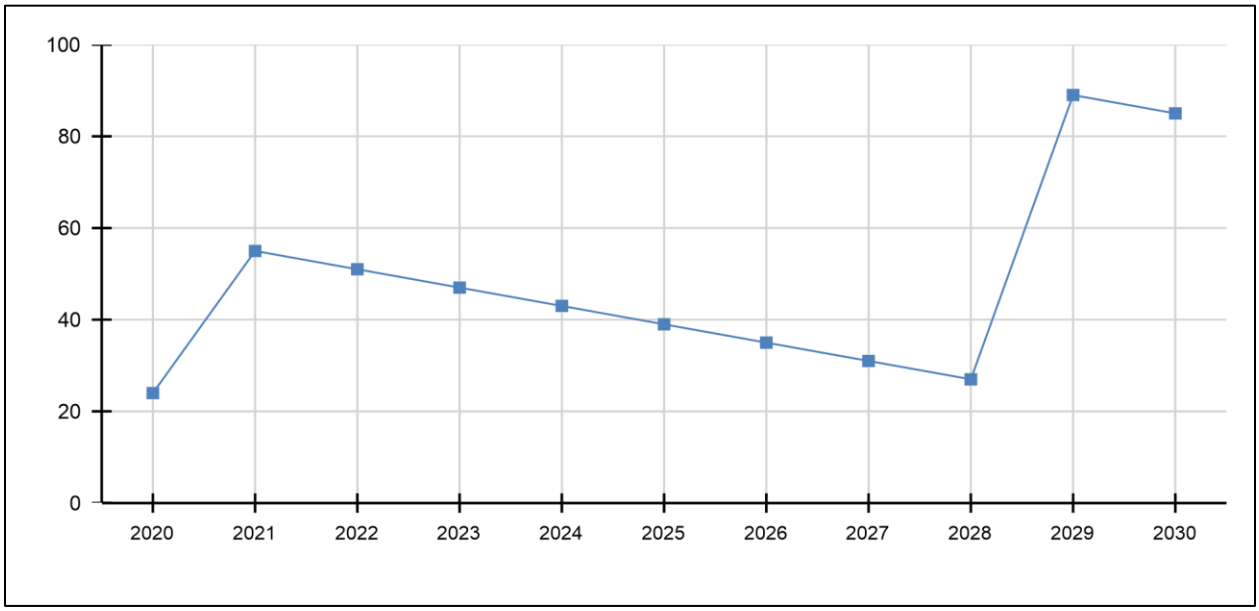


Figure 96: Ball field Diamonds Network Performance

Over the next 10 years, the performance of the Ball field Diamonds Assets network improves from 24 to 85 at the end of plan.

Figure 97 shows the condition status distribution of the Ball field Diamonds Assets network at each year of the plan:

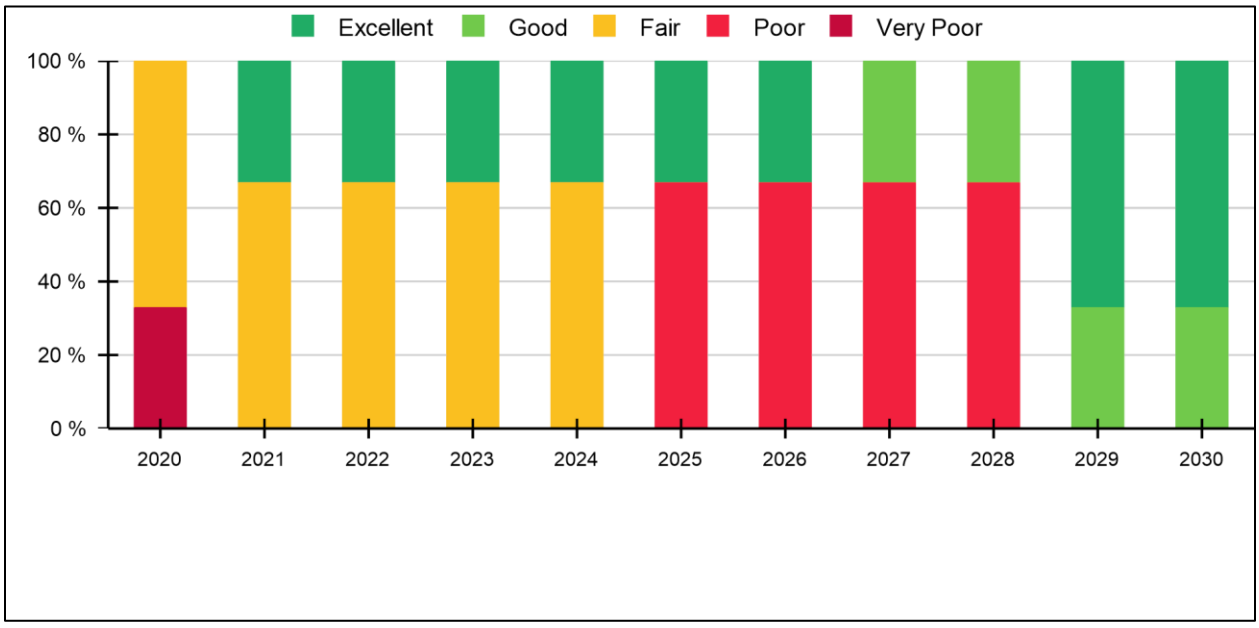


Figure 97: Ball field Diamonds Annual Network Condition Status

As shown in this figure, at the beginning of the plan 67% is in fair, and 33% in very poor condition. At the end of the 10-year plan 67% will be in excellent, and 33% will be in good condition.

The scheduled capital expenditures are shown in Figure 98:

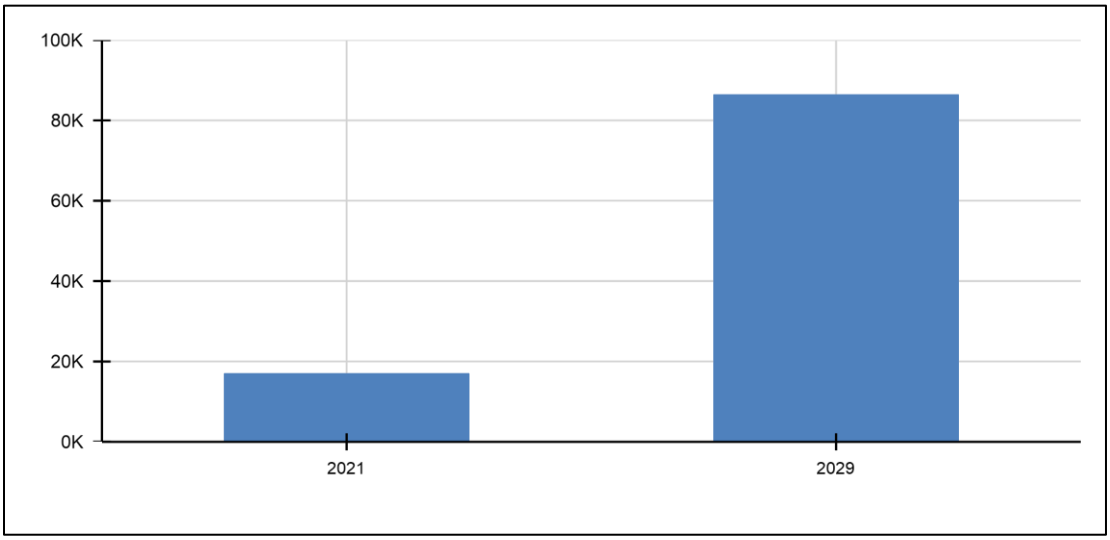


Figure 98: Ball field Diamonds Capital Expenditures

The backlog has been cleared in the first year of the capital plan, and there is no deficit position during the plan period.

5.12 SIDEWALKS

The Town of Thessalon has a total of 5.8 km of Sidewalk Assets.

5.12.1 CONDITION ASSESSMENT APPROACH

The state of the infrastructure for Sidewalks assets is determined through an age-based condition analysis. The five (5) Condition States are defined as follows:

Active	Condition Level	Condition Index Range		
✓	Very Poor	0	to	10
✓	Poor	10	to	25
✓	Fair	25	to	40
✓	Good	40	to	55
✓	Excellent	55	to	100

Figure 99: Sidewalk Condition State Ranges

The age-based condition was calculated to the year 2020, and the current Network Condition (%RSL) of the Sidewalk Assets, weighed by length, is 19. This represents an overall “Poor” condition state.

Title	Condition	Condition State
Network Overall Condition	19	Poor

The following summarizes the 2020 Network Condition States:

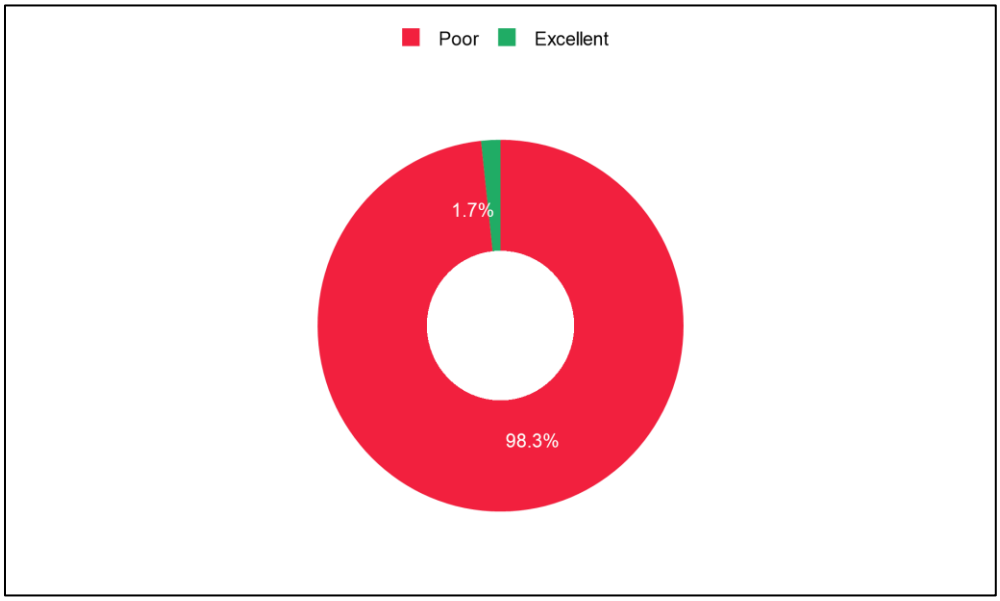


Figure 100: Sidewalk Network Condition

The Map view of the Sidewalk condition states is shown in Figure 101.

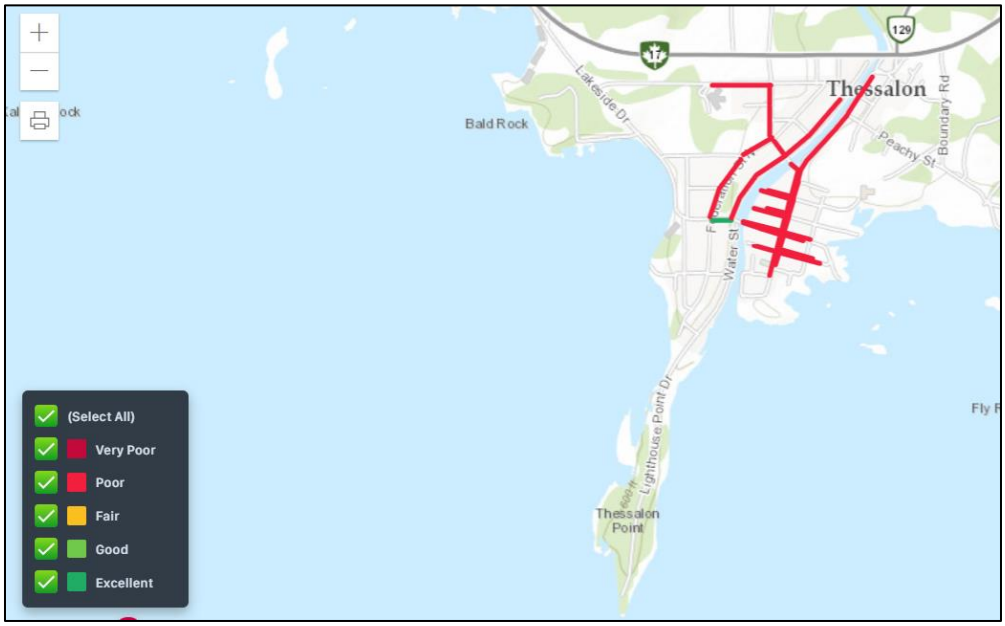


Figure 101: Sidewalks Current Network Condition Map

5.12.2 CRITICALITY AND RISK CRITERIA

Criticality
Based on the data attributes available, the Criticality settings were applied based on asset status. Socio-economic factors were not included.

Criticality Settings

Asset Status	5
Abandoned	0
In-service	100
Removed	0
Unassumed	0

Risk
The Risk settings for Sidewalks Assets are done as described in Section 4. Due to the lack of data, there are no risk targets set in the planning.

5.12.3 LEVEL OF SERVICE REQUIREMENTS

The Town targets to replace Sidewalks before the end of their Service life is reached. The analysis was done based on an end-of-life replacement, with no budget constraint.

5.12.4 LIFECYCLE MANAGEMENT STRATEGY

Two treatments are available for Sidewalks, and they are full replacement and maintenance treatments.

Treatment Methods

Treatment	Description	Unit Cost	Inflation Rate	Cost Estimation Year
Replacement	Replacement Treatment	100%	0.0%	2021
Maintenance	Routine Maintenance	5000.00 $/Km	0.0%	2021

5.12.5 OPTIMIZED CAPITAL PLANNING RESULTS

Optimization analysis has been performed for the Sidewalk Assets, on the basis of a straight end-of-life replacement.

The Optimization Analysis Settings are as follows:

Scenario

Name:	End of life replacement 10 Years
Description:	
Year:	2021

Optimization Settings

Optimization Mode	Standard
Planning Horizon (Years)	10
Include Priorities	Yes
Operational Efficiency	No
Estimate Current Condition	True
Condition Variation	0.0%
Project Size Limit	0
Rollover	0

Optimization Objective

Type	Min/Max	Weight (Sum = 1)	Performance Attribute
Maximize Network Performance	Max	1	NA

Network Optimization Results

Figure 102 shows the Sidewalks Assets overall network performance throughout the plan period:

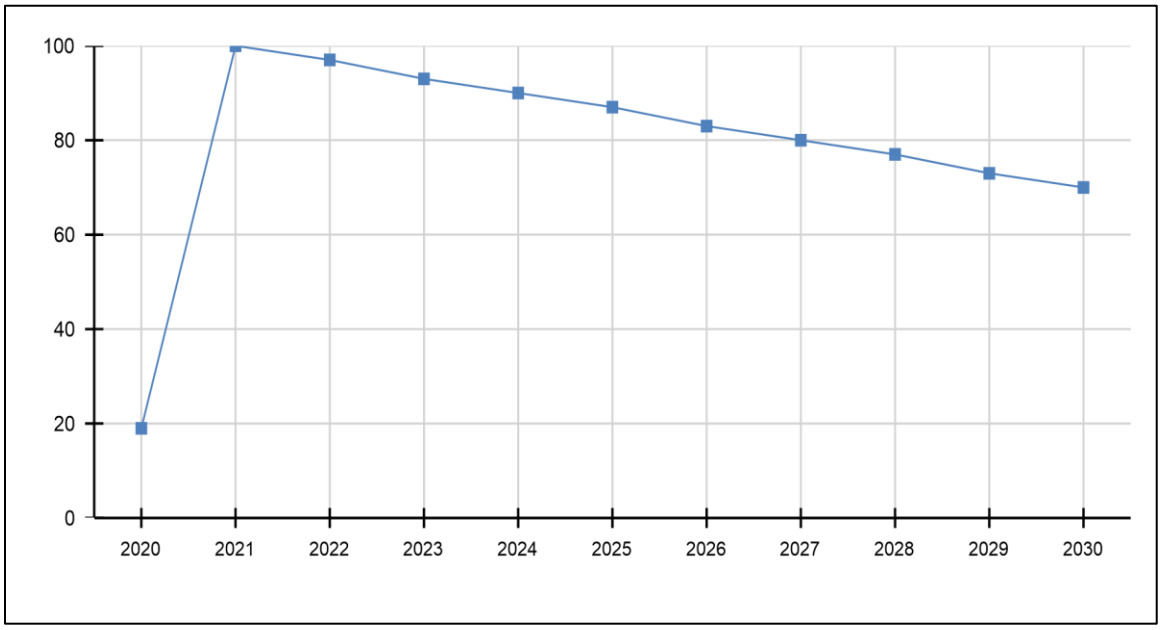


Figure 102: Sidewalks Network Performance

Over the next 10 years, the performance of the Sidewalks Assets network improves from 19 to 70 at the end of plan.

Figure 103 shows the condition status distribution of the Sidewalks Assets network at each year of the plan:

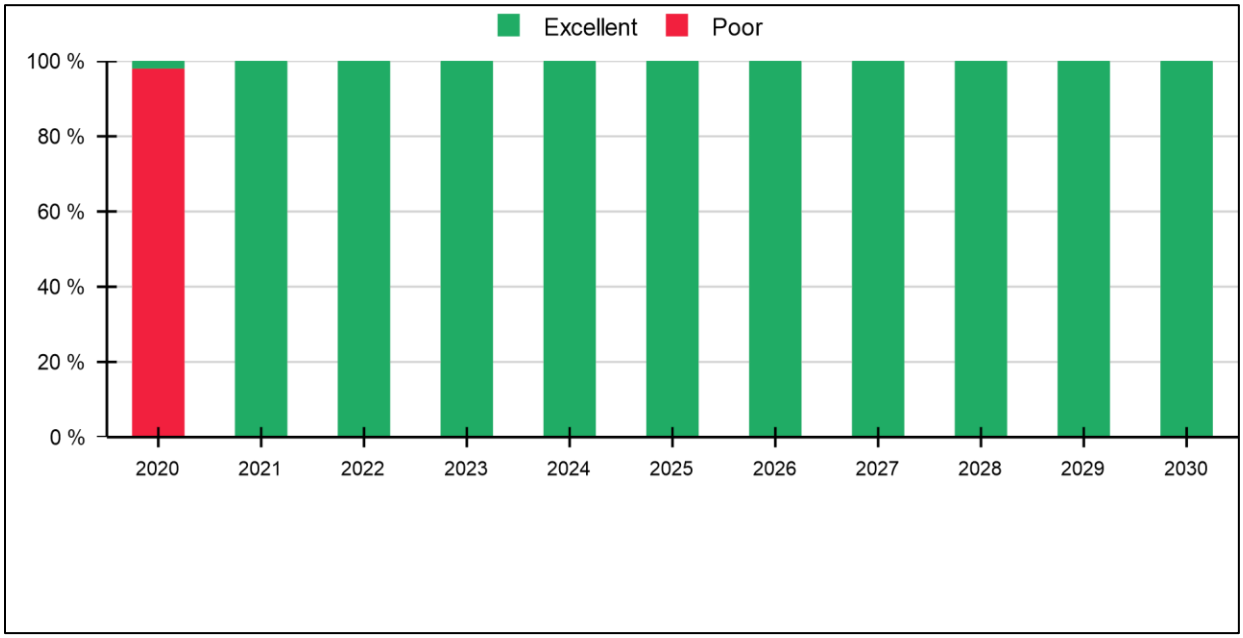


Figure 103: Sidewalks Annual Network Condition Status

As shown in this figure, at the beginning of the plan 2% is in excellent, and 98% in poor condition. At the end of the 10-year plan 100% will be in excellent condition.

