Deep River Asset Management Plan 2022 (Core Assets)

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Acknowledgements and credits

As part of the preparation of this asset management plan, staff performed extensive reviews of work done at other Ontario municipalities. While this AMP is “made in Deep River,” staff would like to acknowledge and thank the asset management teams at the City of Ottawa and the City of Guelph, whose work provided substantial insight into the structure of this document.

1 Introduction

1.1 Background, goals, and objectives

Asset management is the art and science of balancing the **relationship between money, risk, and performance** in businesses that depend on physical assets for their success. It is a **proactive, lifecycle approach** to reducing build, operation, and maintenance costs and risks. This is achieved by:

- Maintaining and/or replacing capital assets using models of the best economy.
- Taking a **system-level, whole-life, whole-cost perspective**, rather than a part-specific perspective
- **Managing risks** rather than specific resources
- Providing **clarity and evidence in our decision-making**, thus ensuring that our stakeholders understand the choices we made

The concept of asset management at the Town of Deep River has expanded and progressed over the Town's history. Council and staff have long regarded the long-term management of assets as critical; the formalisation of integrated asset management practices was initiated in the early to mid-2010's. The Town's first asset management plan was adopted in 2016, followed by a Strategic Asset Management Policy in 2019. These foundational documents have helped staff make progress in the development and implementation of industry recognised asset management practices. The Town continues to improve its asset management practices and processes, and has developed a multi-year, multi-step program to do so.

1.2 Ontario Regulation 588/17

Ontario Regulation 588/17 is a provincial regulation under the *Infrastructure for Jobs and Prosperity Act, 2015.* The Act is intended to help address the large-scale problem of aging municipal infrastructure and funding shortfalls by promoting better asset management planning at the local government level. The regulation requires all municipalities to have Asset Management Policies and Plans in place by certain deadlines.

The regulations outline a phased approach. Each of the deliverables must be adopted by Council resolution by the specified dates.

- **July 1st, 2019:** Asset Management Policy
- **July 1st, 2022:** Asset Management Plan for Core Assets
    - Scope includes roads, domestic water supply, wastewater treatment, stormwater management
    - The plan must describe the asset inventory, replacement costs, age, and condition
    - The plan must include recent performance against specific community and technical metrics

    - The plan must describe the lifecycle activities required to maintain levels of service for ten years
    - The plan must describe the impact of projected growth
- **July 1st, 2024:** Expanded Asset Management Plans for all assets
    - Scope expanded to include "all municipal infrastructure assets", which includes Buildings, fleet, facilities, etc.
    - A full description of the capital and operating costs of implementing lifecycle activities, and an associated financial and funding strategy to implement required lifecycle activities
    - A description of the risks and priorities where there are identified funding shortfalls

The Deep River Asset Management Plan 2022 (Core Assets) includes all information required by section 5 of Ontario Regulation 588/17, describing the Town's asset management plan for core municipal infrastructure.

1.3 Scope of this document

This document describes the Town's asset management plan for core municipal infrastructure, as required by Ontario 588/17. Its scope includes

- Summaries of the asset inventories, condition, and replacement costs of the core asset groups:
    - Transportation, water, wastewater, and stormwater asset groups
- Twenty-year projections of the lifecycle activities required to maintain current levels of service, and their associated costs.
- A description of the Town's asset management principles, strategies, and decision-making processes.

Note that this document does ***not*** include the following:

- Detailed descriptions of asset management practices for individual asset types. These will be developed over time in specific process and procedure documents, and summarized in five-year plans for each asset group.
- Financial strategies or funding mechanisms to fully implement the lifecycle activity projections. These will be developed in the next stage of the asset management program, and in conjunction with updates to the Financial Master Plan.

1.4 Assumptions, limitations, and constraints

This document was prepared using condition data estimated from asset age and from various inspections taken since 2016. The underlying assumption is that the physical condition data is still reasonably applicable, and the estimates of *expected useful life* and degradation are reasonably accurate.

The twenty-year lifecycle activity projections are based on the condition ratings of each asset, and do not imply that the required work can ***only*** be done in the indicated year. The timing of the lifecycle activities listed in the twenty-year projections should be used as input into the rolling detailed five-year plans that staff will develop for each asset group.

In particular, the projected lifecycle costs for any specific year should be used as a guide only; the five- and twenty-year annual averages provide a better representation of lifecycle costs.

Further, the actual selection of the maintenance / rehabilitation / replacement activity is determined through the analysis of on-the-ground conditions, treatment options, and expert advice from service providers. Where possible, coordinated projects which combine activities across asset groups are the preferred, practical option (for example, aligning reconstruction of roads with replacement of water and sewer mains).

2 The Town of Deep River

2.1 Our community today

The Town of Deep River is a lower-tier municipality in Renfrew County with a population of just under 4,200 residents. It is situated between the Ottawa River and the Trans-Canada Highway, approximately 200 km north-west of Ottawa within the Ottawa Valley. The Town was a planned community, originally established in the late 1940's to house employees at Chalk River Nuclear Laboratories and has seen cycles of growth and decline since. Today, the Town is home to a variety of high-tech, retail, and other commercial businesses.

2.2 Service Areas and Asset Classes

The Town of Deep River is responsible for managing public infrastructure which supports the delivery of a large number of services to the community. These include the treatment and supply of drinking water, the treatment of sanitary wastewater, stormwater management, a number of recreational and cultural facilities and programs, administrative services, emergency services, and an extensive network of roads and sidewalks. Table 2-1 summarizes the Town's main assets.