The scheduled capital expenditures are shown in Figure 104:

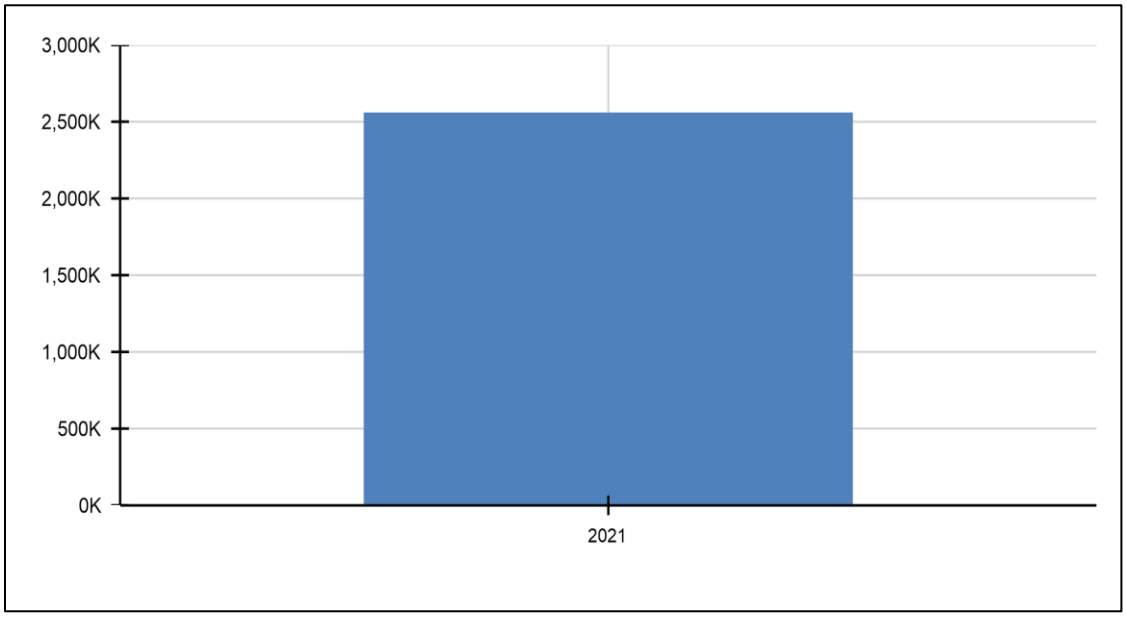


Figure 104: Sidewalks Capital Expenditures

Almost all sidewalks are in a deficit position and are replaced in the first year of the plan.

5.13 CURBS & GUTTERS

The Town of Thessalon has a total of 2.6 km of Curbs & Gutters.

5.13.1 CONDITION ASSESSMENT APPROACH

The state of the infrastructure for Curbs & Gutters is determined through an age-based condition analysis. The five (5) Condition States are defined as follows:

Active	Condition Level	Condition Index Range		
✓	Very Poor	0	to	10
✓	Poor	10	to	25
✓	Fair	25	to	40
✓	Good	40	to	55
✓	Excellent	55	to	100

Figure 105: Curbs & Gutters Condition State Ranges

The age-based condition was calculated to the year 2020, and the current Network Condition (%RSL) of the Curbs & Gutters, weighed by length, is 68. This represents an overall “Excellent” condition state.

Title	Condition	Condition State
Network Overall Condition	68	Excellent

The following summarizes the 2020 Network Condition States:

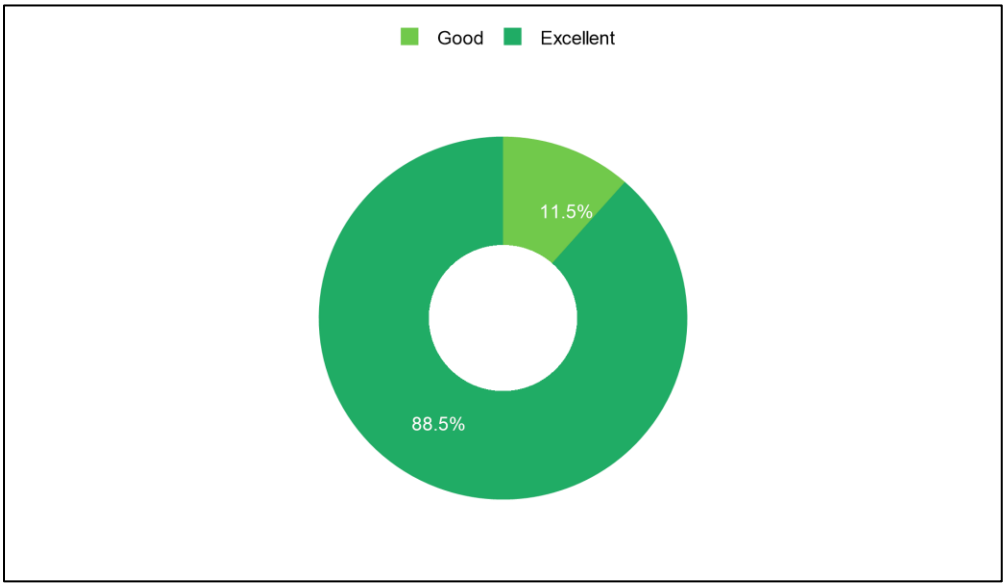


Figure 106: Curbs & Gutters Assets Network Condition

5.13.2 CRITICALITY AND RISK CRITERIA

Criticality
Based on the data attributes available, the Criticality settings were applied based on Asset Status. Socio-economic factors were not included.

Criticality Settings

Asset Status	5
Abandoned	0
In-service	50
Removed	0
Unassumed	0

Risk
The Risk settings for Curbs & Gutters are done as described in Section 4. Due to the lack of data, there are no risk targets set in the planning.

5.13.3 LEVEL OF SERVICE REQUIREMENTS

The Town targets to replace Curbs & Gutters before the end of their Service life is reached. The analysis was done based on an end-of-life replacement, with no budget constraint.

5.13.4 LIFECYCLE MANAGEMENT STRATEGY

A single treatment is available for Curbs & Gutters, and it is a full replacement treatment.

Treatment Methods

Treatment	Description	Unit Cost	Inflation Rate	Cost Estimation Year
Replacement	Replacement	100.00 %	0.0%	2020

5.13.5 OPTIMIZED CAPITAL PLANNING RESULTS

Optimization analysis has been performed for the Curbs & Gutters, on the basis of a straight end-of-life replacement.

The Optimization Analysis Settings are as follows:

Scenario

Name:	End of life replacement 10 years
Description:	
Year:	2021

Optimization Settings

Optimization Mode	Standard
Planning Horizon (Years)	10
Include Priorities	Yes
Operational Efficiency	No
Estimate Current Condition	True

Optimization Objective			
Type	**Min/Max**	**Weight (Sum = 1)**	**Performance Attribute**
Maximize Network Performance	Max	1	NA

Network Optimization Results

Figure 107 shows the Curbs & Gutters overall network performance throughout the plan period:

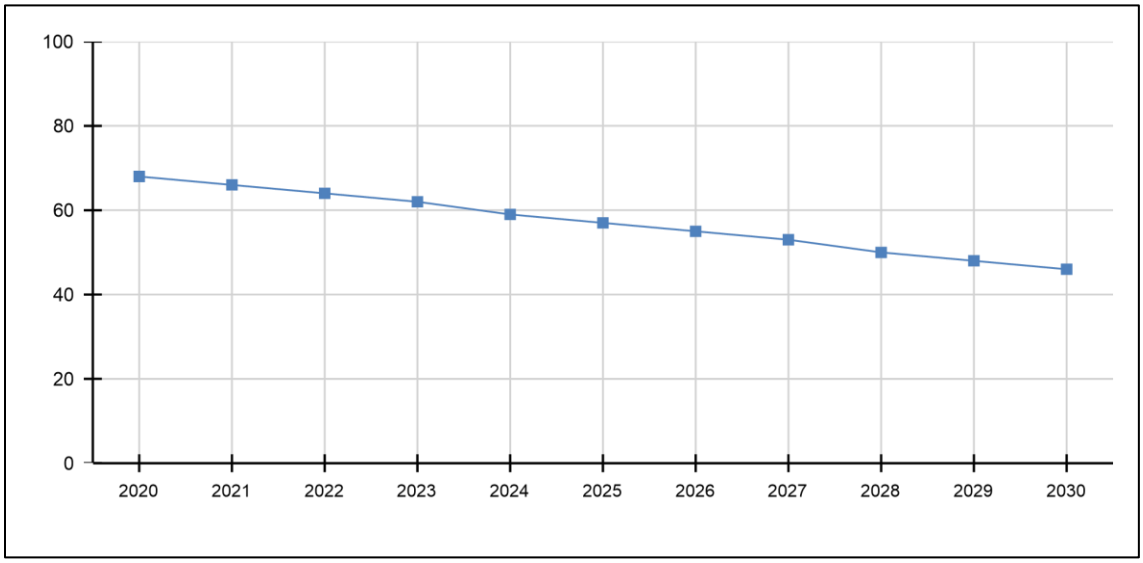


Figure 107: Curbs & Gutters Network Performance

Over the next 10 years, the performance of the Curbs & Gutters Assets network declines from 68 to 46 at the end of plan.

Figure 108 shows the condition status distribution of the Curbs & Gutters network at each year of the plan:

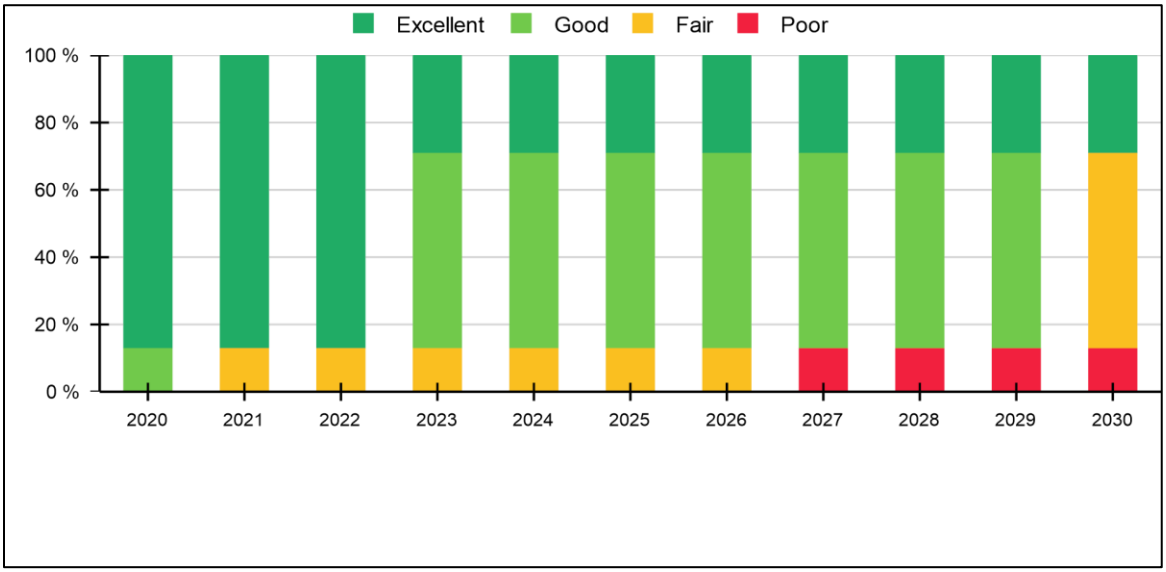


Figure 108: Curbs & Gutters Annual Network Condition Status

As shown in this figure, at the beginning of the plan 87% is in excellent, and 13% is in good condition. At the end of the 10-year plan 29% will be in excellent, 58% in fair, and 13% in poor condition.

None of the Curbs & Gutters are in the deficit position throughout the plan and no replacements are scheduled.

5.14 SIGNS (NOT TRAFFIC)

The Town of Thessalon has a total of 30 Signs (Not Traffic).

5.14.1 CONDITION ASSESSMENT APPROACH

The state of the infrastructure for Signs (Not Traffic) is determined through an age-based condition analysis. The five (5) Condition States are defined as follows:

Figure 109: Signs (Not Traffic) Condition State Ranges

The age-based condition was calculated to the year 2020, and the current Network Condition (%RSL) of the Signs (Not Traffic) is 98. This represents an overall “Excellent” condition state.

Title	Condition	Condition State
Network Overall Condition	98	Excellent

The following summarizes the 2020 Network Condition States:

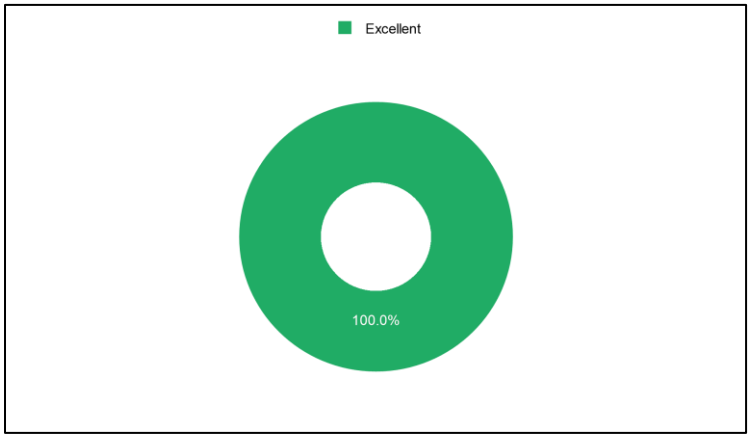


Figure 110: Signs (Not Traffic) Network Condition

5.14.2 CRITICALITY AND RISK CRITERIA

Criticality
Based on the data attributes available, the Criticality settings were applied based on Asset Status. Socio-economic factors were not included.

Criticality Settings

Asset Status	5
Abandoned	0
In-service	50
Removed	0
Unassumed	0

Risk
The Risk settings for Signs (Not Traffic) Assets are done as described in Section 4. Due to the lack of data, there are no risk targets set in the planning.

5.14.3 LEVEL OF SERVICE REQUIREMENTS

The Town targets to replace Signs (Not Traffic) before the end of their Service life is reached. The analysis was done based on an end-of-life replacement, with no budget constraint.

5.14.4 LIFECYCLE MANAGEMENT STRATEGY

A single treatment is available for Signs (Not Traffic), and it is a full replacement treatment.

Treatment Methods

Treatment	Description	Unit Cost	Inflation Rate	Cost Estimation Year
Replacement	Replacement	100.00 %	0.0%	2020

5.14.5 OPTIMIZED CAPITAL PLANNING RESULTS

Optimization analysis has been performed for the Signs (Not Traffic), on the basis of a straight end-of-life replacement.

The Optimization Analysis Settings are as follows:

Scenario

Name:	End of life replacement 10 years
Description:	
Year:	2021

Optimization Settings

Optimization Mode	Standard
Planning Horizon (Years)	10
Include Priorities	Yes
Operational Efficiency	No`
Estimate Current Condition	True

Optimization Objective			
Type	**Min/Max**	**Weight (Sum = 1)**	**Performance Attribute**
Maximize Network Performance	Max	1	NA

Network Optimization Results

Figure 111 shows the Signs (Not Traffic) overall network performance throughout the plan period:

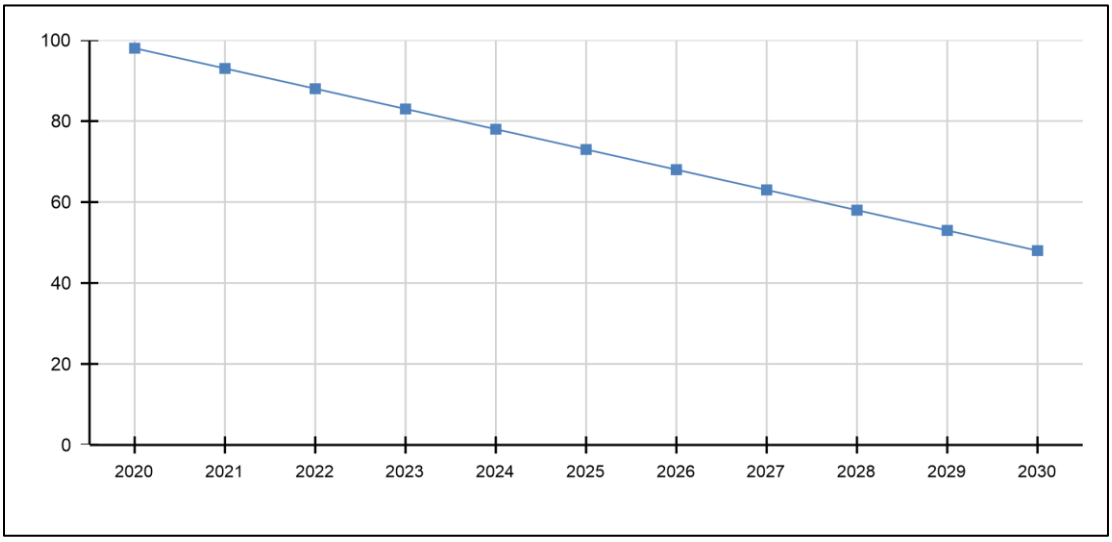


Figure 111: Signs (Not Traffic) Network Performance

Over the next 10 years, the performance of the Signs (Not Traffic) declines from 98 to 48 at the end of plan.