Table 2-1: Assets classes and subtypes

Asset Class	Asset	Quantity
Transportation	Roads	41.1 km
	Sidewalks	5.9 km
	Streetlights	597
	Traffic Signs	274
Water	Water Mains	46.7 km
	Valves	287
	Hydrants	241
	Water Tower	1
	Booster Station	1
	Treatment Plant	1
Wastewater	Sanitary Mains	28.3 km
	Maintenance Holes	470
	Treatment Plant	1
Storm Water	Storm Mains	13.8 km
	Catch Basins	251
	Maintenance Holes	186
Fleet and Facilities	Fleet	30
	Facilities	13

2.3 Future Growth

The Town of Deep River is anticipated to have population growth of approximately 8% over the next 10 to 15 years. This growth is largely dependent on the two major employers in the area, Garrison Petawawa and Canadian Nuclear Laboratories. Residential housing growth will primarily be within the municipal urban area, and through the development of additional sub-divisions. These will require expansion of municipal infrastructure (roads, water supply and wastewater collection). The Town's current wastewater treatment infrastructure is running near full capacity, and will need to be expanded in the medium term.

2.4 Climate Change

One focus of the asset management plan is to identify the potential impacts of climate change. While the full effects of climate change are difficult to predict, it is likely that there will be substantial impacts to Town infrastructure and some services delivered by the Town.

The Atlantic Infrastructure Management Network recommends the use of the Climate Atlas of Canada (https://climateatlas.ca/) to estimate potential changes in local climate. The Climate Atlas uses data and modelling from the Pacific Climate Impacts Consortium to provide projections of precipitation and daily temperatures at the local level. According to these projections, the Town of Deep River may experience the significant changes to the local climate, including

- An increase in annual precipitation, more frequent high-rainfall and snow days, and an increase in the maximum precipitation per day.
- An increase in annual mean temperature of approximately 2.2°C, and a significant increase in the number of high temperature days.

These changes will have a significant impact on Deep River infrastructure. In particular, the Town's storm water management system will be placed under strain due to higher overall rainfall and more frequent severe rainfall events. The risk of flooding and property damage is therefore increased. Increased high-snowfall days will require increased snow and ice operations.

Further, hotter temperatures will likely increase demand for water, and may place additional strain on the cooling and ventilation systems of town facilities.

Overall, there are many potential risks that can be attributed to climate change. Careful asset planning to anticipate these predicted increases and address the risks before they occur will result in better long-term benefits for the Town.

3 Asset Management Planning

3.1 Components of an asset management plan

Asset management plans typically provide information related to describing the assets, their value, their risk and criticality levels, and the activities required to maintain the delivery of service over the life of the asset. The main components of a typical plan are shown in Table 3-1.

Table 3-1: Components of this asset management plan

Information	Description
Asset information	Inventory (list of assets) Attributes (size, material, etc.) Location Estimated current replacement costs
Risk information	Likelihood of failure (related to condition, age, etc.) Consequence of failure (criticality of each asset; impact on service delivery of failure)
Lifecycle activities	Estimated useful life, and typical degradation over time Maintenance, rehabilitation, and reconstruction activities required over the life of the asset Costs of lifecycle activities Long-term projections of required activities and costs
Operations and maintenance strategies	Routine maintenance programs Inspection and condition assessment schedules
Capital investment decision making strategies	Approach to investment decision-making

3.2 Assessing the value of our assets

This Asset Management Plan relies on *estimated current replacement cost* as its basis for the valuation of each asset rather than *net book value,* which is typically used for financial reporting purposes. Total asset valuation is determined using a bottom-up approach, accounting for individual asset attributes (e.g., type, size, etc.). This approach is preferred for asset management because it depicts a more accurate picture of the potential value.

The valuation based on replacement cost is especially useful for assets that have relatively lengthy useful lives like water, wastewater, and transportation infrastructure. For these assets, the use of replacement value is more representative of future funding needs and more useful for decision-making support than historical cost valuation methods.

Town staff have used a variety of methods to develop asset replacement unit costs. In most cases, these are based on recent capital project work (for example, the replacement costs for water and wastewater infrastructure are based on costings for the Lasalle Drive project in 2022), recent quotations, and surveys of other regional municipalities.

Town staff will continue to review and update replacement unit costs on a regular basis (at least annually) to ensure that future funding needs remain representative.

3.3 Assessing the condition of our assets

Understanding the condition of an asset is an essential step in identifying the future needs of that asset. Where possible and economical, the Town performs physical assessments of assets using industry-standard evaluation procedures. Condition assessments can involve different forms of evaluations, such as professional opinion, physical testing, and mathematical modelling, and may be completed through a detailed or a very cursory approach. In some cases, there are regulated requirements to conduct detailed condition assessments (the inspection of play structures is subject to CAN/CSA Z614-07), and in many cases there are industry-standard assessment procedures.

The Town of Deep River has various methods for assessing the condition of its assets, although further development and formalization of routine inspection programs is required.

- Roads and sidewalks are inspected every four to five years against OGRA standards using advanced 2D and 3D mapping camera technology (performed by Streetlogix).
- Camera footage of sewer mains have been conducted historically, with the intention of inspecting mains on a five-year rotation.
- Manholes are physically inspected on an annual basis.
- Waterlines have not been inspected historically, however, staff are investigating the feasibility of using new technologies such as leak detection and electromagnetic inspection devices.
- Hydrants and valves are annually exercised and flushed.
- Some storm lines have been inspected using CCTV footage, however, no regular program is currently in force.

Ideally, all assets would undergo physical inspections to determine their condition, and therefore their likelihood of failure. However, this is not always feasible – many of our assets are buried or the cost of inspections is prohibitive. Where we cannot capture physical condition data, we rely on the asset's *expected useful life (eul)*. The asset's condition is then estimated based on its age relative to its *eul* (refer to Table 3-2). Although this approach is not as accurate for entire life cycle analysis as the use of detailed condition data, it does provide a reliable benchmark of future requirements. Each asset is analyzed individually. Therefore, while there may be inaccuracies in the data associated with any given asset, these imprecisions are typically minimized at the aggregate level over entire asset classes.

In Deep River's case, many of our assets were installed in the early 1950s, and therefore are reaching the end of their expected life at roughly the same time. In the strict sense of the definition, this means they are all rated in *poor* and *very poor* condition. Many, however, are still fit for purpose, and therefore may not need immediate replacement. *Expected useful life* only provides a sense of potential requirement – all replacement work must be confirmed through performance monitoring, field inspections, etc.

Town staff estimated expected useful lives based on, local experience, expert advice, and industry knowledge (as contained in the D.O.T software system – see section 3.9 for further detail). A survey of asset management plans from other local municipalities was used as a final check of the range of *euls*.

Table 3-2: Description of condition ratings

Rating	Definition	% *expected useful life* remaining[1]
Very Good	**Fit for the Future** – The asset is typically new or recently rehabilitated. Very few elements exhibit deficiencies. Regular maintenance is required to maintain asset.	90% to 100%
Good	**Adequate for Now** – The asset shows general signs of deterioration from normal use; however, the asset is still able to provide its intended function without problems. Few elements exhibit deficiencies. Levels of service are not affected. Regular maintenance continues to be required.	75% to 90%
Fair	**Requires Attention** – The asset shows general signs of deterioration, likely from normal use but possibly as a result of another deficiency and requires repair or some rehabilitation. Levels of service may be negatively affected. Maintenance needs and costs will increase.	40% to 75%
Poor	**At Risk** – The asset is approaching its estimated service life. It likely can no longer provide its intended design function, thus levels of service begin to be negatively affected. Major repairs or rehabilitation will be required, with the possibility for full replacement.	15% to 40%
Very Poor	**Unfit for Sustained Service** – The asset demonstrates evidence of acute deterioration. Service levels will be negatively affected and there may be a risk to health and safety. Major rehabilitation or replacement required.	0% to 15%

[1]: Indication only. The rate of deterioration differs across assets, and is typically not linear. Condition ratings and % eul remaining will be different for different asset types.

3.4 Assessing the criticality and risk of our assets

The risk associated with any particular asset is determined by assessing the likelihood of a failure in conjunction with the consequence of that failure:

Risk = Likelihood of Failure × Consequence of Failure

High risk levels are therefore associated with a high likelihood of failure, a severe consequence of that failure, or a combination of both.

For the purposes of this asset management plan, the likelihood of failure of an asset is derived from the asset's condition, age, and severity of distress. In order to assess the potential consequence of an asset failure, each asset is assigned a *Criticality Index*. The Criticality Index defines the relative importance of the asset, and is related to the potential scale of level of service loss. The value of the criticality index is defined by a variety of attribute-based and community impact factors.

Attribute-based factors are qualitative and quantitative factors that define an asset, such as the diameter of pipes, or the Minimum Maintenance Standards and surface types of roads. Attribute-based factors allow us to prioritize assets based on a specific quality or physical attribute.

Community impact factors are defined by location and socio-economic factors, for example, whether a road is a primary route for schools, or whether a waterline directly supplies a hospital. Community impact factors allow us to prioritize assets that have the greatest effect on the community. For this asset management plan, the following community impact factors were used:

- Provision of service to areas with high levels of community use
- Provision of service to schools and healthcare facilities
- Provision of service to high-density residential buildings or areas
- Provision of service to areas with high levels of business or tourism

3.5 Operations, maintenance, rehabilitation, and replacement activities

Throughout this Asset Management Plan, reference is made to lifecycle activities. These generally comprise maintenance, rehabilitation, and replacement activities.

Table 3-3: Definition of operations, maintenance, rehabilitation, and replacement

Activity	Definition	Typical example	Typically funded from
Operations	Activities designed to ensure that assets are used to their full potential.	Programming of swimming courses at the community pool; active use of fleet equipment with staff reporting asset deficiencies.	Operations budget
Maintenance	Actions necessary for retaining an asset as near as practicable to original condition. Maintenance slows down deterioration and delays need for rehabilitation/renewal. Maintenance activities can be further broken down into preventative, routine, and reactive maintenance.	Crack sealing of roads; flushing and cleaning of sewer mains.	Operations budget
Rehabilitation	Rehabilitation activities attempt to return assets to near-original condition. Rehabilitation can be minor or major, depending on the nature of the work completed.	Removal and replacement of asphalt layers on a road; Relining of water mains.	Operations or Capital budget depending on size and complexity
Replacement for renewal	Where assets can no longer meet the required level of service because the asset can no longer be rehabilitated in a cost-effective way, they be replaced entirely.	Full depth reconstruction of a road; full replacement of water lines.	Capital budget

Activity	Definition	Typical example	Typically funded from
Replacement for expansion	Where levels of service have increased such that assets can no longer meet their requirements (even at new condition), they would need to be expanded or replaced with higher capability assets.	Upsizing of sewer mains to account for increased flow requirements.	Capital budget

It is clear that different assets will be managed differently. Similar assets may also be managed differently as a result of difference in risk ratings, operating conditions or where the asset lies in its expected lifecycle. When an asset is still relatively new or freshly renewed, the activities consist of monitoring and routine maintenance. As the asset ages, routine maintenance may no longer ensure the provision of the intended service, and the treatments may migrate towards more significant rehabilitation or even replacement.

Similarly, critical assets, or those with a higher risk rating, may require increased levels of inspection and performance monitoring. In some cases, critical assets may be replaced before it deteriorates to a point where failure could be imminent and the consequences significant.

The overall operations and maintenance goal is to maintain the current levels of service and mitigate risk while minimizing cost. While the Town has varying levels of proactive and reactive maintenance built into its operations, this is an area identified for improvement. Asset management principles must be incorporated into the various activities, processes, and procedures related to operations and maintenance. Improved reporting and data management is a critical area requiring development.

3.6 Levels of Service

Levels of Service metrics are used to measure how well assets fulfill their intended functions. Levels of Service can be divided into two main categories – technical and community. Technical metrics are described through regulatory and legislated requirements, as well as industry best practices (for example wastewater effluent regulations). Community metrics are associated with the outcomes of service delivery and are developed through engagement with Council and other stakeholders (for example, the safety and rideability of roads).

Staff plan to incorporate the development, review, and update of community Levels of Services into the Town's strategic planning cycle for early 2023.