Figure 112 shows the condition status distribution of the Signs (Not Traffic) network at each year of the plan:

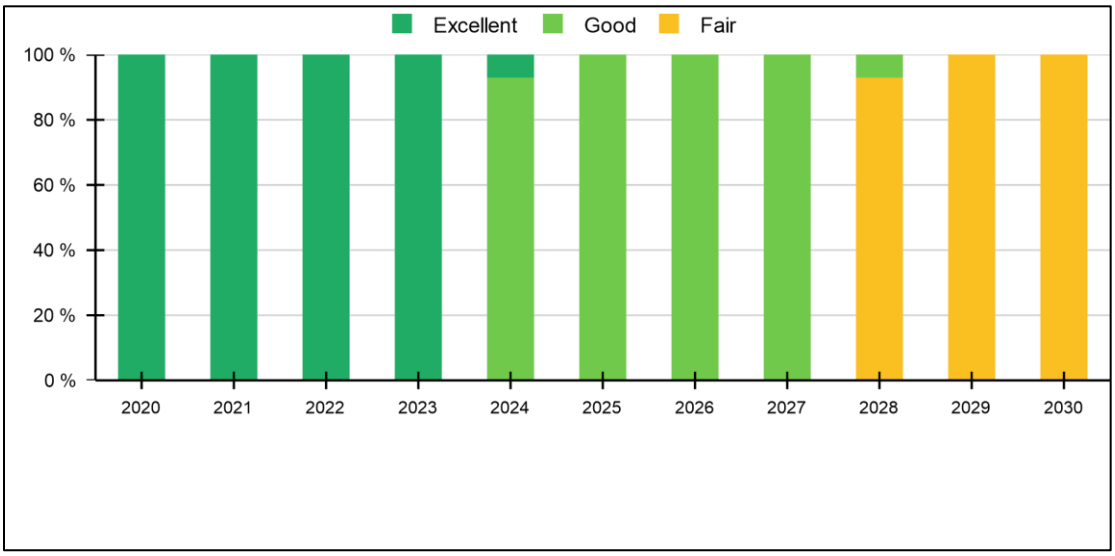


Figure 112: Signs (Not traffic) Annual Network Condition Status

As shown in this figure, at the beginning of the plan 100% is in excellent condition. At the end of the 10-year plan 100% will be in fair condition.

None of the Signs (Not Traffic) are in the deficit position throughout the plan and no replacements are scheduled.

5.15 STORMLINES

The Town of Thessalon has a total of 6.1 km of Stormlines.

5.15.1 STORMLINES ATTRIBUTES

The following summarizes the Stormlines Materials within the Municipality:

Material	Length	Percentage
Concrete	1.8	29.5%
Corrugated Steel	0.9	14.8%
High-Density Polyethylene	1.6	26.2%
PVC	1.8	29.5%

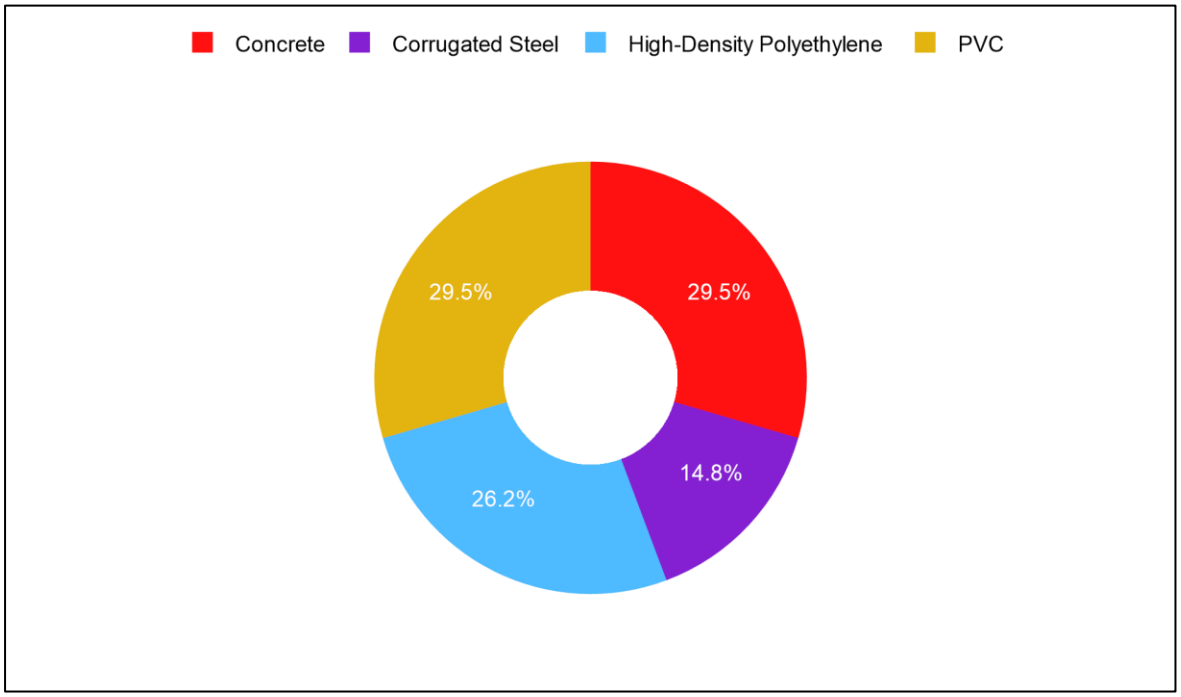


Figure 113: Stormlines by Material

5.15.2 CONDITION ASSESSMENT APPROACH

The state of the infrastructure for Stormlines is determined through an age-based condition analysis. The four (4) Condition States are defined as follows:

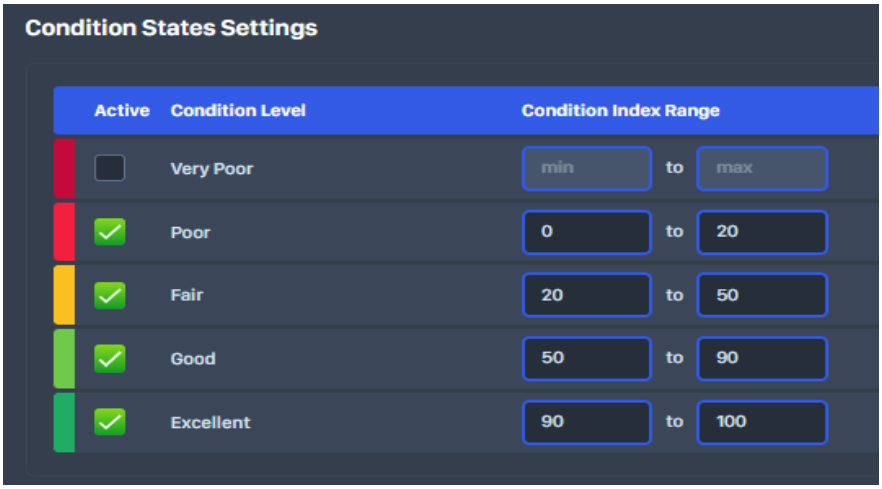


Figure 114: Stormlines Condition State Ranges

The age-based condition was calculated to the year 2020, and the current Network Condition (%RSL) of the Stormlines, weighed by length, is 56. This represents an overall “Good” condition state.

Title	Condition	Condition State
Network Overall Condition	56	Good

The following summarizes the 2020 Network Condition States:

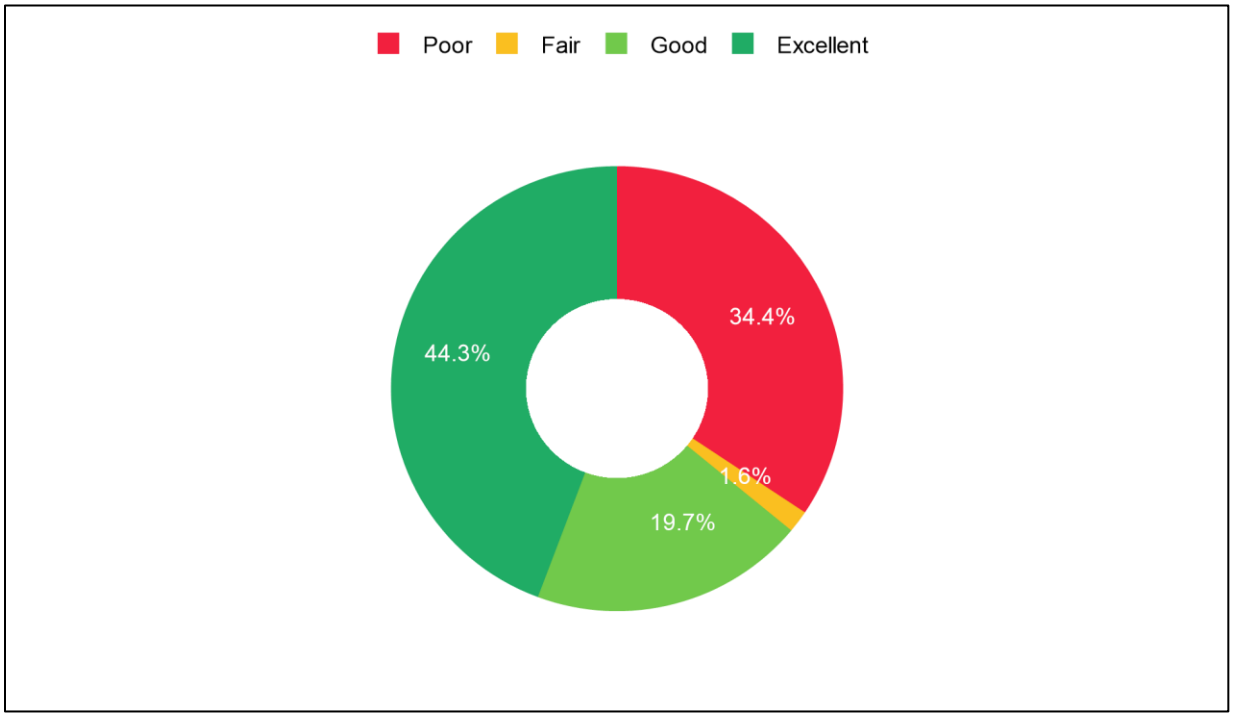


Figure 115: Stormlines Assets Network Condition

Figure 116 shows the Stormlines Network Condition State by Material:

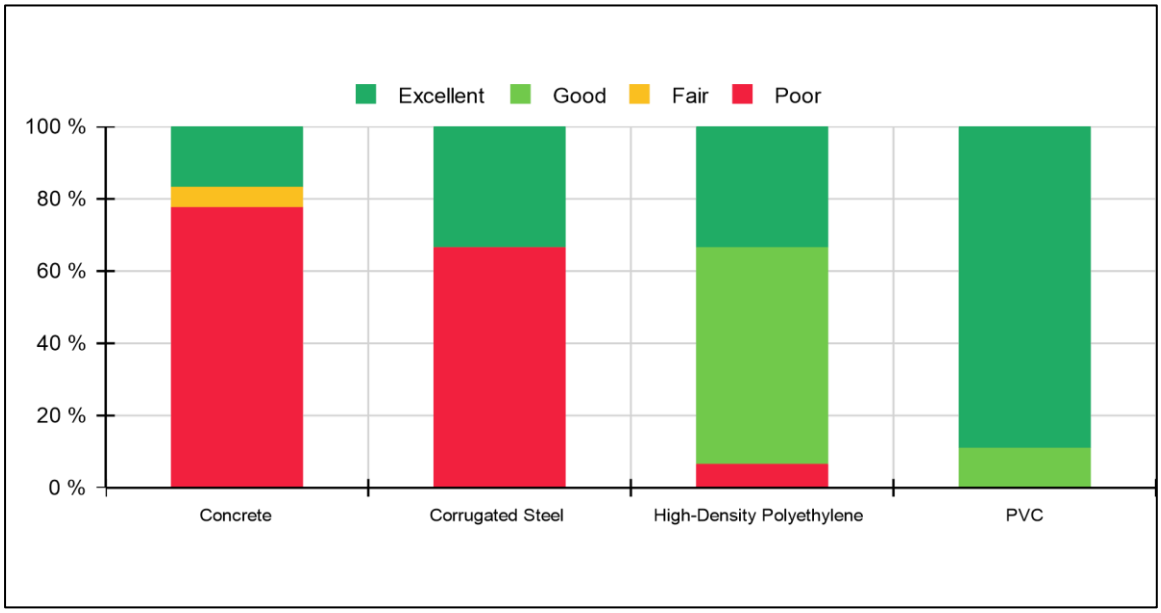


Figure 116: Stormlines Condition by Material

The Map view of the condition state is shown in Figure 117:

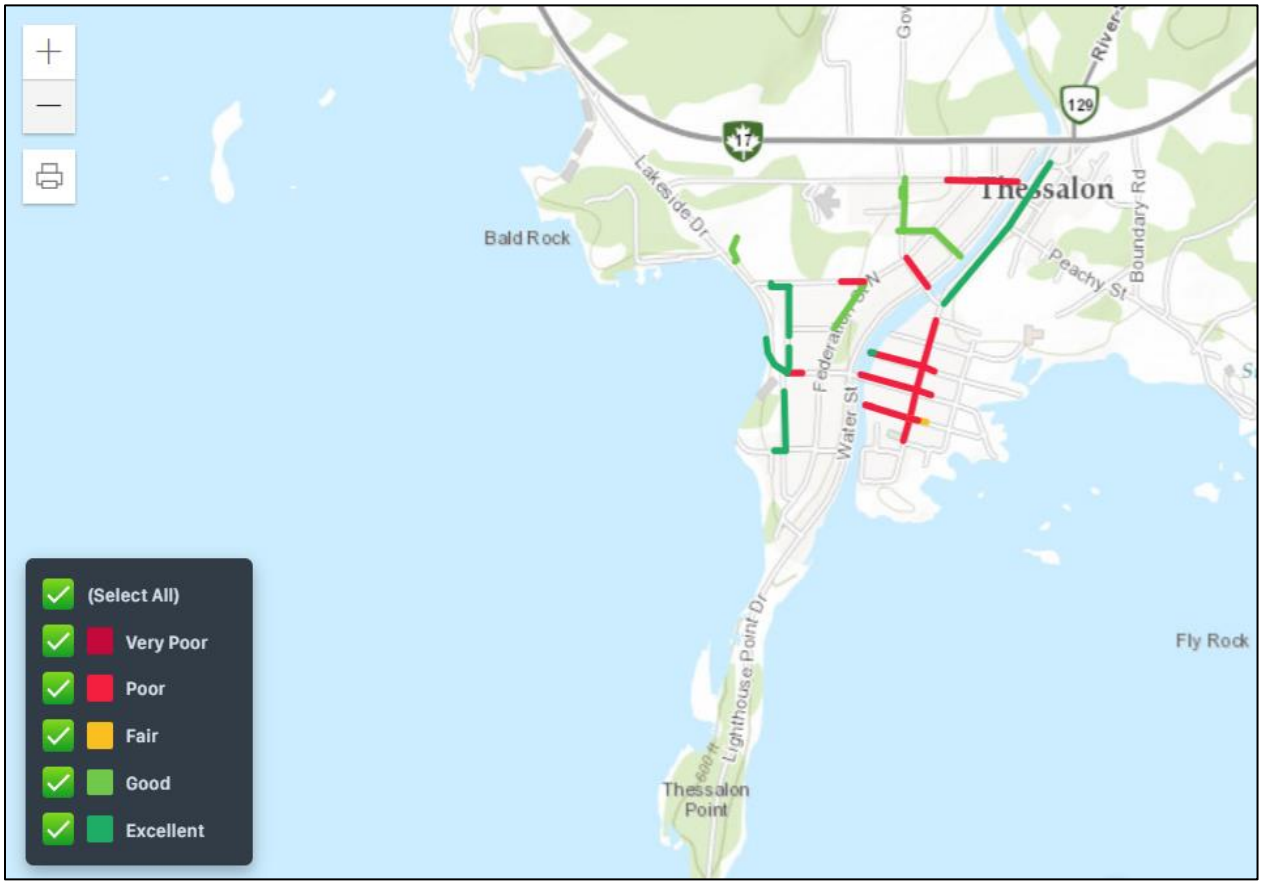


Figure 117: Stormlines Current Network Condition Map

5.15.3 CRITICALITY AND RISK CRITERIA

Criticality
Based on the data attributes available, the Criticality settings were applied based on asset status. Socio-economic factors were not included.

Criticality Settings

Asset Status	5
Abandoned	0
In-service	50
Removed	0
Unassumed	0

Risk
The Risk settings for Stormlines are done as described in Section 4. Due to the lack of data, there are no risk targets set in the planning.

5.15.4 LEVEL OF SERVICE REQUIREMENTS

The Town targets to replace Stormlines before the end of their Service life is reached. The analysis was done based on an end-of-life replacement, with no budget constraint.

5.15.5 LIFECYCLE MANAGEMENT STRATEGY

The following Replacement Treatments based on pipe material are available for Stormlines:

Treatment Methods

Treatment	Description	Unit Cost
Open Trench Replacement (Concrete)	Open Trench Replacement	100.00 %
Open Trench Replacement (Steel)	Open Trench Replacement	100.00 %
Open Trench Replacement (PE)	Open Trench Replacement	100.00 %
Open Trench Replacement (PVC)	Open Trench Replacement	100.00 %
Open Trench Replacement	Open Trench Replacement	100.00 %

5.15.6 OPTIMIZED CAPITAL PLANNING RESULTS

Optimization analysis has been performed for the storm lines Assets, on the basis of a straight end-of-life replacement.