Ontario Regulation 588/17 includes several technical and community metrics that all municipalities are required to report against. These are included in the relevant sections.

3.7 Developing long-term projections of lifecycle activities and costs

Ontario Regulation 588/17 requires a description and associated costs of the lifecycle activities (i.e. maintenance, rehabilitation, and replacement) that would need to be undertaken for each asset group to maintain the current levels of service for a ten-year period.

This document contains lifecycle activity and cost projections over a twenty-year period. Many of the Town's assets were installed in the 1950's and are approaching the end of their estimated useful lives (see section 3.2 for more detail on estimated useful life). This means that many of the assets may need to be replaced in the short- and medium-term. A twenty-year planning horizon provides a better representation of potential resources required.

The twenty-year projections are the result of an optimization analysis performed using the Town's asset management software (*Decision Optimization Technology* produced by Infrastructure Solutions Inc.). The analysis algorithm performs an iterative process to identify the type and timing of lifecycle activities required for each asset to minimize the overall risk rating of the system while maintaining the overall level of service.

Each asset's risk rating is taken into consideration, which includes the asset's criticality and condition. The optimization algorithm will prioritize higher risk assets (high criticality and/or worse condition) over assets with a lower risk rating. The appropriate maintenance, rehabilitation or replacement activity is selected based on the asset's condition. The degradation of assets over time is accounted for using degradation models based on industry standards.

No maximum yearly budget is set, resulting in a conservative estimate of the projected costs. In some cases, however, this assumption may result in all assets in *very poor* condition being replaced in the first year. Where this has occurred, the projections have been adjusted to allow for these assets to be replaced in the first ten years, with work and costs averaged over that period.

It is important to note that the lifecycle activity projections are based on the condition ratings of each asset, and do not imply that the required work can ***only*** be done in the indicated year. Effective planning by Town staff is required to distribute the forecasted work over many years, allowing more even resource requirements.

Further, the actual selection of the maintenance / rehabilitation / replacement activity is determined through the analysis of on-the-ground conditions, treatment options, and expert advice from service providers. Coordinated projects which combine activities across asset groups (for example, aligning reconstruction of roads with replacement of water and sewer mains) may result in lower overall costs.

3.8 Asset management decision-making

Decision-making is currently based on a range of approaches which incorporate available asset condition, performance data, and expert knowledge from Town staff and outside service providers. The Town's current planning practice is to perform an annual review of the high-level five-year capital plan during the development of the annual budget. Typically, the high-level plan identifies major capital work required over the five-year period, and individual capital projects for the following year.

This process will be strengthened through the development of more detailed five-year plans for each asset group which will include maintenance (typically funded in the operations budget), rehabilitation, and replacement work (typically funded in the capital budget). The detailed five-year plans will be reviewed twice annually to identify and plan specific asset requirements. The combination of risk-based and cost-benefit analyses will ensure that Town staff are able to base their decision-making on a more consistent approach which allows better understanding of how investment decisions are linked to service outcomes.

3.9 Managing our asset data

Asset-related information forms a foundational part of the Town's ongoing asset management strategies.

Historically, the Town has relied on paper-based asset data, including physical maps and hand-written record keeping. Significant work was done between 2015 and 2017 to capture the Town's asset inventory data digitally. A number of databases and a Geographical Information System (GIS) were created to capture asset attribute and location information, and an extensive physical verification program was performed. This work was extended and updated in the preparation of this Asset Management Plan, and work to consolidate databases and sources is ongoing. Building the capability to digitally capture maintenance, repair, rehabilitation, and replacement work for individual assets is a significant next improvement program.

The Town has a number of systems which are used to track, monitor, and analyze asset-related information, including spreadsheets, database tools, and some recently-introduced specialized expert systems. Figure 3-1 shows the main functions of each system, and how these interact.

The core asset management systems include:

- **QGIS:** a GIS system and database which contains all asset attributes (materials, sizes, types, etc.) and locations. The database structure was built in-house by Town staff.
- **DOT:** a database and asset management planning tool which allows complex lifecycle optimization analysis
- **Streetlogix Work Order Management:** a management tool which assigns and track tasks and activities to individual public works and facilities staff members. Staff are currently implementing Streetlogix Citizen Engagement which allows residents to log issues and service requests online.

Staff also perform manual analyses using spreadsheet systems, and some data is maintained in the Town's financial management system (currently being migrated from Asyst to Vadim iCity).

Where possible, the Town will work to integrate systems to allow improved data flow. The Town is currently exploring the feasibility of using an alternative GIS platform which would allow direct integration into DOT, and consulting with the service providers on options to automatically align some Streetlogix and DOT data.