The Optimization Analysis Settings are as follows:

Scenario

Name:	End of life replacement 10 years
Description:	
Year:	2021

Optimization Settings

Optimization Mode	Standard
Planning Horizon (Years)	10
Include Priorities	Yes
Operational Efficiency	No
Estimate Current Condition	True
Condition Variation	10.0%
Project Size Limit	2000
Rollover	0

Optimization Objective

Type	Min/Max	Weight (Sum = 1)	Performance Attribute
Maximize Network Performance	Max	1	NA

Network Optimization Results

Figure 118 shows the Stormlines Assets overall network performance throughout the plan period:

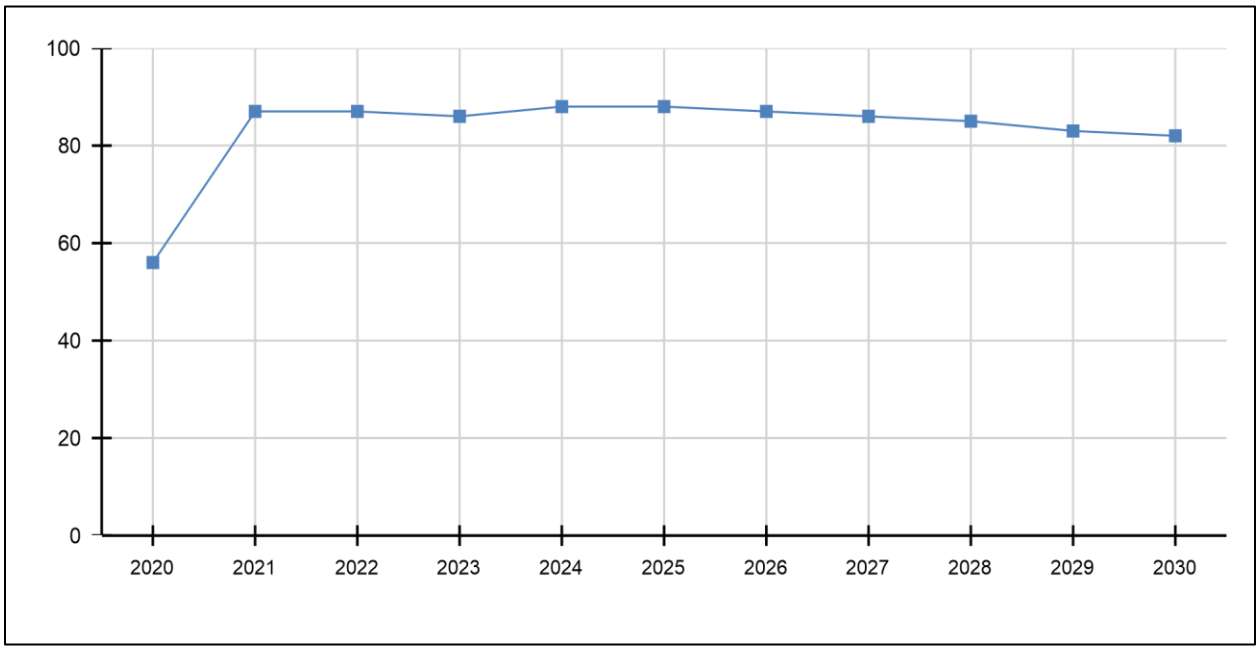


Figure 118: Stormlines Network Performance

Over the next 10 years, the performance of the storm lines Assets network increases from 56 to 82 at the end of plan.

Figure 119 shows the condition status distribution of the stormlines network at each year of the plan:

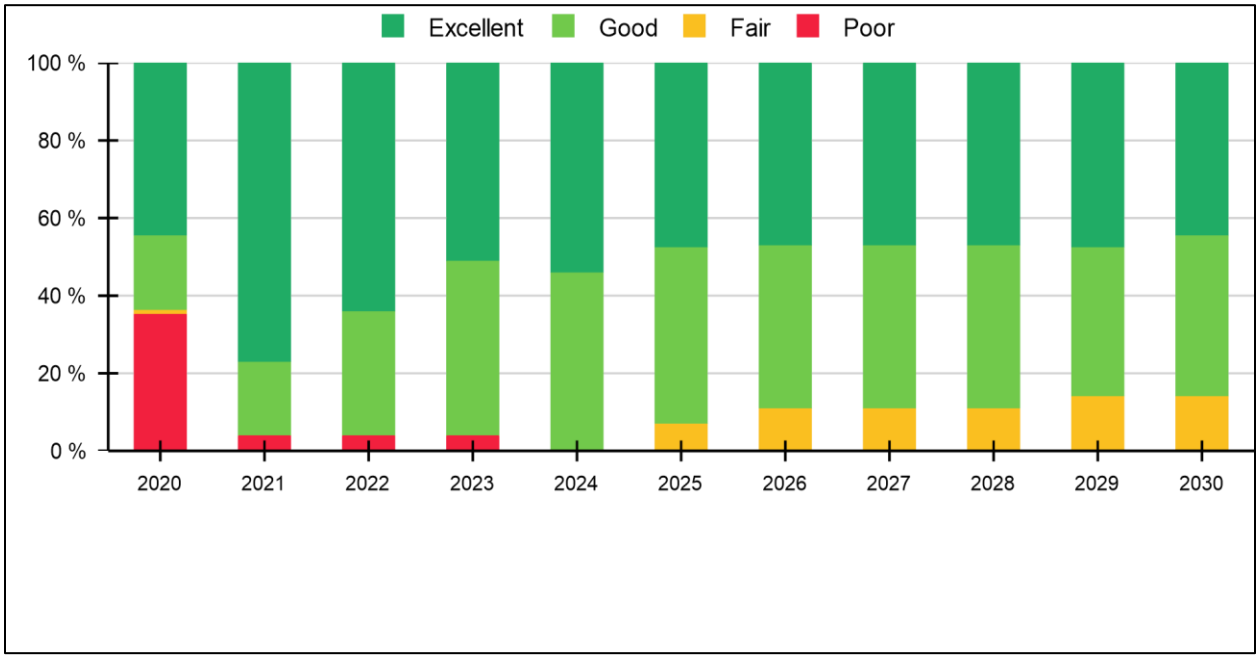


Figure 119: Stormlines Annual Network Condition Status

As shown in this figure, at the beginning of the plan 44% is in excellent, 19% in good, 1% in fair, and 35% in poor condition. At the end of the 10-year plan 44% will be in excellent, 41% in good, 14% in fair, condition.

The scheduled capital expenditures are shown in Figure 120:

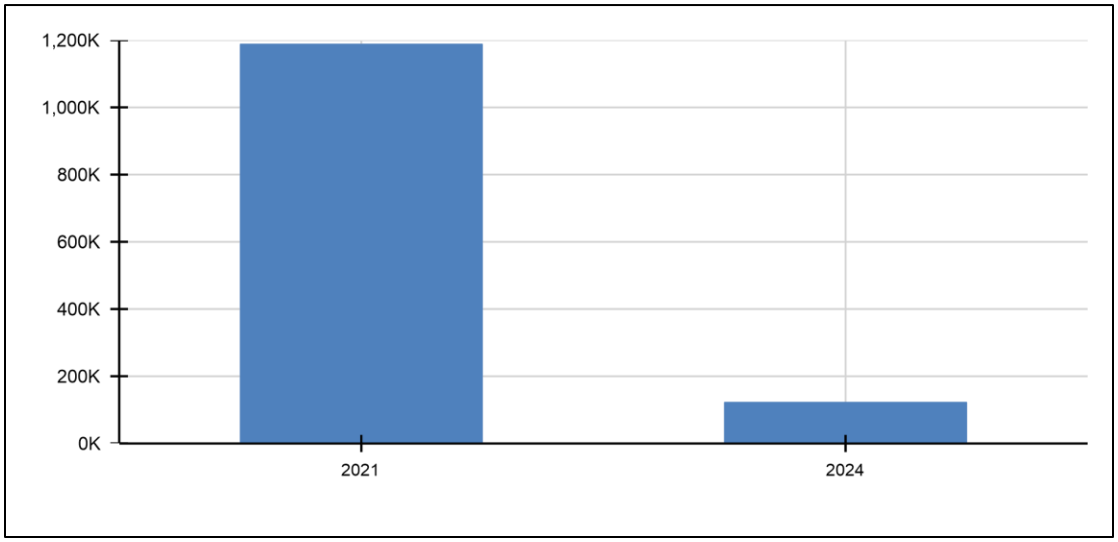


Figure 120: Stormlines Capital Expenditures

The backlog is being cleared in the first year of the capital plan, and there is no deficit position during the plan period.

5.16 STREETLIGHTS

The Town of Thessalon has a total of 307 Streetlights.

5.16.1 CONDITION ASSESSMENT APPROACH

The state of the infrastructure for Street Lights is determined through an age-based condition analysis. The five (5) Condition States are defined as follows:

Figure 121: Streetlights Condition State Ranges

The age-based condition was calculated to the year 2020, and the current Network Condition (%RSL) of the Street Lights Assets, weighed by replacement cost, is 77. This represents an overall “Excellent” condition state.

Title	Condition	Condition State
Network Overall Condition	77	Excellent

The following summarizes the 2020 Network Condition States:

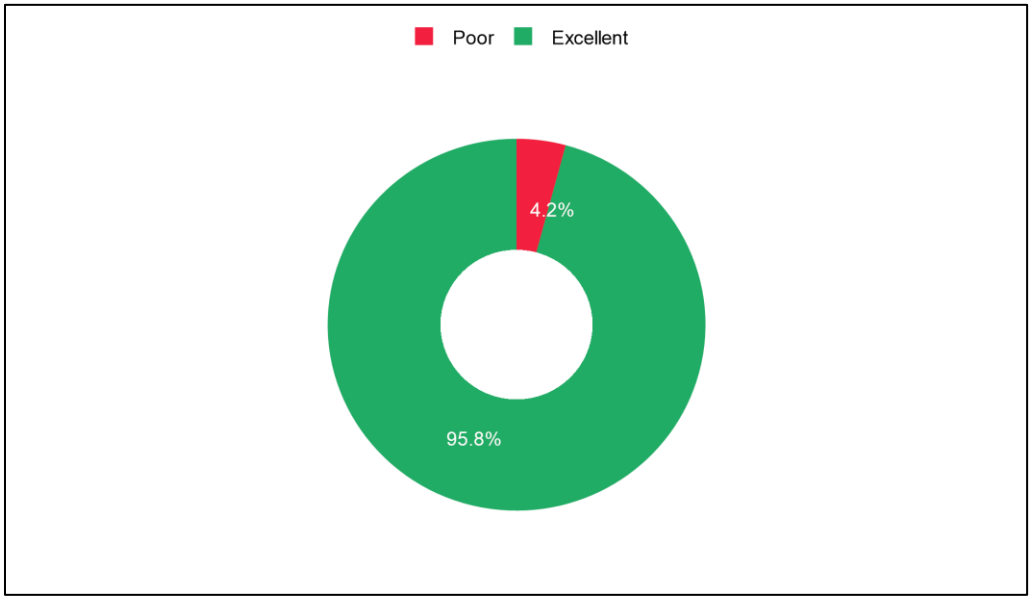


Figure 122: Streetlights Network Condition

The Map view of the condition state is shown in Figure 123.

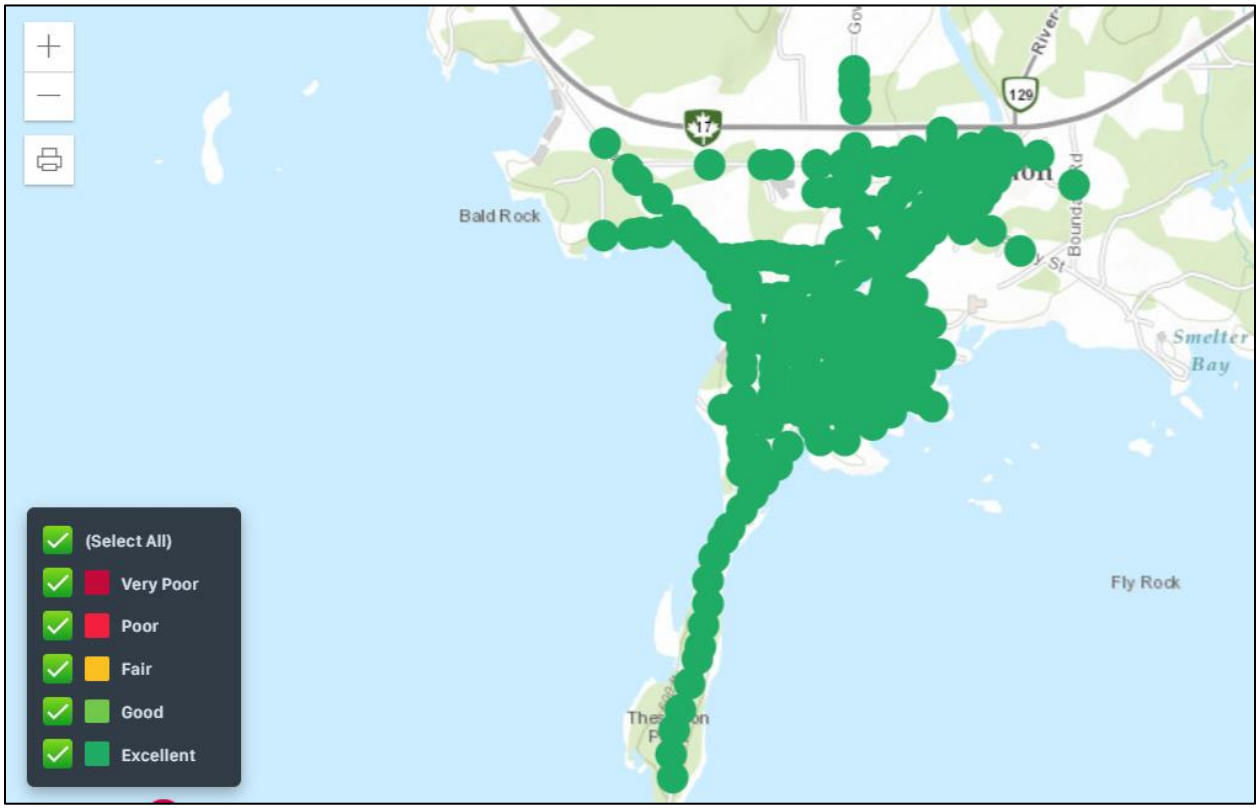


Figure 123: Streetlights Current Network Condition Map

5.16.2 CRITICALITY AND RISK CRITERIA

Criticality
Based on the data attributes available, the Criticality settings were applied based on asset status. Socio-economic factors were not included.

Criticality Settings

Asset Status	5
Abandoned	0
In-service	50
Removed	0
Unassumed	0

Risk
The Risk settings for Streetlights are done as described in Section 4. Due to the lack of data, there are no risk targets set in the planning.

5.16.3 LEVEL OF SERVICE REQUIREMENTS

The Town targets to replace Streetlights before the end of their Service life is reached. The analysis was done based on an end-of-life replacement, with no budget constraint.

5.16.4 LIFECYCLE MANAGEMENT STRATEGY

A single treatment is available for Streetlights, and it is a full replacement treatment.

Treatment Methods

Treatment	Description	Unit Cost	Inflation Rate	Cost Estimation Year
Replacement	Replacement	100.00 %	0.0%	2020

5.16.5 OPTIMIZED CAPITAL PLANNING RESULTS

Optimization analysis has been performed for the Streetlights, on the basis of a straight end-of-life replacement.

The Optimization Analysis Settings are as follows:

Scenario

Name:	End of life replacement 10 years
Description:	
Year:	2021

Optimization Settings

Optimization Mode	Standard
Planning Horizon (Years)	10
Include Priorities	Yes
Operational Efficiency	No
Estimate Current Condition	True

Optimization Objective

Type	Min/Max	Weight (Sum = 1)	Performance Attribute
Maximize Network Performance	Max	1	NA

Network Optimization Results

Figure 124 shows the Streetlights overall network performance throughout the plan period:

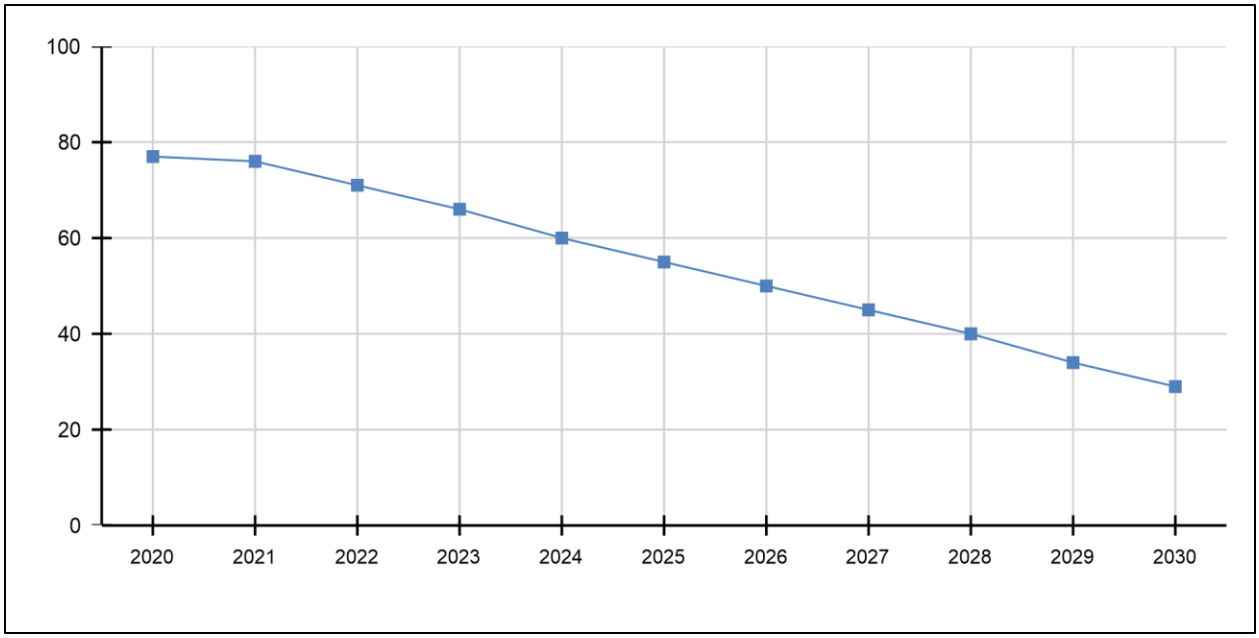


Figure 124: Streetlights Network Performance

Over the next 10 years, the performance of the Streetlights Assets network declines from 77 to 29 at the end of plan.