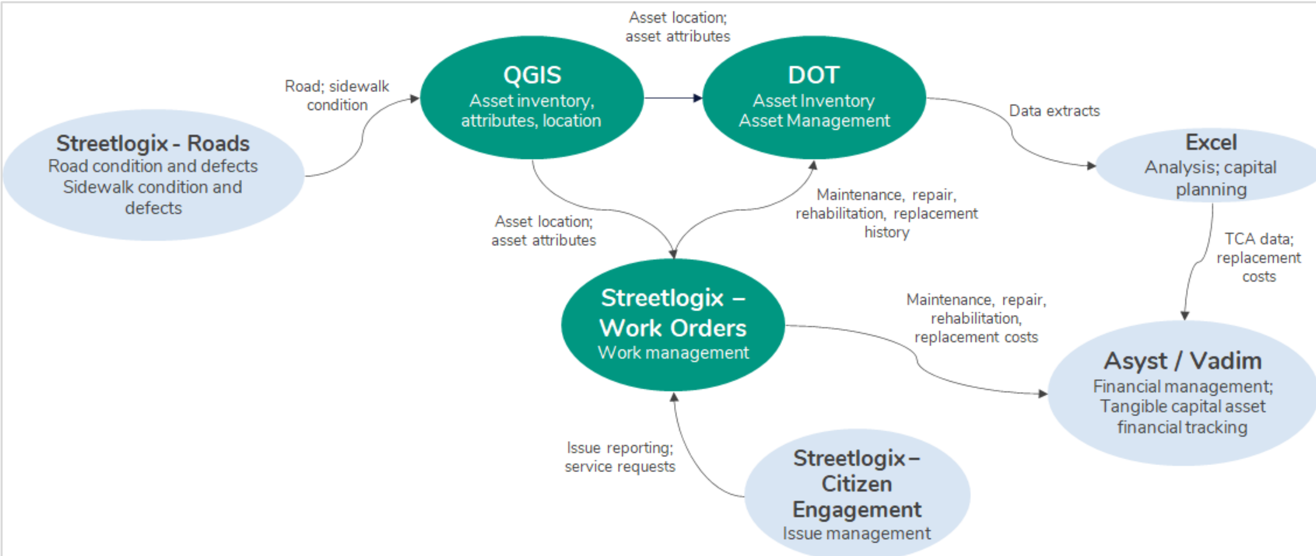

Figure 3-1: Asset management-related IT systems

3.10 Relationship with Strategic and other plans and policies

The Town has an array of strategic, long-term planning documents that complement each other and work together to direct Deep River's future, including:

- The Strategic Plan, which outlines Council's priorities
- The Official Plan, which outlines projected growth and land development
- The Financial Master Plan, which describes financial constraints and strategies for long term financial sustainability
- The Recreation and Culture Plan (in development), which guides recreational and cultural service delivery
- The Water and Wastewater Utility Rates Plan, which outlines how the Town will continue to provide financially sustainable water and wastewater services
- Etc.

The principles outlined in the Town's Strategic Asset Management Policy 2019 were used in the development of this Asset Management Plan.

The Asset Management Plan is a dynamic document that will be reviewed and updated as Council and staff identify changing needs or requirements. This will generally occur during the regular strategic plan updates and review cycles.

3.11 Ongoing development of asset management capabilities

The practice of asset management extends beyond the development of asset management plans, and should affect most levels of decision-making in a municipality. The embedding of AM concepts and practices will take time, and Town staff continue to develop their AM capabilities and capacity.

In order to measure development progress, Town staff have adopted the Federation of Canadian Municipalities' *Asset Management Readiness Scale* as a tool to assess the Town's maturity in asset management. The scale evaluates existing practices in five key competencies against development milestones from initial investigation, to adoption, and eventually to full integration of AM practices into daily routines. The Asset Management Readiness Scale helps municipalities identify the areas which require further work and development.

The Town of Deep River is currently at Readiness level of 2 out of 5.

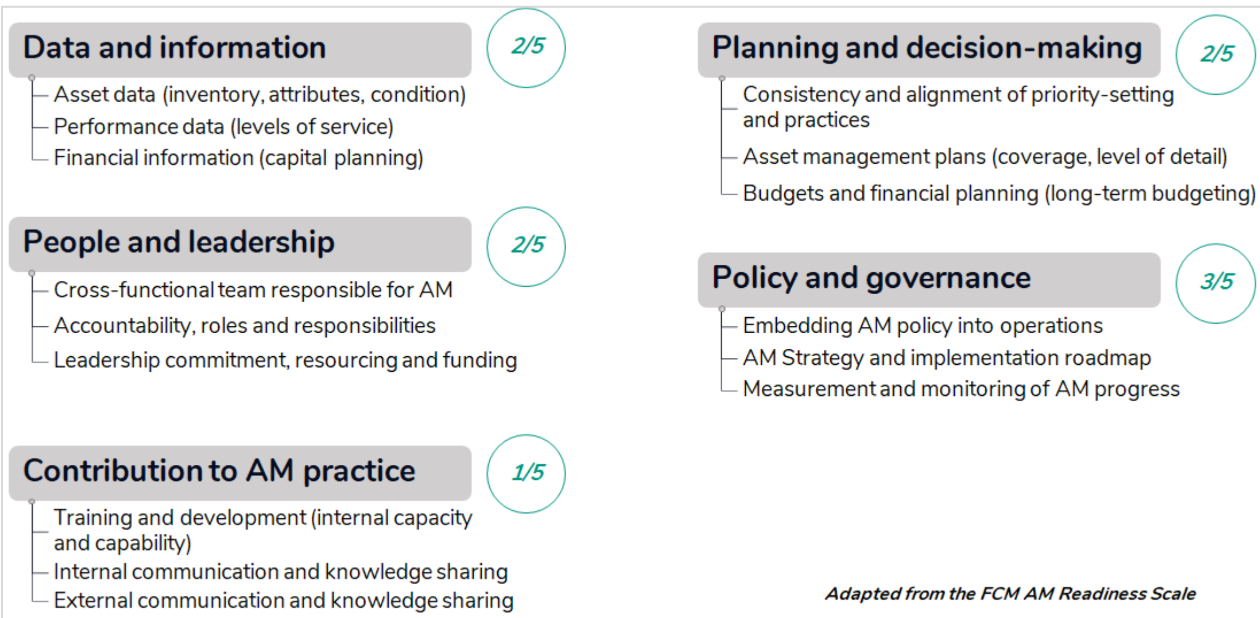

Figure 3-2: Deep River asset management readiness level

Staff have identified the following improvements as specific focus areas for the next year:

- The development of more detailed service-level asset management plans, which include detailed five-year plans,
- Improved financial information and more detailed capital planning at the asset group level,
- Improved data collection, specifically regarding maintenance, repair, rehabilitation, and replacement work,
- Improved communication and knowledge sharing of asset management principles and practices internally and externally.

4 Overall State of Assets

4.1 Asset Valuation and Condition

Based on a total estimated replacement value of $211 million dollars, the Town manages approximately $50,500 per person of physical public assets, or just over $100,000 per household. Table 4-1 shows the replacement value of the various asset groups and their estimated condition.

Table 4-1: Summary of asset valuation and condition

Asset class	Estimated Current Replacement Value	Average condition of network	% of network in				
			Very poor condition	Poor condition	Fair condition	Good condition	Very good condition
Transportation	$46,293,884	Fair	1%	26%	44%	20%	8%
Water	$68,705,200	Fair	0%	47%	5%	37%	12%
Wastewater	$47,301,000	Poor-Fair	34%	6%	43%	1%	16%
Storm	$14,445,500	Poor	60%	0%	6%	0%	34%
Facilities	$30,525,100	Fair-Good	0%	5%	47%	27%	21%
Fleet	$3,910,000	Fair	0%	22%	44%	34%	0%
Overall	**$211,180,684**	Fair	**12%**	**23%**	**29%**	**21%**	**14%**

It must be noted that a significant portion of the Town's infrastructure, and especially its buried infrastructure, was installed during the 1950s when the Town was built. While there has been extensive expansion, rehabilitation, and replacement work since then, a significant portion of the Town's assets is nearing the end of its life. As described in section 3.3 above, assets nearing the end of their *eul* are rated in *poor* and *very poor* condition. Many of these assets, however, continue to be fit for purpose.

4.2 Twenty-year projection of lifecycle activities and costs

The following sections contain twenty-year projections of the activities and costs required t maintain levels of service. The approach used to generate these is generally described in section 3.7, and with some additional detail in the asset-group sections below.

Table 4-2 contains the summary of projected total costs per asset group.

Table 4-2: Summary of projected annual costs over twenty years

Asset class	Average annual cost for twenty-year period	Average annual cost for five-year period between			
		2022 - 2026	2027 - 2031	2032 - 2036	2037 - 2041
Transportation	$1,321,259	$845,396	$2,731,128	$1,271,844	$436,670
Water	$1,620,931	$1,632,531	$1,629,331	$1,614,131	$1,607,731
Wastewater	$1,433,288	$1,433,288	$1,433,288	$1,433,288	$1,433,288
Storm	$434,459	$434,459	$434,459	$434,459	$434,459
Overall	**$4,809,938**	**$4,345,674**	**$6,228,207**	**$4,753,722**	**$3,912,149**

5 Transportation (Roads & Sidewalks)

5.1 Inventory

The Town of Deep River includes almost 40km of roads, 6km of sidewalks, and a significant number of streetlights and traffic signs within its municipal boundaries. The primary connection to neighbouring municipalities is via Highway 17, and there are two County-owned and operated roads (County Roads 72 and 73).

The Transportation system comprises the following asset types:

Table 5-1: Transportation asset types

Asset type	Description
Local roads	Local roads carry lower levels of traffic and are used primarily for residential access. Most of the paved roads in Deep River are local roads.
Collector roads	These roads provide connectivity through the urban areas of town and typically carry higher levels of traffic than local roads. Collector roads are defined in the Town's Zoning bylaw. They include Hillcrest Avenue, McElligott Drive, Avon Road, and some sections of Banting Drive, River Road, Alder Crescent, and Pine Point Road.
Gravel roads	The Town has several gravel roads, including McAnulty Road, Rocky Point Lane, and some sections of Double Dip and Pine Point Roads.
Surface treated roads	Balmer's Bay Road was upgraded from a gravel road by applying a surface treatment to the existing gravel base. Note that the structural design of a surface treated road is substantially different to that of a paved road.
Sidewalks	These include all paved and concrete sidewalks which are maintained year-round. Recreational trails (typically gravel or limestone surfaces) are not included in this plan.
Streetlights	The majority of streetlights in the Town are owned and operated by the Town. However, there are a number which are still owned by Hydro One. Note that the electrical supply and wiring network is owned by Hydro One.
Traffic Signs	These include regulatory, warning and restriction signs. Street name and wayfinding signs are not included in this category, and have not been included in this plan.

Table 5-2 summarises the assets included in this system, their estimated current replacement value, and average condition. Only those assets owned and operated by the Town are included. Note that the Town does not own any bridges or large culverts as defined by Ontario Regulation 588/17.

Maps of location, condition, and criticality of the various asset types can be found in Appendix A.

The total estimated Current Replacement Value of all assets in the Transportation category is $46,293,884.

Overall, the Transportation assets are in an average *Fair* condition, with 72% of assets (by CRV) in better than *Fair* condition. Note , however, that the remaining 27% in poor and very poor condition includes some high criticality collector roads and sidewalks. These will require the most immediate attention, and will be targets for specific interventions to improve condition, and therefore service delivery.

Table 5-2: Inventory, value, and condition of Transportation Assets

Asset Type[1]	# of Units		Estimated Current Replacement Value	Average condition of network	% of inventory in:				
					Very poor condition	Poor condition	Fair condition	Good condition	Very good condition
Roads – Local	*25,400*	*m*	$36,366,342	Fair	1%	30%	44%	18%	8%
Roads – Collector	*5,900*	*m*	$8,521,422	Good	0%	15%	47%	29%	10%
Sidewalks	*5,900*	*m*	$835,388	Fair	7%	23%	48%	13%	8%
Streetlights	*597*	*ea.*	$263,999	Not Assessed	0%	0%	0%	0%	0%
Roads - Surface Treated	*3,500*	*m*	$255,686	Good	0%	0%	0%	100%	0%
Roads - Gravel	*4,000*	*m*	$26,387	Fair	18%	0%	58%	25%	0%
Signs	*274*	*ea.*	$24,660	Good	0%	0%	23%	77%	0%
Overall			**$46,293,884**	Fair	**1%**	**26%**	**44%**	**20%**	**8%**

[1]: Excluding any non-Town roads (see section 5.2 for more detail)

5.2 Inventory not included in the Asset Management Plan

5.2.1 Non-town roads

The following roads fall within Deep River's municipal boundaries but are not owned or operated by the Town:

- Highway 17, between Legere Drive to Pinewood Place, which is owned and operated by the provincial Ministry of Transport.
- County Road 73 (Deep River Road from Highway 17 to Ridge Road) which is owned and operated by the County of Renfrew.
- County Road 72 (Ridge Road from Deep River Road to Highway 17) which is owned and operated by the County of Renfrew.
- The road network within the AECL / CNL campus.
- A portion of Pine Point Road northwest of Thomas Street, which is privately owned.