Figure 125 shows the condition status distribution of the Streetlights network for each year of the plan:

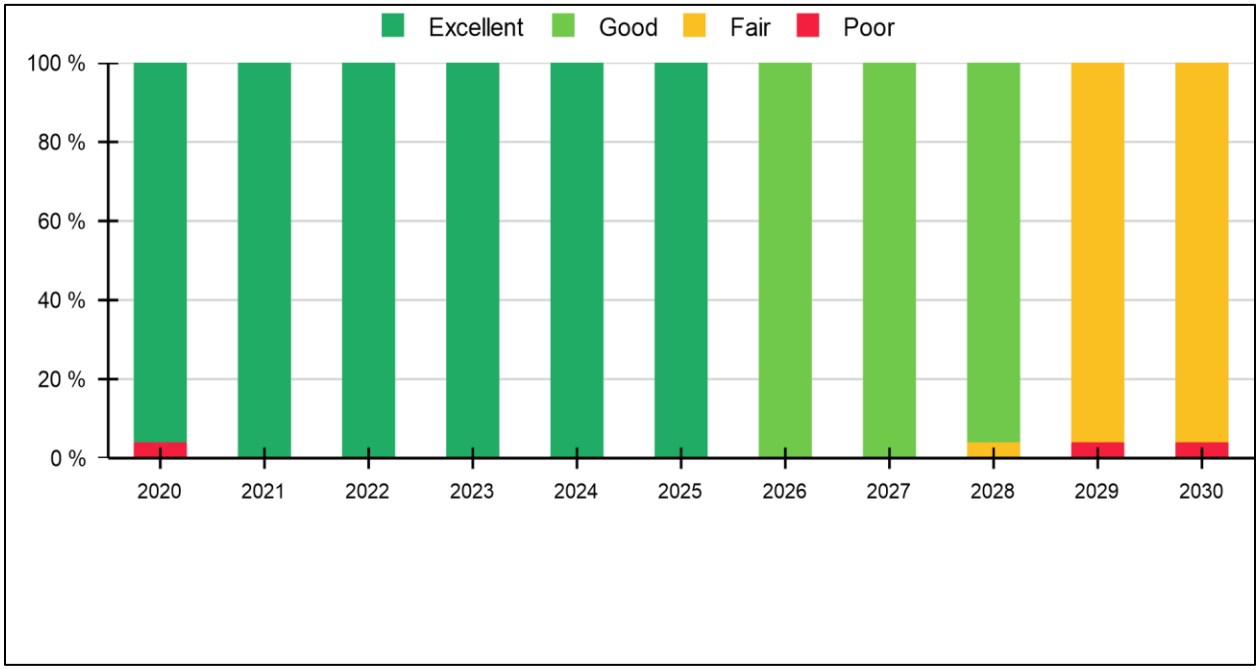


Figure 125: Streetlights annual Network Condition Status

As shown in this figure, at the beginning of the plan 96% is in excellent, and 4% in poor condition. At the end of the 10-year plan 96% will be in fair, and 4% will be in poor condition

The scheduled capital expenditures are shown in Figure 126:

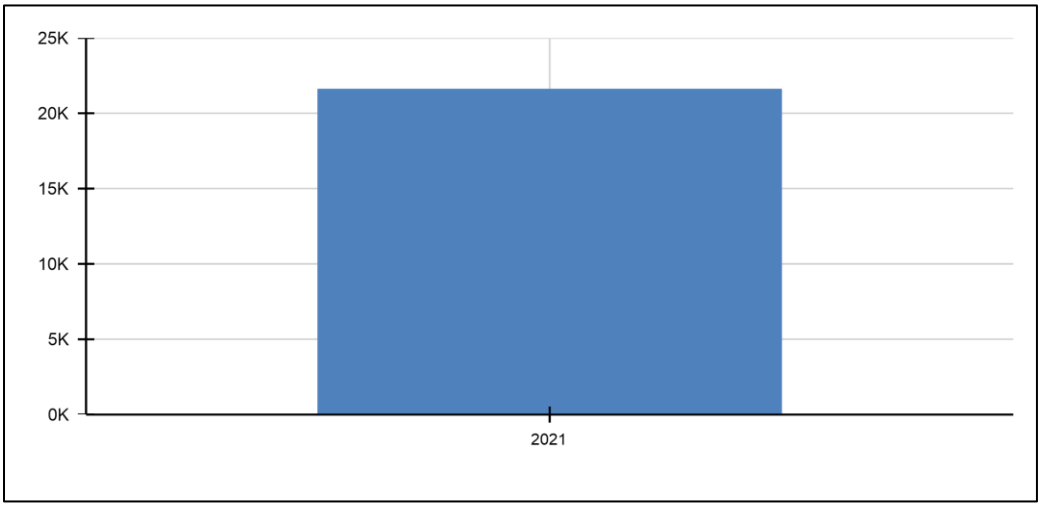


Figure 126: Streetlights Capital Expenditures

The backlog is cleared in the first year of the capital plan, and none of the streetlights are in the deficit position throughout the plan.

5.17 WATER TREATMENT PLANT

The Town of Thessalon has a total of 12 Water Treatment Plant Assets.

5.17.1 CONDITION ASSESSMENT APPROACH

The state of the infrastructure for Water Treatment Plants Assets is determined through an age-based condition analysis. The four (4) Condition States are defined as follows:

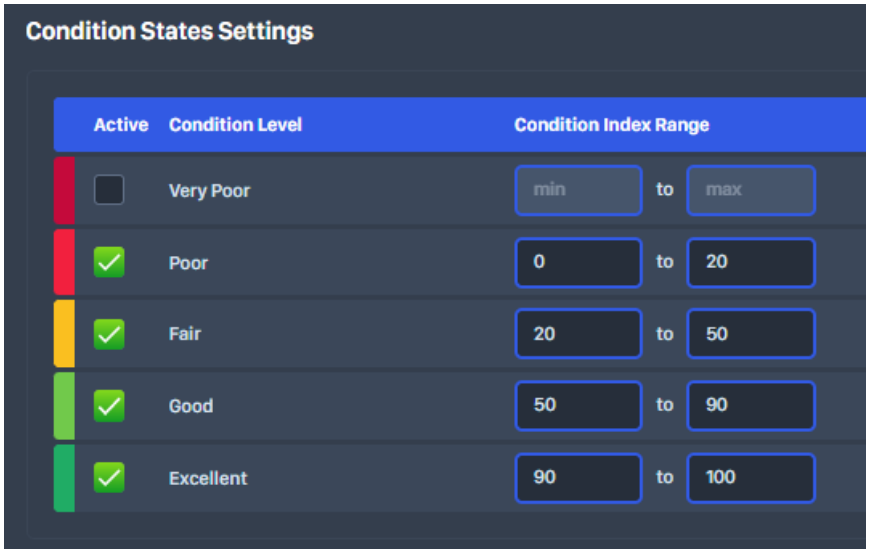


Figure 127: Treatment Plant (Water) Condition State Ranges

The age-based condition was calculated to the year 2020, and the current Network Condition (%RSL) of the Water Treatment Plants Assets, weighed by replacement cost, is 81. This represents an overall “Good” condition state.

Title	Condition	Condition State
Network Overall Condition	81	Good

The following summarizes the 2020 Network Condition States:

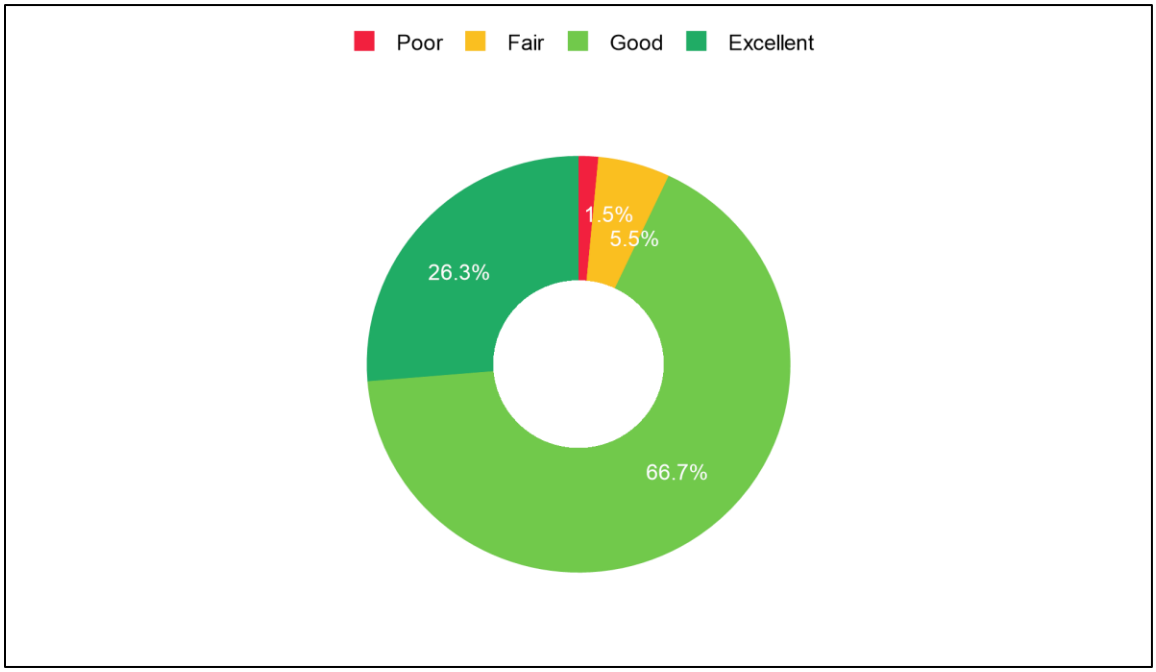


Figure 128: Treatment Plant (Water) Assets Network Condition

5.17.2 CRITICALITY AND RISK CRITERIA

Criticality

Based on the data attributes available, the Criticality settings were applied based on asset status. Socio-economic factors were not included.

Criticality Settings

Asset Status	5
Abandoned	0
In-service	50
Removed	0
Unassumed	0

Risk

The Risk settings for Water Treatment Plant Assets are done as described in Section 4. Due to the lack of data, there are no risk targets set in the planning.

5.17.3 LEVEL OF SERVICE REQUIREMENTS

The Town targets to replace Water Treatment Plant Assets before the end of their Service life is reached. The analysis was done based on an end-of-life replacement, with no budget constraint.

5.17.4 LIFECYCLE MANAGEMENT STRATEGY

Three treatments are available for Water Treatment Plant Assets, and they are a full replacement, rehabilitation and Maintenance treatments.

Treatment Methods

Treatment	Description	Unit Cost	Inflation Rate	Cost Estimation Year
Replacement	Full Replacement	100.00 %	0.0%	2020
Rehabilitation	Rehabilitation	60.00 %	0.0%	2020
Maintenance	Routine Maintenance	5.00 %	0.0%	2020

5.17.5 OPTIMIZED CAPITAL PLANNING RESULTS

Optimization analysis has been performed for the Water Treatment Plants Assets, on the basis of a straight end-of-life replacement.

The Optimization Analysis Settings are as follows:

Scenario

Name:	End of life replacement 10 years
Description:	
Year:	2021

Optimization Settings

Optimization Mode	Standard
Planning Horizon (Years)	10
Include Priorities	Yes
Operational Efficiency	No
Estimate Current Condition	True

Optimization Objective

Type	Min/Max	Weight (Sum = 1)	Performance Attribute
Maximize Network Performance	Max	1	NA

Network Optimization Results

Figure 129 shows the Water Treatment Plants Assets overall network performance throughout the plan period:

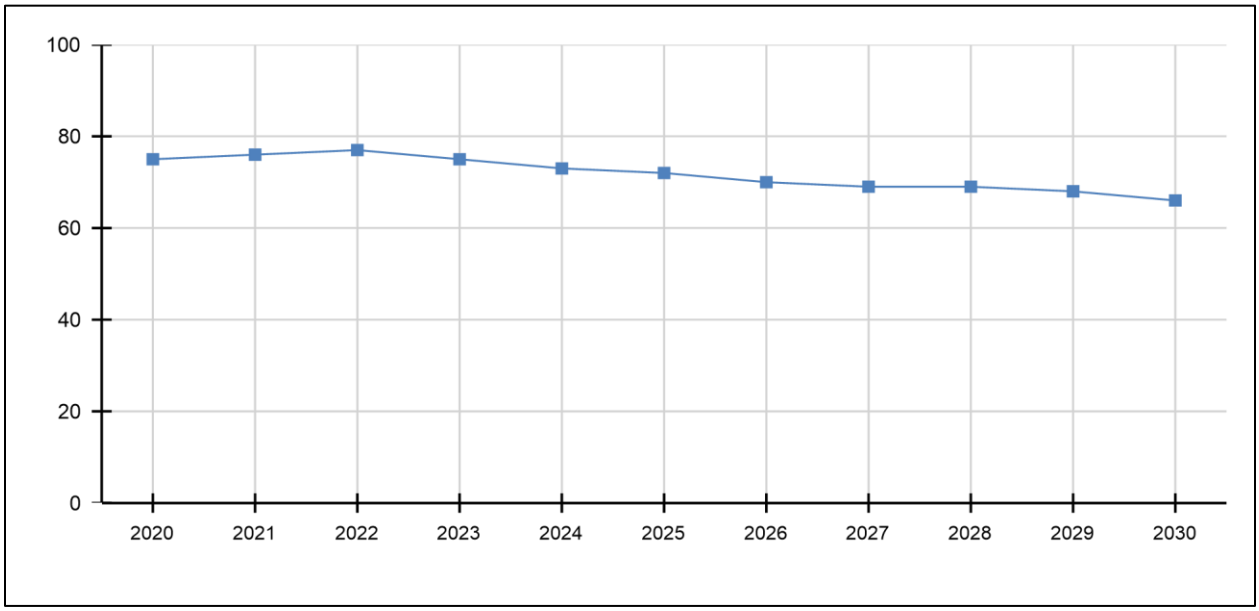


Figure 129: Water Treatment Plant Network Performance

Over the next 10 years, the performance of the Water Treatment Plants Assets network declines from 75 to 66 at the end of plan.

Figure 130 shows the condition status distribution of the Water Treatment Plant Assets at each year of the plan:

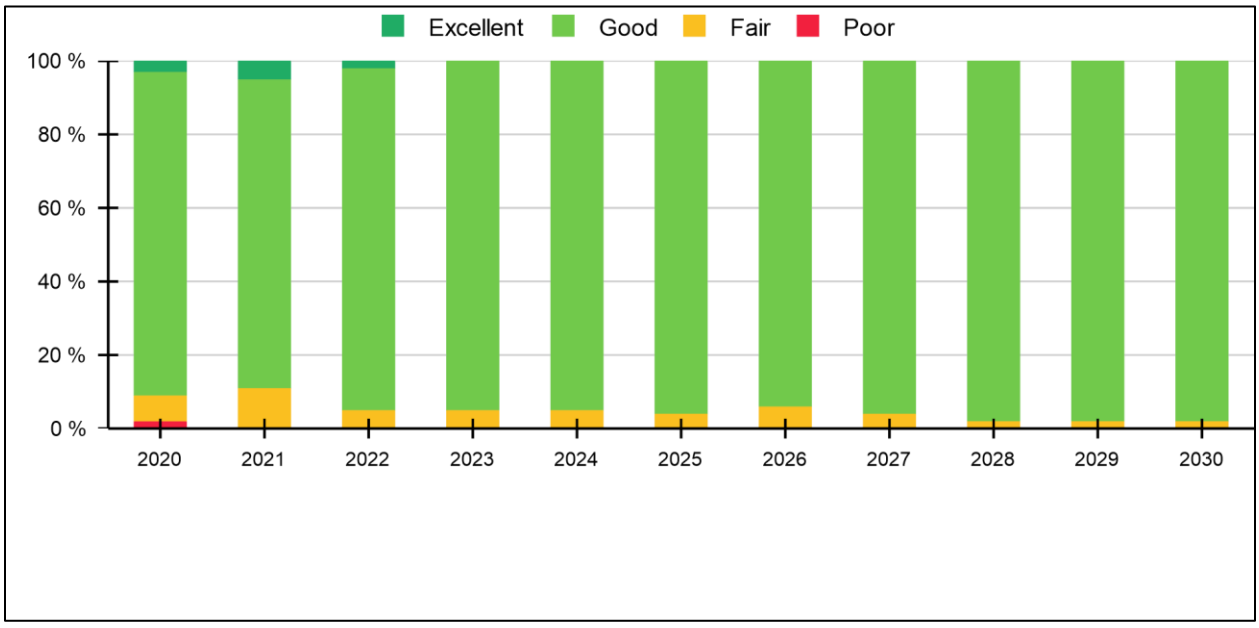


Figure 130: Treatment Plant (Water) annual Network Condition Status

As shown in this figure, at the beginning of the plan 3% is in excellent, 88% in good, 7% in fair, and 2% in poor condition. At the end of the 10-year plan 98% will be in good, and 2% in fair condition.

The scheduled capital expenditures are shown in Figure 131:

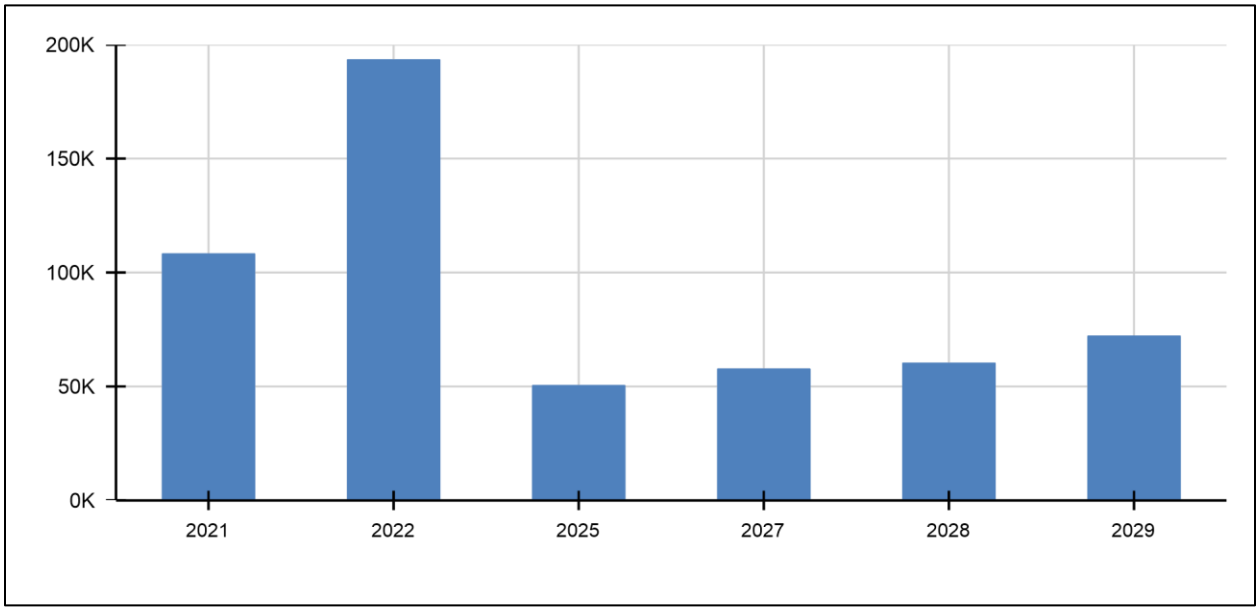


Figure 131: Treatment Plant (Water) Capital Expenditures

The projected Routine Maintenance expenditures for treatment plant (water) are shown in Figure 132:

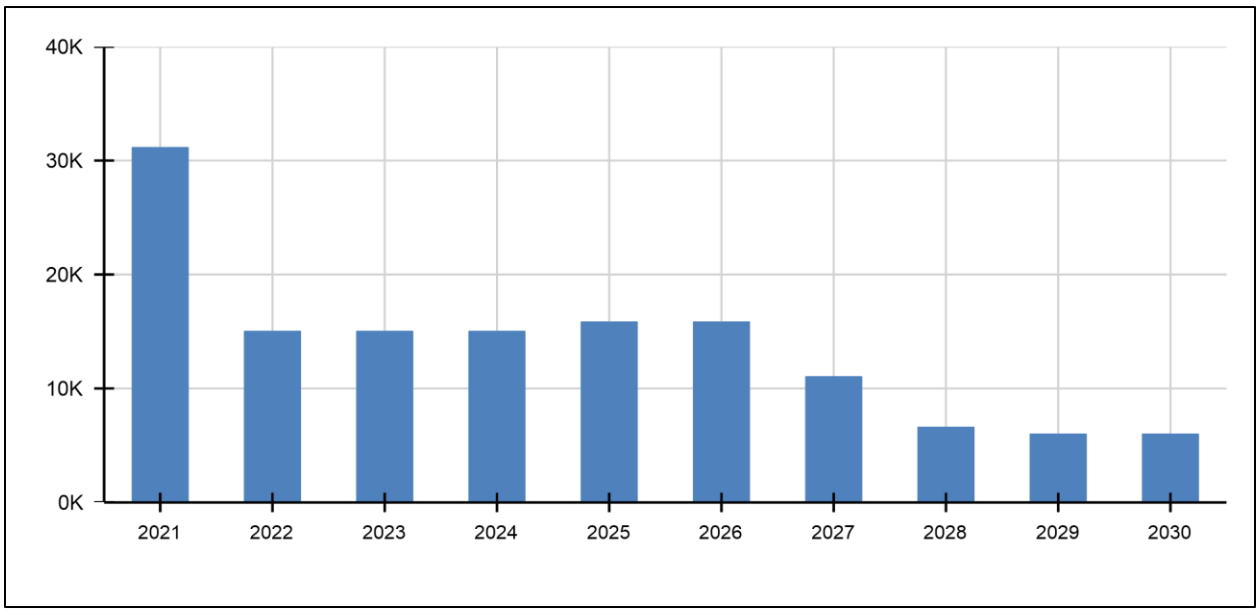


Figure 132: Treatment Plant (Water) Maintenance Expenditures

6 CAPITAL INVESTMENT PLAN

6.1 BACKGROUND

Managing the Municipality's capital assets requires an assessment of the long-term capital project requirements and the establishment of the funding for high-priority projects in an efficient, timely and cost-effective manner. As a result of this analysis, the Municipality will be able to more effectively monitor, track and manage infrastructure assets, to ensure that policy makers obtain sufficient funding in order to maintain, at a minimum, and potentially enhance future service levels. Through capital planning, the Town of Thessalon can plan the future operating budget expenses and reserve funds to manage the financial position over a long-term period. Capital planning also provides the core information needed for implementing the Council's planning and fiscal policies.

An Asset Management Plan provides many benefits including:

- A systematic evaluation of all potential projects at the same time.
- The ability to stabilize the debt and consolidate projects to reduce borrowing costs.
- To serve as a public relations and economic development tool.
- A focus on preserving a municipal government's infrastructure while ensuring the efficient use of public funds.
- An opportunity to foster cooperation among departments and the general public regarding the Municipality's priorities.

6.2 OVERVIEW

The Capital Plan, an integral part of an Asset Management Plan, is a blueprint for planning a community's capital expenditures and is one of the most important responsibilities of local government officials. It coordinates community planning, financial capacity, and physical development. It is a tool to assess the long-term capital project requirements of a Municipality and to establish funding of high-priority projects in a timely and cost-effective fashion. The development of a Capital Plan is intended to ensure that policy makers are responsible to residents and businesses of the community with respect to the expenditure of public funds. It also promotes the provision of continuous efficient services.

The Capital Plan provides a detailed understanding of anticipated investments into tangible capital assets. These assets include basic facilities, services, and installations needed for the functioning of the community. The development of a CIP that will ensure sound fiscal and capital planning requires effective leadership and the involvement and cooperation of all municipal departments. A complete, properly developed CIP has the following benefits:

- Facilitates coordination between capital needs and the operating budgets
- Enhances the community's credit rating, control of its tax rate, and avoids sudden changes in its debt service requirements
- Identifies the most economical means of financing capital projects
- Increases opportunities for obtaining federal and provincial aid
- Relates public facilities to other public and private development and redevelopment policies and plans
- Focuses attention on community objectives and fiscal capacity
- Keeps the public informed about future needs and projects

- Encourages careful project planning and design to avoid costly mistakes and help a community reach desired goals

A municipal government must take care of two key responsibilities in managing its infrastructure:

- The first major responsibility is the maintenance and repair of existing infrastructure. Given the high cost to replace linear assets and the fact that they are essential to providing programs and services to the public, it is extremely important that regular maintenance and periodic refurbishments be done to keep facilities and other assets in good working condition for as long as possible.
- The second major responsibility that municipal governments have is to plan and construct new community infrastructure. This involves several steps including deciding what services are to be provided, identifying community needs, careful planning, determining priority investments, figuring out how to finance projects and good management to ensure projects are completed on time and on budget.

Although the Capital Plan is generally maintained separately from the operating budget, they do work in unison since the debt charges on funds borrowed for capital expenditures become expense items in the annual operating budget. In addition, operating and maintenance costs of capital assets have an impact on the operating budget. In order to have a realistic, workable Capital Plan, therefore, it is necessary to estimate the effect that debt service and operating costs will have on future tax rates. In this way, non-essential capital expenditures will not be undertaken at the expense of pending essential capital projects and the Municipality will thus be in a better position to control future debt levels.

6.3 METHODOLOGY

The Town of Thessalon's Capital Plan addresses infrastructure deficiencies and future capital expenditures. It includes existing service infrastructure not meeting engineering standards, the cost of renovation or replacement of infrastructure which has exceeded its service life and which as a consequence, is not meeting required service standards. Provision is required to renovate or replace previously constructed infrastructure when it reaches the end of its service life. These costs do not include on-going operational and regular maintenance (which typically represent the greatest cost component of a facility's service life, for example). Unless informed by the Town, requirements such as investments required to support industrial, commercial and residential development in accordance with the growth projections required to serve the community and social needs as well as supply the increasing population and to service to the boundaries of new subdivisions have not been analyzed.

The Town's Capital Plan includes:

- Development of parameters for each asset class
- Development of rehabilitation and replacement unit costs
- Identifying the asset types to be included in the Capital Plan and determining and confirming the components of each asset class
- Identification of services to be provided and the capital expenditures to be incurred
- Determination of secondary cost estimates of capital expenditures (consideration of cost elements such as remoteness of the Town, land, architect/engineering fees, construction, legal fees, taxes, etc.). The non-rebatable portion of HST at 1.76% has been applied, for example

- Determination of the time periods over which the asset is to be constructed or acquired and the costs prorated accordingly

The methodology used for building this Capital Plan was to:

1) Determine target Levels of Service for each Asset Type.
2) Identify the Town's current infrastructure deficit.
3) Determine the Town's future requirements to meet target Levels of Service.
4) Prepare a report detailing the capital required for each asset class based on current rehabilitation and replacement unit costs
5) Establish the cost of maintaining existing infrastructure while addressing the infrastructure deficit.

7 ASSET MANAGEMENT PLAN RESULTS

Like most other local governments in this province, Thessalon is dealing with aging infrastructure and constrained budgets. Upon completion of the collection of all the pertinent data, the capital plan was generated, broken down by asset class for the years 2021 to 2030. Inflation is incorporated in the financial analysis. The results are as follows:

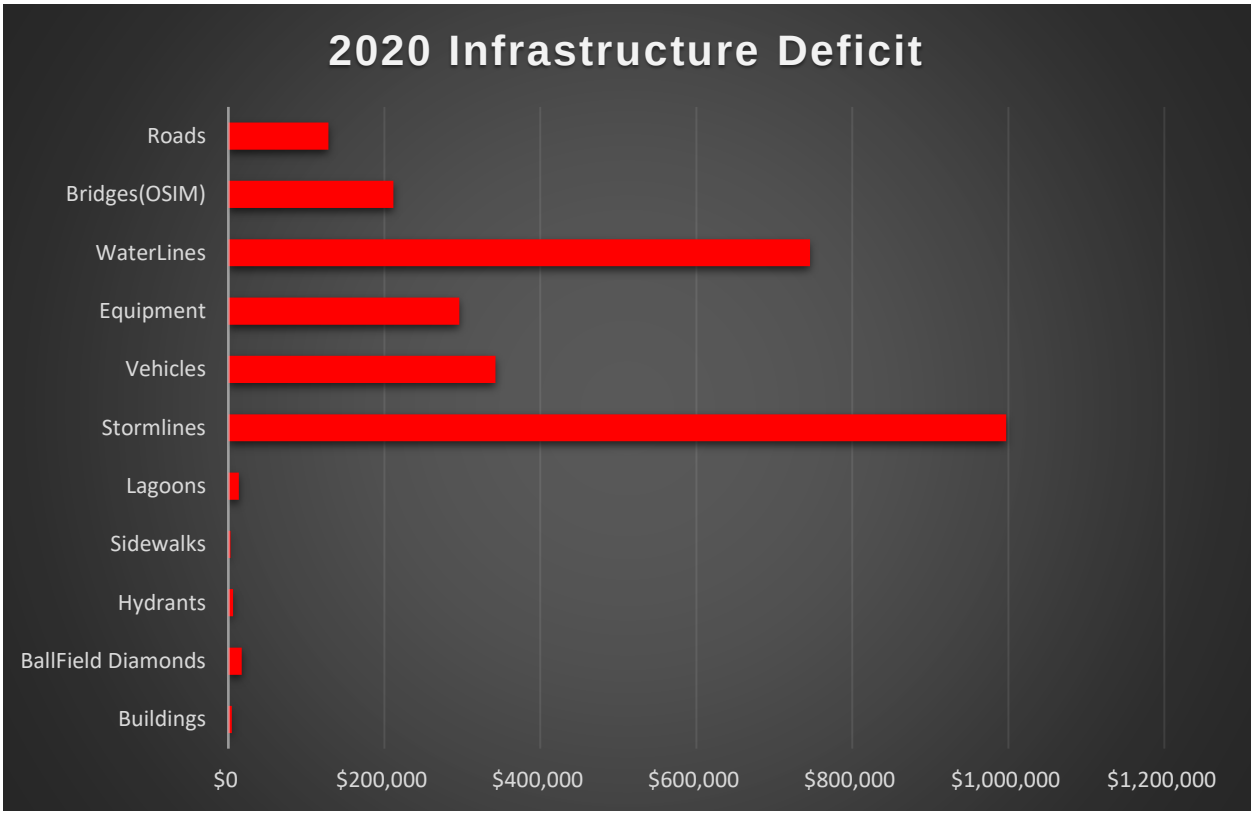


Figure 133: 2020 Infrastructure Deficit by Asset Category

The total Infrastructure deficit is $2.87 million, contributed mostly by Stormlines ($997 thousand), Waterlines ($746 thousand), Vehicles ($342 thousand), and Equipment ($296 thousand).

The 10-year Capital Plan is summarized below, with the backlog included in the first year:

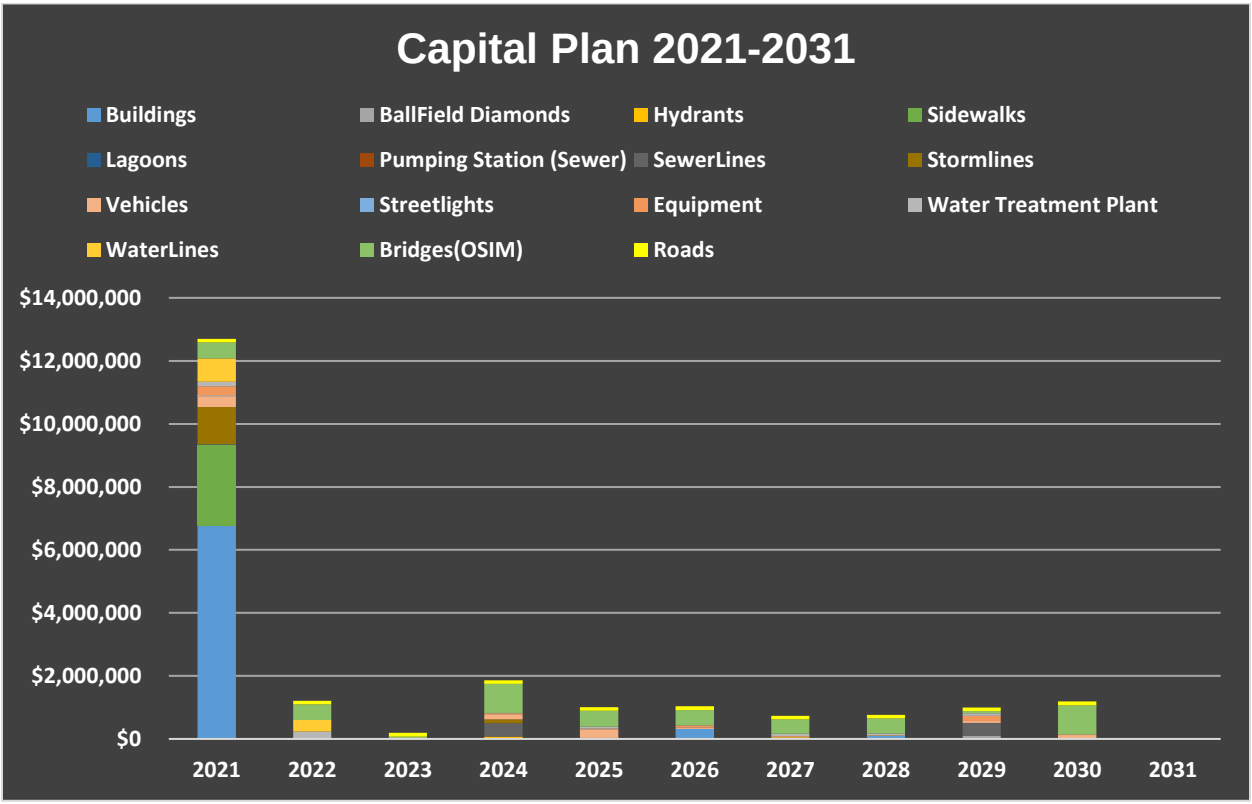


Figure 134: Summary of Capital Plan 2021-2030

Timeframe	Year	Capital Projects (Incl. HST)
Year 2021-2031	2021	$12,713,150
	2022	$1,262,212
	2023	$204,960
	2024	$2,077,207
	2025	$1,161,452
	2026	$1,247,107
	2027	$911,190
	2028	$983,092
	2029	$1,378,343
	2030	$1,637,184
Total		**$23,575,898**

Timeframe	Year	Buildings	Sidewalks	Lagoons	Pumping Station (Sewer)	SewerLines	StormLines	Vehicles
Year 2021-2031	2021	$6,751,866	$2,556,630	$13,276	$0	$0	$1,188,358	$342,400
	2022	$16,065	$0	$0	$0	$0	$0	$0
	2023	$0	$0	$0	$0	$0	$0	$0
	2024	$0	$0	$0	$0	$425,323	$122,659	$163,000
	2025	$0	$0	$0	$0	$0	$0	$270,000
	2026	$313,376	$0	$0	$0	$0	$0	$50,300
	2027	$0	$0	$0	$0	$0	$0	$36,800
	2028	$91,800	$0	$0	$0	$0	$0	$0
	2029	$16,065	$0	$0	$0	$404,018	$0	$61,600
	2030	$0	$0	$0	$0	$0	$0	$118,800

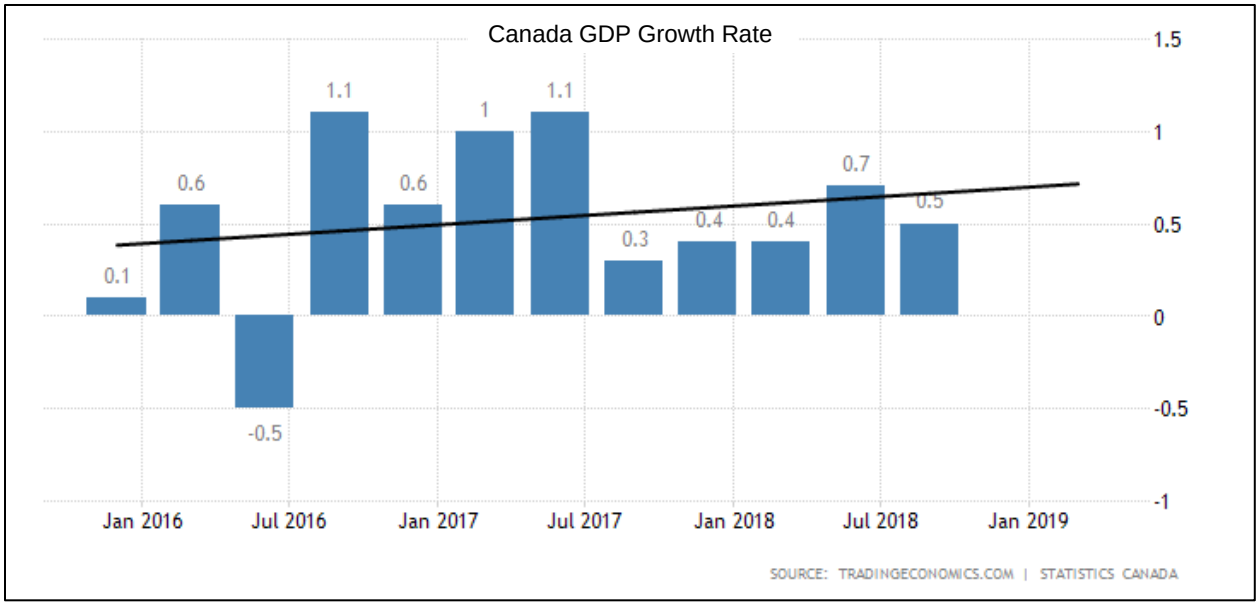
Timeframe	Year	StreetLights	Equipment	WTP	WaterLines	Roads	Ball Field Diamonds	Hydrants	Bridge
Year 2021-2031	2021	$21,600	$296,000	$139,361	$745,683	$118,965	$17,000	$5,940	$504,059
	2022	$0	$6,500	$208,413	$369,203	$109,884	$0	$0	$502,638
	2023	$0	$0	$15,028	$0	$112,753	$0	$0	$62,811
	2024	$0	$26,000	$15,028	$0	$117,508	$0	$77,220	$916,685
	2025	$0	$16,200	$66,318	$0	$114,992	$0	$35,640	$503,531
	2026	$0	$61,600	$15,847	$0	$120,326	$0	$0	$478,920
	2027	$0	$6,804	$68,739	$0	$115,435	$0	$47,520	$458,620
	2028	$0	$8,500	$66,909	$0	$111,192	$0	$11,880	$475,143
	2029	$0	$166,204	$78,167	$0	$117,270	$86,400	$0	$71,246
	2030	$0	$23,000	$6,007	$0	$117,444	$0	$0	$920,757

A detailed project-by-project breakdown of this Capital Plan and all proposed or consultant/study recommended projects are included in the capital project list in Appendix A.