5.2.2 Back-lanes

The back-lanes in the central part of Deep River are a distinct feature of the Town. These are typically narrow gravel lanes, and see very light, local traffic. There are approximately 6.1km of back-lanes in Deep River.

While these are owned, operated, and maintained by the Town, they have not been included in this Asset Management Plan, as they do not fall into the definition of a roadway included in Ontario Regulation 588/17.

The Town performs regular maintenance on the back-lanes, including dust control and surface grading. Major reconstruction of back-lanes will only be performed where required by other infrastructure work (for example, the replacement of water or sewer mains).

5.2.3 Active transportation infrastructure

In addition to the sidewalks included in this plan, the Town has an extensive network of trails on both public and privately owned lands which connect various areas of Town. The trails are well used by pedestrians and cyclists, both recreationally and for commuting. The trails are typically surfaced with gravel or crushed limestone, and are not maintained during the winter.

Public trails are maintained regularly as part of normal Public Works operations, and upgrades or rehabilitation work is typically done on an ad hoc / special project basis.

5.3 O.Reg 588/17 Levels of Service

Ontario Regulation 588/167 under the Infrastructure for Jobs and Prosperity Act, 2015 lists several community and technical levels of service metrics. These are described in the tables below.

Table 5-3: Extract from O.Reg 588/17 Table 4: Community LOS for Roads

Service Attribute	Community levels of service (qualitative descriptions)	Town of Deep River response
Scope	Description, which may include maps of the road network in the municipality and its level of connectivity.	The Town's road network covers approximately 40km of roads, which provides connectivity to all of the Town's settled areas. Connectivity with neighbouring municipalities is primarily through Provincial Highway 17. Appendix A contains maps showing the Town's road network and its condition.
Quality	Description or images that illustrate the different levels of road class pavement condition.	The Town of Deep River follows the standards and best practices described by the Ontario Good Roads Association. The definitions provided by OGRA for determining pavement condition are followed by the third-party consultants engaged by the Town when performing pavement inspections.

Table 5-4: Extract from O.Reg 588/17 Table 4: Technical LOS for Roads

Service Attribute	Technical levels of service (technical metrics)	Town of Deep River response
Scope	Number of lane-kilometres[1] of each of arterial roads, collector roads and local roads as a proportion of square kilometres of land area of the municipality[2].	**Arterial Roads:** 4.6 lane-km / 50.1km^2 = 0.032% of total land area *Note that these are County Roads 72 and 73, and are not owned and operated by the Town of Deep River.*
		Collector Roads: 11.8 lane-km / 50.1km^2 = 0.082% of total land area
		Local Roads: 65.8 lane-km / 50.1km^2 = 0.46% of total land area *Note that these include paved, surface treated and gravel roads.*
Quality	For paved roads in the municipality, the average pavement condition index value.	The **average PCI for paved roads is 61 = FAIR** (as assessed in Q3 2021)
	The average surface condition for unpaved roads in the municipality (e.g., excellent, good, fair or poor).	The **average surface condition for gravel roads is FAIR** (as assessed in Q1 2022)

[1]: "Lane-kilometre" means a kilometre-long segment of roadway that is a single lane in width. The average lane-width in Deep River is 3.5m, and all roads are two lanes wide.

[2]: The Town of Deep River has a reported land area of 50.1km^2.

5.4 Assessing asset condition

The Town of Deep River has various methods for assessing the condition of the assets in this group:

- Roads and sidewalks are inspected every four to five years against OGRA standards using advanced 2D and 3D mapping camera technology (performed by Streetlogix). This assessment method produces the Pavement Condition Index and Sidewalk Condition Index for each segment of road and sidewalk, as well as GIS maps of the type and location of road deficiencies.
- Roads and sidewalks are also inspected on a monthly basis, as required by provincial minimum maintenance standards.
- Streetlights are inspected infrequently, and generally only when repair work is required. Further development and formalization of routine inspection program is required.
- Historically, signs were inspected by a third party on an annual basis, but this has not occurred in the last three years (delayed due to the COVID-19 pandemic restrictions).

5.5 Maintenance, rehabilitation, and replacement activities

Table 5-5 describes the type of treatments that are generally available in Deep River for maintenance, rehabilitation, and replacement of transportation-related assets.

Table 5-5: Typical Lifecycle Activities for Roads

Asset Type	Type of treatment	Treatment	Typical condition range for use[1]
Roads	Routine Maintenance	**Condition Assessme**nt	All – conducted every 3-5 years
	Preventative Maintenance	**Crack Sealing** (filling cracks in asphalt with hot rubberized crack sealer)	Good – Very good
	Minor Rehabilitation	**Slurry Sealing** (coating roads with a thin layer of asphalt, water and aggregate to improve longevity and fill minor damage)	Fair – Good
		Patching (pot hole repair and road segment repair/repaving using cold or hot mix asphalt)	Fair – Good
		Mill and Pave (removal of a layer of asphalt which is heated, mixed with additives, and re-laid)	Fair – Good
		Chip Seal[2] (spraying a coat of hot liquid asphalt mix to the existing surface of a prepared base and then distributing washed chip aggregate)	Fair – Very Good
	Major Rehabilitation	**Full Depth Reclamation** (pulverizing the surface layers of the pavement and a portion of underlying granular up to 300mm in depth)	Poor – Fair
	Replacement / Reconstruction	**Full Depth Reconstruction** (rebuilding entire pavement structure and base)	Very poor – Poor
Sidewalks	Reconstruction	**Asphalt Reconstruction** (removal and relaying of sidewalk base and surface)	Very poor – Poor
		Concrete Reconstruction (removal and relaying of sidewalk base and surface)	Very poor – Poor
Streetlights	Replacement	**Full Replacement**[3]	Very Poor - Poor
Signs	Replacement	**Full Replacement**[3]	Very Poor - Poor

[1]: Treatments are dependent on a variety of other factors, not just condition.