8 FINANCIAL PROJECTIONS

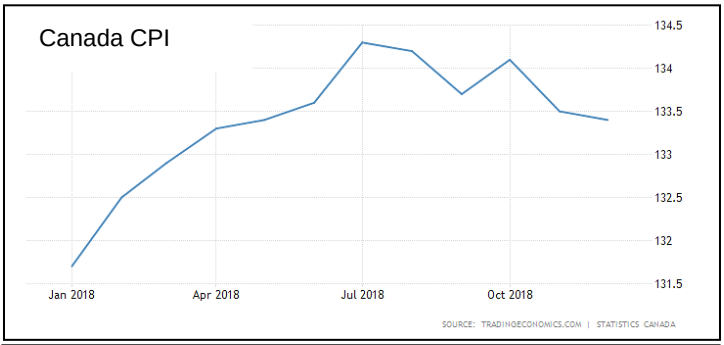
Our first steps in Financial Forecasting include compounding/inflating historical costs to Present Value (2020), and then further compounding/inflating these numbers to meet future requirements. Due to the volatility of inflationary factors, we were not able to determine a comprehensive regional "*Municipal Cost Index (MCI)*" that was reliable enough to have confidence in. We therefore used the CPI (Consumer Price Index) for the historic analysis. For financial forecasting beyond 2020, we assumed an inflation rate of 3.5%. In recent years inflation has been in the 2% range but has recently gone up to as much as 5%. We therefore believe that a 3.5% inflation rate is a reasonable assumption for long range financial planning.

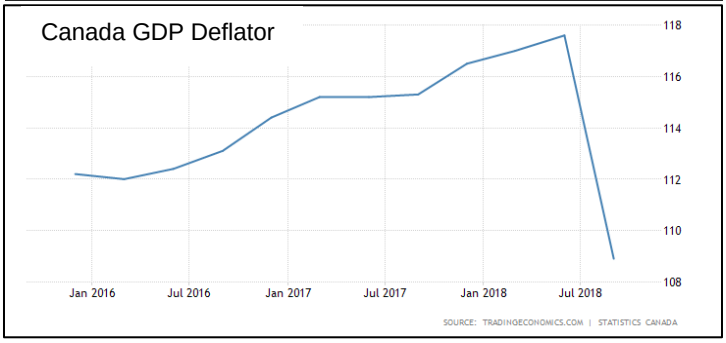
Our basic assumptions and calculations, included within this document, are key to the planning process and serve as the base for the forecasting and predicting your future budgetary requirements and needs.



8.1 CONSUMER PRICE INDEX: OUR PERSPECTIVE

A price index measures the change in the costs of purchasing a fixed basket of goods and services in the current period, compared to a base period, typically month-over-month or year-over-year. The most widely applied measure of inflation/price index is the Consumer Price Index (CPI). Given its pervasive use in setting cost-of-living adjustments, it can be the appropriate metric when calculating the rate of consumer inflation at the national level. Major components of the CPI include housing, food, and transportation.





Extending the use of the CPI into discussions about the appropriate level of tax and fee rate increases becomes problematic, however, because a government's actual experience with inflation can differ greatly from the CPI. This is because the largest expenditures for governments are typically labor, materials, and contractual services — different factors than those found in the CPI. Spending patterns that are different than those of other economic sectors. A price index that does not reflect the municipal purchasing structure does not truly reflect changes in the cost experience, and thus the purchasing power, of local governments. For instance, the CPI reflects household spending patterns that focus on shelter (27.7 percent of the Statistics Canada CPI basket), transportation (19.5 percent), food (15.5 percent), and recreation (12.9 percent) — none of which registers as leading purchase categories for local governments.

There are two main parts to the MCI (Municipal Cost Index) calculation: the weightings of the expenditure categories (showing the relative importance of items in the index), and the inflation factor used for each component. The inflation factors for expected price changes are based on economic data from two main sources, the Conference Board of Canada (CBOC) and Statistics Canada. The key issue is to match an appropriate inflator from these external sources to the types of expenditures in each budget category. MCI can be used in the following ways:

- To measure the increase in overall municipal expenditures attributed to inflation;
- To allow managers to more closely monitor the increase in spending by expenditure category, thus making inflationary price increases or decreases more visible;
- To provide an indication of the historical, current, and future direction of prices relative to municipal expenditures;
- To explain increased expenditures attributed to inflation when submitting annual budgets.

As mentioned at the beginning of this section, we did not use MCI in the analysis due to the volatility of the inflationary factors.

8.2 FINANCIAL STRATEGY ASSUMPTIONS

The following summarizes the key assumptions used in the preparation of the financial strategy for major assets:

- 2.0% annual operating income increase (property taxation, base scenario)
- 5.0% annual increase in user fees and 3.5% increase in other revenues
- 3.5% annual operating expenditure increase
- 3.5% annual increase in capital replacement costs
- 2021 Canada Community-Building Fund (formerly Gas Tax Fund) of **$159,988** for 2021 as per AMO allocation table. In 2021 there is a top-up amount included, but for the financial forecasting only the base amounts as per AMO allocation table are included for 2022 and 2023, and are extended beyond 2023 with no inflation.
- Existing funding sources, as identified in the 2020 FIR or Financial Statements
- No growth-related capital has been included in the analysis as the financial strategy relates to the replacement of existing assets.
- Capital replacement needs as identified in the previous section of this report.

It is important to keep in mind that assumptions may significantly change over time. In addition, capital replacement cost estimates may vary from current projections. As such, there is a need to monitor the financial strategy over time.

8.3 FUNDING REQUIREMENTS

In our efforts to create the best plan moving forward for the Municipality, ISI decided to create two scenarios:

- Capital Plan including infrastructure deficit (backlog)
- Capital Plan (excluding infrastructure deficit)

The financial analysis separates the primarily tax funded assets from the user fee funded water and wastewater assets, including all related revenues, capital and operating expenditures.

8.3.1 TAX FUNDED ASSETS

This section looks at all assets other than Water and Wastewater which have their own dedicated User Fees. With the current annual Property Tax increase of 2.0%, a Capital Plan that will eliminate the deficit over the next 10 years requires the Municipality to make an average annual capital investment of $1,396,166 as compared to the current contribution of ($436,227), a negative amount, resulting in an annual funding gap of $1.83 million. The Municipality is not generating sufficient funds, not even to cover its operating expenses, and by our calculations would have to increase the property tax annually by 12.3% from the 2.0% base rate to 14.3% per year to cover its operating and projected capital expenditures during the 10-year plan period.

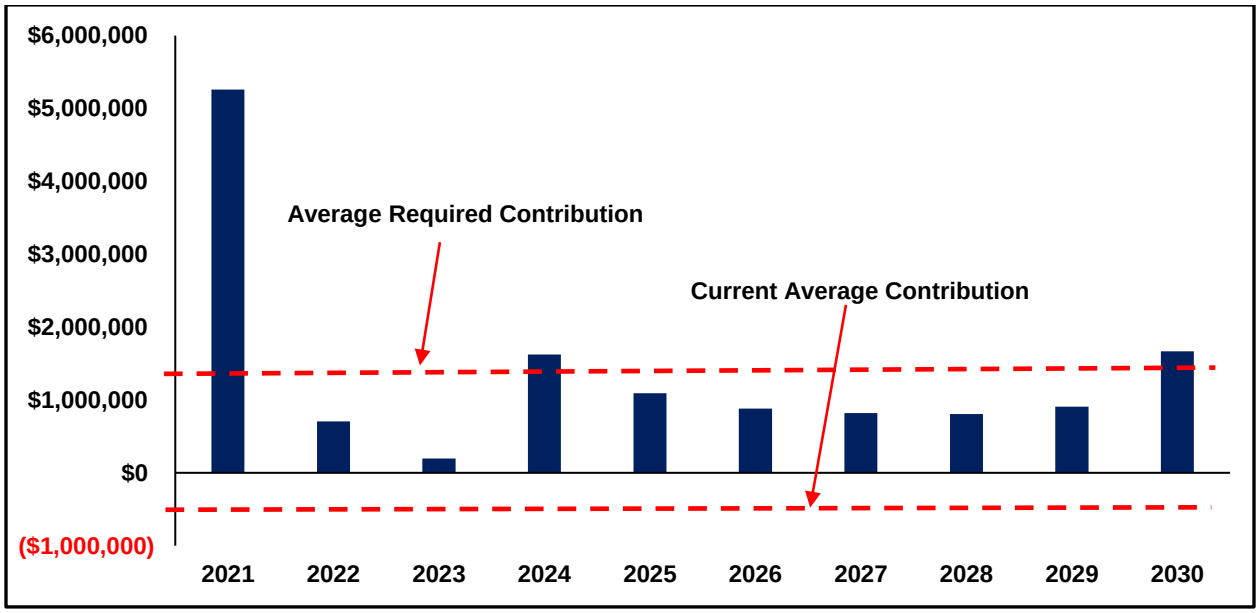


Figure 135: Tax Funded Capital Program Contributions (Required vs. Existing)

Without taking the deficit into consideration, by our calculations the average annual capital requirement is $1,195,655. With a current contribution to the capital program of ($436,227), the Municipality would have to set the annual property tax increases to 11.3% from the 2.0% base rate to 13.3% per year.

8.3.2 WATER AND WASTEWATER ASSETS

This section looks at the Water and Wastewater assets which have their own dedicated User Fees. With the current annual User Fee increase of 5.0%, a Capital Plan that will eliminate the deficit over the next 10 years requires the Municipality to make an average annual capital investment of $282,676 as compared to the current contribution of $290,326. The Municipality is generating sufficient funds for its Water and Wastewater systems, and by our calculations would be able to maintain the current annual user fee increases at 5.0% to meet its operating and projected capital expenditures during the 10-year plan period.

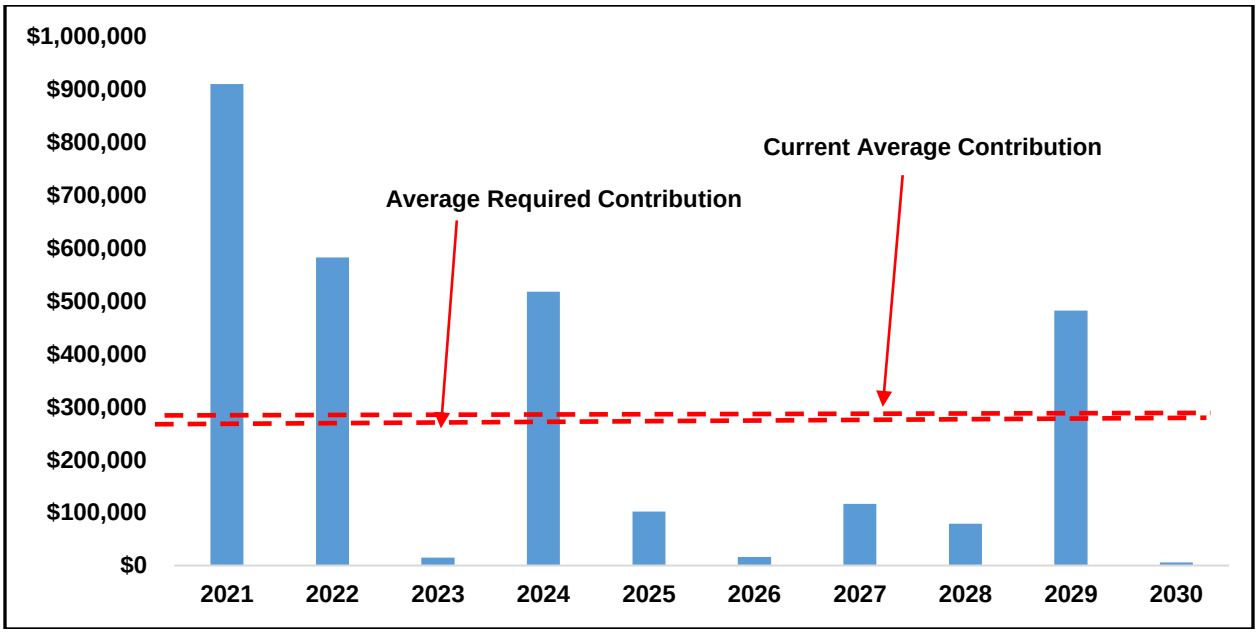


Figure 136: Water & Wastewater Capital Program Contributions (Required vs. Existing)

Without taking the deficit into consideration, by our calculations the average annual capital requirement is $196,544. With a current contribution to the capital program of 290,326, the Municipality could reduce the annual user fee increases by 1.9% from the 5.0% base rate to 3.1% per year, less than the projected rate of inflation.

To reliably establish the funding requirements for water and wastewater, the Town should have a 50-year Water and Wastewater Rate Study done to make sure that enough reserves are available when large renewal projects become due.

9 FINANCIAL STRATEGIES – THE INFRASTRUCTURE GAP

Financial sustainability requires that a Municipality ensures that there are sufficient resources to support the delivery of services for which the Municipality bears responsibility. Given the need and benefit for further infrastructure investment in order to protect, sustain, and maximize the use of the Town of Thessalon's infrastructure assets, a number of options and strategies have been considered. Through the optimization software, for example, strategies are recommended which allow for an increased deficit on low volume rural Bridges, while directing capital to more critical non-transportation services. Deficit elimination is outside the financial capability of the Municipality, but much can be done to ensure non-priority items can be put on the backburner while critical services remain adequately funded.

9.1 STRATEGY 1: SPECIAL LEVY

For the Town's general infrastructure, with the exception of water and wastewater systems, the current contributions fall far short. Without any grants from the Federal or Provincial governments, the contributions are not even sufficient to meet current operating expenditures, leave alone funding the projected capital projects over the next 10 years. One option would be to implement a special infrastructure levy on the property taxes as a surcharge. For example, by applying a

special infrastructure levy of 5% annually, the Town will increase the funds available over the 10-year period by approximately $7 million. This reflects the significant power of compounding:

The following table is provided for illustrated purposes to help explain the significant potential through a modest levy increase to address the infrastructure gap:

5% Special Infrastructure Levy		
2021	$	81,181
2022	$	174,540
2023	$	281,496
2024	$	403,623
2025	$	542,662
2026	$	700,538
2027	$	879,382
2028	$	1,081,551
2029	$	1,309,648
2030	$	1,566,551
Total	***$***	***7,021,171***
Average increase	***$***	***702,117***

9.2 STRATEGY 2: RETHINKING INFRASTRUCTURE SERVICES

Optimization
The potential exists to reduce infrastructure costs by determining the most cost-effective options for all capital programs on new or rehabilitated infrastructure by pursuing life cycle cost analysis (discussed earlier in the report). The DOT (Decision Optimization Technology)™ capital planning software will be instrumental in assisting the Town in focusing on preventive maintenance, and optimizing the allocation of the capital budget to determine highest return on investment.

Service Reduction
Recognizing the significance of the infrastructure deficit, the Municipality should consider a services review with the objective of re-evaluating the priorities of the community and cost of services provided with the objective of streamlining and potentially eliminating low priority services.

Long Range Planning
Many municipalities develop rehabilitation and replacement programs on a system-wide program basis versus annual project by project basis. This will allow for improved prioritization and coordination of required work.

Deferred Replacement
The infrastructure deficit can be viewed as hypothetical in some cases, applying conservative engineering lifecycle calculations that may be overly aggressive in comparison to the real-life experience. For example, you might project the life of a building to be 50 years, but many fully functional buildings are more than 100 years old. Due to the limited funds available, some consideration should be given to where the replacement of some assets may be deferred.

9.3 STRATEGY 3: STRATEGIC USE OF DEBT

In some circumstances, it makes good sense to incur debt today rather than take the consequence and cost of allowing assets to deteriorate to a point where replacement or reconstruction would substantially increase cost to the community. The concepts involved with changing the oil in our cars and fixing the roof of our house also apply to preventive maintenance on road networks, for example. Keep a road in good shape with regular maintenance and you will never face a full reconstruction.

Due to the backlog in the tax-supported programs, there is a need to examine the cost/benefit of addressing these needs through the issuance of debt. Using debt strategically can provide capital funding flexibility by allowing certain infrastructure to be built and used before sufficient revenue has accumulated to offset the needed investment. Debt is frequently issued and considered a standard practice in Municipalities for capital projects that are long term in nature and that benefit future taxpayers, thereby spreading the costs across future years. As such, debt promotes inter-generational equity in that infrastructure is paid for by those who use it. With favourable interest rates and significant backlog, the Municipality may wish to consider the need to issue debt to expedite capital replacement.

A debt management policy improves the quality of decisions, identifies policy goals and demonstrates a commitment to long-term financial planning, including a multi-year plan. Adherence to a debt management plan signals to rating agencies and capital markets that the Municipality is well managed and is well positioned to meet its obligations in a timely manner. The Province regulates the amount of debt that Municipalities issue by setting an annual repayment limit for each Municipality (25% of a Municipality's own source revenues). Based on our experience, Municipalities typically establish thresholds below the Provincial limit to take into consideration taxpayer affordability and to ensure flexibility. The Town of Thessalon has a 2020 Annual Debt Repayment limit of $663,572, of which $197,240 is utilized with existing debt.

In addition to a debt guideline, monitoring also becomes important when considering the idea of the increased use of debt as a funding source to ensure that it is being used in a fiscally responsible manner. Government Finance Officers Association recommends that Municipalities adopt policies that specify appropriate uses for debt.

The following strategies are recommended to determine the most appropriate time to issue debt

- Debt will be proportionate to the Town's tax base and will not put an excessive burden on operating expenditures.
- Outstanding and planned debt levels will not exceed an amount that can be supported by the existing and projected tax revenue base. Debt policies will focus on:
    - projected debt requirement
    - limits and benchmarks
    - term and structure of debt
    - use of reserves to offset debt issuance
- Long-term debt for the replacement and refurbishment of existing capital assets will be reduced and a planned process will be developed whereby an annual contribution will be made to meet lifecycle needs of all assets.

The following policies are recommended to manage debt within the Town:

- Tax Debt Charges as a percentage of Tax Own Source Revenues will not exceed 10%.
- Long-term debt financing will be restricted to specific project types:
    - Increased/new services to residents for new initiatives

- New, non-recurring infrastructure requirements
- Projects which are supported by a business plan that shows revenues will cover capital and interest costs
- Projects where the cost of deferring expenditures exceeds debt servicing costs
- Project costs not recovered from Development Charges
- Projects tied to third party matching funding

(Note: These restrictions may have to be phased in to meet short-term budget challenges.)

- The length of the term of debt will not exceed the useful life of the underlying asset.
- The Town will monitor and report on all forms of debt annually.

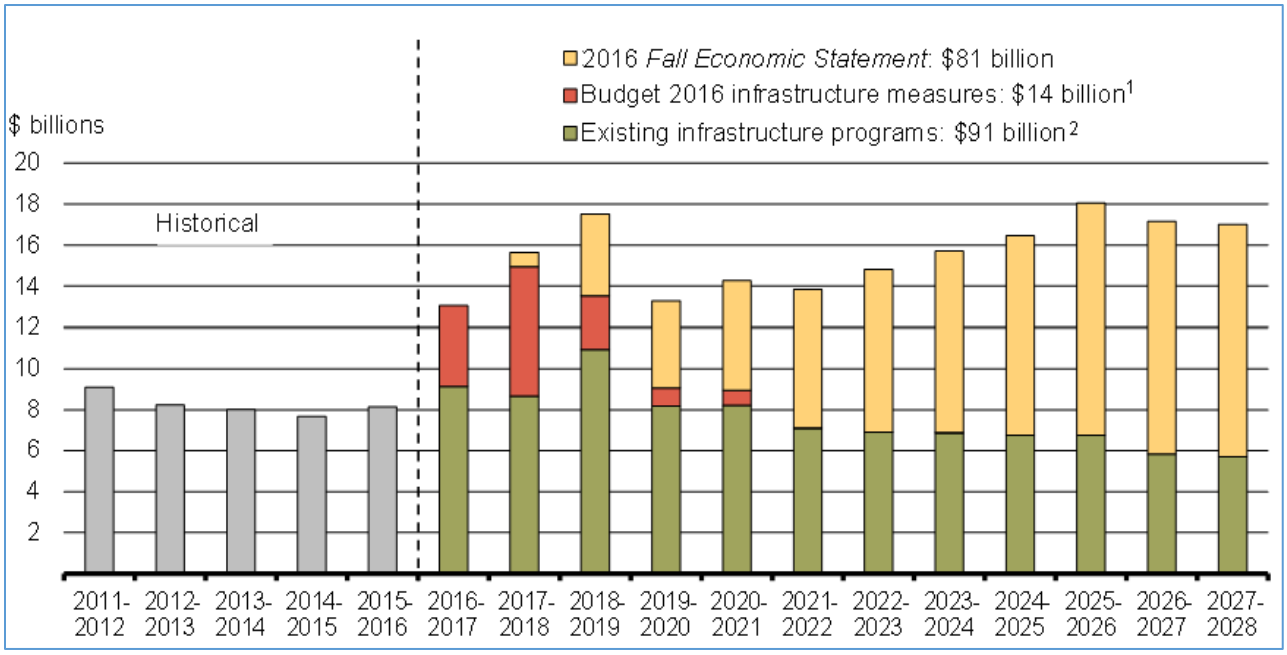
9.4 STRATEGY 4: USE OF GRANTS

It is well established that the condition of Canada's municipal infrastructure is one of the keys to underpinning, maintaining and enhancing Canada's economic productivity and competitiveness. It is therefore clearly in the national and provincial interests for the federal and provincial government to institute permanent and sustainable infrastructure funding. Along with the strategic use of debt, the Municipality can also apply for the grants available from the Provincial and Federal governments. Some significant components of the infrastructure deficit can be dealt with through close monitoring of grant programs and a careful expression of interest to access these funds.

FEDERAL GOVERNMENT INVESTING IN CANADA

Across the country, people and communities are in need. The middle class and those working hard to join it need the opportunities that come with good, well-paying jobs, and communities need help to maintain, improve and expand the things that make Canada's Towns and cities great places to live.

Investing in Canada's infrastructure builds strong communities and helps to strengthen and grow the middle class, setting the stage for sustained economic growth in the future. In Budget 2016, the government made a down payment on future growth by making immediate investments of $11.9 billion in public transit, green infrastructure and social infrastructure. This 2016 Fall Economic Statement strengthens the government's commitment to long-term growth for the middle class. It proposes an additional investment of $81 billion over 11 years, starting in 2017–18, in public transit, green infrastructure, social infrastructure, transportation that supports trade, Canada's rural and northern communities, and smart cities. The government will also establish a new Canada Infrastructure Bank to provide innovative financing for infrastructure projects, and help more projects get built in Canada, where public capital can be leveraged.



Taking into account existing infrastructure programs, new investments made in Budget 2016 and the additional investments contained in this Fall Economic Statement, the government will make a total investment in Canada's communities of more than $180 billion.

This commitment is unprecedented in Canadian history.

ONTARIO PROVINCIAL GOVERNMENT

As announced in the 2016 Ontario Economic Outlook and Fiscal Review, the Province of Ontario plans to invest more than $160 billion over 12 years, starting in 2014–15.

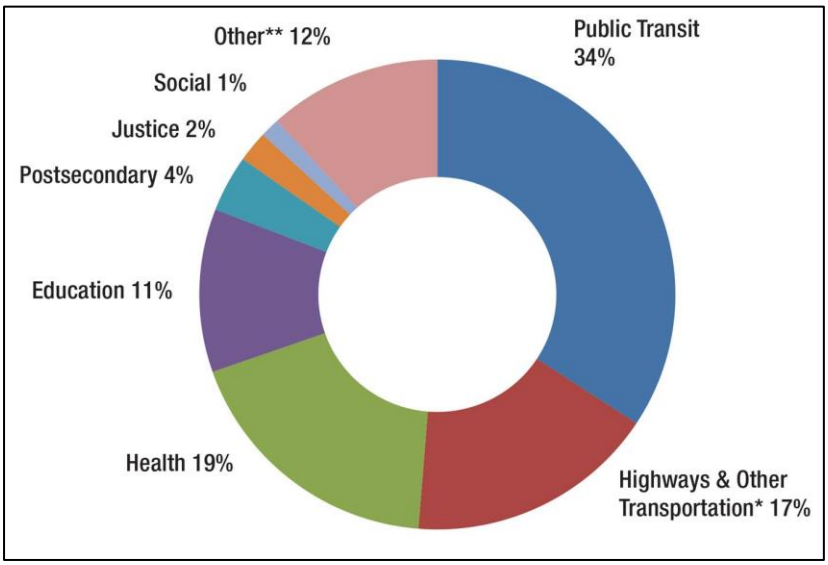


Figure 137: The Province's 12-year infrastructure plan by sector (%)

The infrastructure plan includes investments in Moving Ontario Forward for public transit, highways and other priority infrastructure projects. The infrastructure expenditures table below outlines all planned investments over 12 years, starting in 2014-15, and shows they touch all key sectors.

Sectors ($M)	2014-15 Actuals	2015-16 Actuals	Outlook 2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	12-Year Total
Public Transit	3,554	3,967	5,381	6,632	8,053	8,528	7,656	6,742	4,983	3,378	2,112	1,807	62,791
Highways & Other Transportation*	2,323	2,372	2,919	3,163	3,248	3,340	2,947	2,582	2,287	2,047	1,966	1,946	31,139
Health	3,568	3,225	3,192	2,745	2,774	2,775	3,062	2,243	2,339	2,816	2,952	1,914	33,603
Education	1,833	1,590	2,561	1,932	1,865	1,808	1,686	1,558	1,434	1,432	1,432	1,396	20,526
Postsecondary	519	624	1,091	1,035	593	450	466	467	468	464	459	456	7,093
Justice	144	150	255	314	566	626	573	396	230	217	216	216	3,903
Social	231	267	814	353	243	183	68	54	52	51	51	51	2,419
Other**	645	556	1,184	1,299	1,936	2,071	1,935	2,072	2,647	3,555	1,680	1,676	21,256
Total Infrastructure Expenditure	12,817	12,751	17,396	17,474	19,277	19,779	18,393	16,113	14,440	13,960	10,869	9,463	182,731
Less: Other Partner Funding & Federal Contributions	1,661	1,931	3,240	2,498	2,331	1,357	1,481	1,300	1,337	1,349	1,293	1,214	20,991
Total	**11,156**	**10,820**	**14,156**	**14,975**	**16,947**	**18,422**	**16,912**	**14,812**	**13,103**	**12,611**	**9,576**	**8,249**	**161,740**

Figure 138: Infrastructure Expenditures Table
(Source: 2016 Ontario Economic Outlook and Fiscal Review)

10 RECOMMENDATIONS

10.1 SOTI RECOMMENDATIONS

The SOTI/Capital Plan identifies a number of asset-specific recommendations. However, there are six recurring recommendations that should be addressed in future strategic asset management initiatives:

1. Develop, through more detailed analysis, a plan for allocating the additional funds to the operating and/or capital budgets, as required, in order to successfully develop, implement, and maintain an approved asset management plan;
2. Develop a policy and implement a strategy to reach long-term sustainable funding for each of the assets covered in this SOTI Report;
3. Implement a comprehensive budget structure along service delivery lines, so that service managers can adequately know what the true total cost of their service is (including asset management, operations, capital, and borrowing costs).
4. Review the selection and use of rehabilitation strategies on life-cycle costing and on a return-on-investment (ROI) basis.
5. Review operating and maintenance practices, balancing least life-cycle cost against level of service and risk exposure, on a business-case basis using InfraGuide Best Practices and other industry sources;
6. Provide regular updates to the SOTI Report Card and Analysis

10.2 CAPITAL PLAN RECOMMENDATIONS

1. Asset condition assessment of capital assets should be considered wherever feasible. Age-based condition assessment has the least level of confidence for building a capital plan.
2. The Town needs to build a definitive policy with respect to it's infrastructure deficit.
3. The Town of Thessalon should release its infrastructure policy, strategy and intention as it pertains to the infrastructure deficit, including communications, to the general public in order to gain stakeholder support for tough decisions.
4. The Town should proactively define organizational responsibilities to maintain the asset inventory including proposed and actual project cost information, updating the data as assets are acquired or betterments are added to existing assets and projects are started and completed. In this manner, the accuracy of future Capital Plans will increase over time.
5. The Town should consider establishing as policy the following guiding principles, that it be:
    a) **Customer Focused:** To have clearly defined Levels of Service and applying asset management practices to maintain the confidence of residents in how the Town of Thessalon assets are managed.
    b) **Forward Looking**: To make the appropriate decisions and provisions to better enable its assets to meet future challenges, including changing demographics and populations, customer expectations, legislative requirements, technological and environmental factors.
    c) **Integrated System Focused**: Evaluate an asset in terms of its role and value within the context of the greater system, as opposed to examining individual assets in isolation
    d) **Risk-based**: To manage the asset risk associated with attaining the agreed levels of service by focusing resources, expenditures, and priorities based upon risk assessments and the corresponding cost/benefit recognizing that public safety is the priority.
    e) **Value-Based/Affordable**: To choose practices, interventions, and operations that aim at reducing the life cycle cost of asset ownership, while satisfying agreed levels of service. Decisions are based on balancing service levels, risks, and costs.
    f) **Holistic**: To take a comprehensive approach that looks at the “big picture” and considers the combined impact of managing all aspects of the asset life cycle.
    g) **Sustainable**: The Town will make the appropriate decisions and provisions to better enable its’ assets to meet future challenges, including population growth, people expectations, legislative requirements, technological and environmental factors, without compromising the ability of future generations to meet their own needs.
    h) **Optimal**: The Town will make informed decisions between competing factors such as service delivery, asset quality & value, cost, and risk by determining which option will deliver the optimal lifecycle value.
6. To meet the goals and objectives of this policy, senior management could consider:

a) The creation and maintenance of a Comprehensive Asset Management (CAM) governance structure to lead the development of AM tools and practices and to oversee their application across the organization.
b) Adopt a Comprehensive Asset Management Strategy (AMS) to:
    - Establish, document and continually adhere to industry recognized asset management protocols;
    - Develop asset management knowledge and competencies aligned with recognized competency frameworks;
    - Entrench lifecycle costing when evaluating competing asset investment needs across the Town assets;
    - Monitor the performance of the assets and track the effectiveness of AM practices with a view to continuous improvement;

10.3 LEVEL OF SERVICE RECOMMENDATIONS

1. We recommend that the Town incorporate a Level of Service analysis prior to resolving the infrastructure deficit in order to maximize the impact of their capital investments with the objective to:
    - Refine levels of service that balance customer expectations with risk, affordability and timing constraints as it pertains to the Town's unique requirements;
    - Adopt risk-based decision-making processes that consider the likelihood of asset failure and the consequence of a failure with regards to impacts on safety and levels of service;
2. To assist in better establishing Levels of Service, the Town should consider collecting technical performance measures required to provide information on:
    - the types of failure
    - the number of customers affected
    - the duration of the failure
    - the severity of the failure
3. To support decision-making for effective management of the assets, the Town should consider technical performance measurement and monitoring, undertaken by the Town such as:
    - Assessing the effectiveness of the operational, maintenance and capital works program
    - Review and refinement of maintenance and rehabilitation strategies and standards
    - Assistance in strategic decision-making through definition of remaining life, based on the measure being assessed

10.4 FINANCIAL STRATEGY RECOMMENDATIONS

A financial strategy to support the asset management plan is a dynamic document that should be updated and re-evaluated on an ongoing basis. The Town should give due consideration to the following points:

1. The Town has insufficient funds from existing sources to proactively manage its infrastructure and will need to prioritize its requirements to maximizing the impact of existing financial resources.

2. The Town has a growing infrastructure deficit which is serious considering its population and tax base. A special infrastructure levy will help the Municipality to reduce the gap over time and should be taken into consideration.
3. In the event that the Town implements an infrastructure levy, the excess funds should be transferred into a reserve so that the Town has some flexibility to prioritize and sustain future infrastructure and service level requirements and have the ability to match funds with grant programs.
4. The Town needs to be proactive in reviewing and capitalizing on the upcoming Provincial and Federal programs, as the Town will need financial assistance to close its infrastructure deficit. It should seek government grants to be able to undertake the capital projects outlined in this Asset Management Plan.
5. The Town needs to be proactive in reviewing funding options including Infrastructure Ontario Lending Policies, Private Public Partnerships, user fees and other funding options to have an understanding of financing options.
6. The Town needs to embrace the principles of Asset Management to formulate assumptions, projections, and strategies going forward. The Plan should be modified and updated on an ongoing basis.
7. The Town should track and build awareness of the results of its projections on current operating and capital spending and funding levels with the objective of fine-tuning the forecasting process.
8. The Town should continue the analysis and examination of key financial goals and strategies that guide future priorities and expenditures.

11 CONCLUSION

The vast majority of smaller Canadian municipalities do not have a sufficient tax base to gain control over their infrastructure deficit. Without corrective action over the next 10 years, these communities will see a deterioration in the level of service being offered to its residents. Increased taxes and/or deteriorating levels of services often trigger a migration to larger municipalities, further undermining the smaller community's tax base. Although Provincial and Federal governments are now committing to substantially increased investment in infrastructure, much of it ends up in major urban centers where the greatest number of citizens are served.

At Thessalon, ISI worked with Town Superintendent Ken Seabrook, Deputy Clerk-Treasurer Debbie Rydall and Asset Manager Julia Kluding, who were responsive in providing ISI with information from the Town. The information we received was, by in large, accurate and well organized. The overall state of the linear infrastructure at the Municipality is in line with other, similarly sized municipalities in this Province. As highlighted in the Report Card, the current state of the linear infrastructure, based on available condition rating and age analysis, presents a picture of the Town's linear assets to require substantial work. The Town should continue to be proactive in their strategies, to extend asset useful life and avoid major rehabilitation/reconstruction or replacement costs.

It is highly recommended that the Town of Thessalon embrace the principles of Asset Management. Managing existing infrastructure, doing the right thing, at the right time, involves knowing and implementing the most cost-effective maintenance, repair, rehabilitation or replacement activity at the right time throughout the entire lifecycle of the asset. Beyond cost savings, assets need to be viewed in terms of their ability to enhance quality, function, capacity and safety of the service being provided.

The process of implementing Asset Management is rife with challenge. It requires clear direction from Council, significant cross-departmental cooperation, allocating of time, energy, and resource to assume new responsibilities, consultation with the community, and working with constrained budgets to balance priorities. Because infrastructure management deals with assets that have long lifespans, it may take years before a substantial financial return on investment (ROI) becomes apparent. Still, managing existing capital-intensive public-sector infrastructure assets could provide very significant benefits (i.e. 20 – 40% reductions in life cycle costs).

Through Asset Management, smaller municipalities have the best opportunity to build a strategy for self-sufficiency. A municipal council's first order of business is to capitalize on the significant cost savings and lifecycle gain associated with preventive maintenance. A second initiative would be to use advanced analytical tools to attain the highest possible return, both from a financial and socio-economic perspective, on capital expenditures.

Finally, the Town will likely be faced with difficult decisions over the next years, and the infrastructure deficit will continue to widen without corrective action. Only by stakeholder buy-in on a practical and implementable capital plan can communities stem their infrastructure deficit, maintain a quality of life and plot a course for the future with confidence. The Council should put together a public communication program to engage the community in discussing the true cost of services and the assets required to provide those services. Community and stakeholder buy-in for an implementable asset management plan and service levels in line with public expectations and willingness to pay are critical to the success of the program.

APPENDIX A - DETAILED LIST OF CAPITAL PROJECTS

A detailed list of capital project for each asset type is provided under a separate cover.