[2]: Only used on surface treated roads.

[3]: Only those parts of the fixture in poor to very poor condition will be replaced if the rest is in good condition

5.6 Twenty-year projection of lifecycle activities and costs

Ontario Regulation 588/17 requires a description of the lifecycle activities that would need to be undertaken to maintain the current levels of service for a 10-year period, as well as the associated costs.

Figure 5-1 to Figure 5-3 below show a breakdown of the lifecycle activities that would need to be undertaken to maintain the current levels of service for a twenty-year period, as well as the associated costs.

This set of projected activities is the result of an optimization analysis performed using the Town's asset management software which attempts to minimize the overall risk rating of the system while maintaining its current level of service. Each asset's risk rating is taken into consideration, which includes the asset's criticality and condition. The optimization algorithm will prioritize higher risk assets (high criticality and/or worse condition) over assets with a lower risk rating.

No maximum yearly budget was set, resulting in a conservative estimate of the projected costs. In some cases, however, this assumption may result in all assets in *very poor* condition being replaced in the same year.

As noted in section 3.7 above, these projections should be regarded as guides only, and will be used as an input into the detailed rolling five-year plans for each asset group. The five-year average costs, however, can be viewed as representative of the investment required.

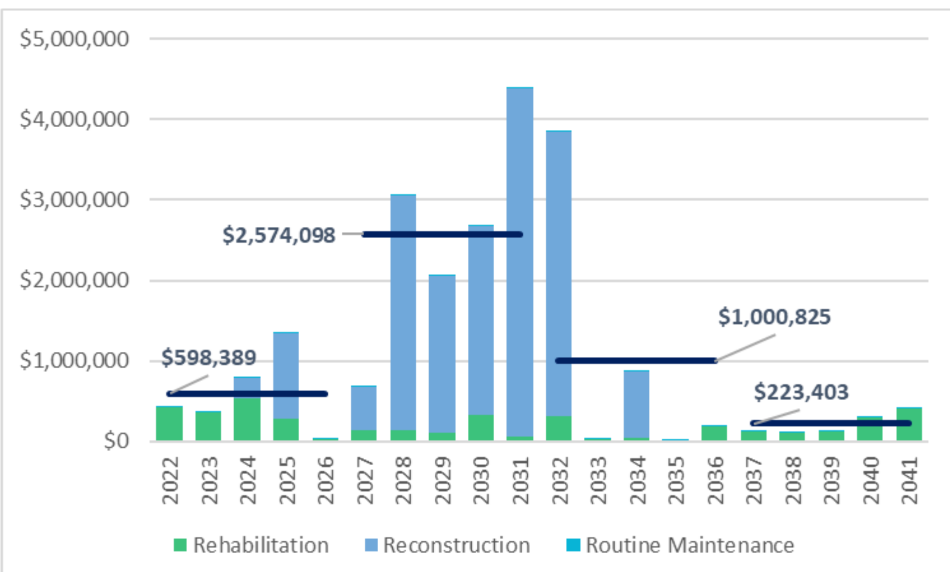

Figure 5-1: Twenty-year projection of lifecycle activities and costs for Roads

The projections for roads show that it will be necessary to rehabilitate and reconstruct a significant portion of the road network in the next ten to fifteen years. Note that there is a consistent requirement for rehabilitation work, which can be used to extend the life of roads, delaying costly reconstruction. Crack sealing and other routine maintenance activities must also be used, especially on newly rehabilitated roads to prevent deficiencies from occurring.

An average of $1,100,000 per year is required over the twenty-year period to accommodate the rehabilitation and reconstruction work required.

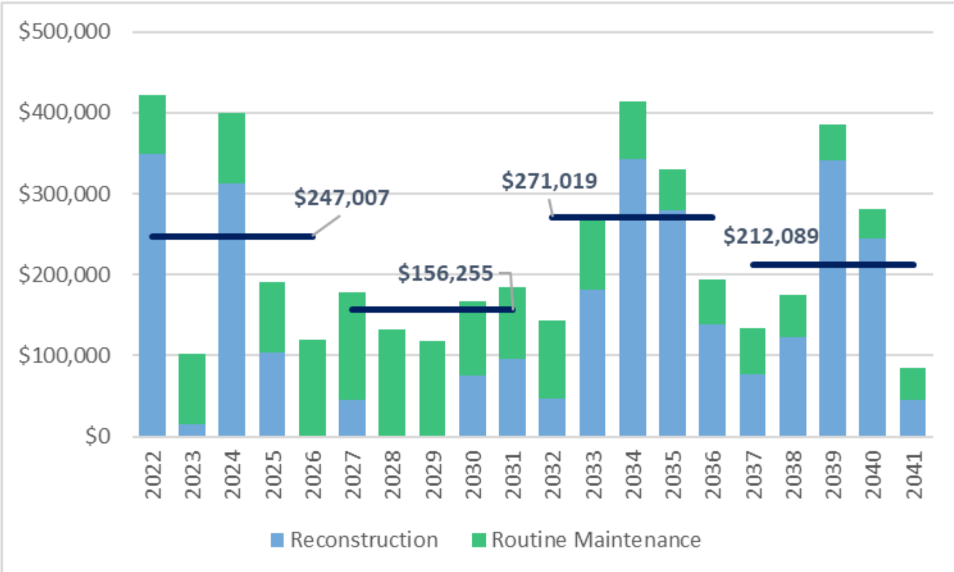

Figure 5-2: Twenty-year projection of lifecycle activities and costs for Sidewalks

Similar to the Town's roads, many of the sidewalks require major rehabilitation or reconstruction. Note that almost one-third of the Town's sidewalks are constructed of concrete, which is significantly more expensive to maintain and replace than asphalt paved sidewalks. Further, the Town does not have in-house capability to effectively patch and repair concrete sidewalks (experience, training, equipment). Town staff will work towards replacing concrete sidewalks where possible to reduce the long-term costs.

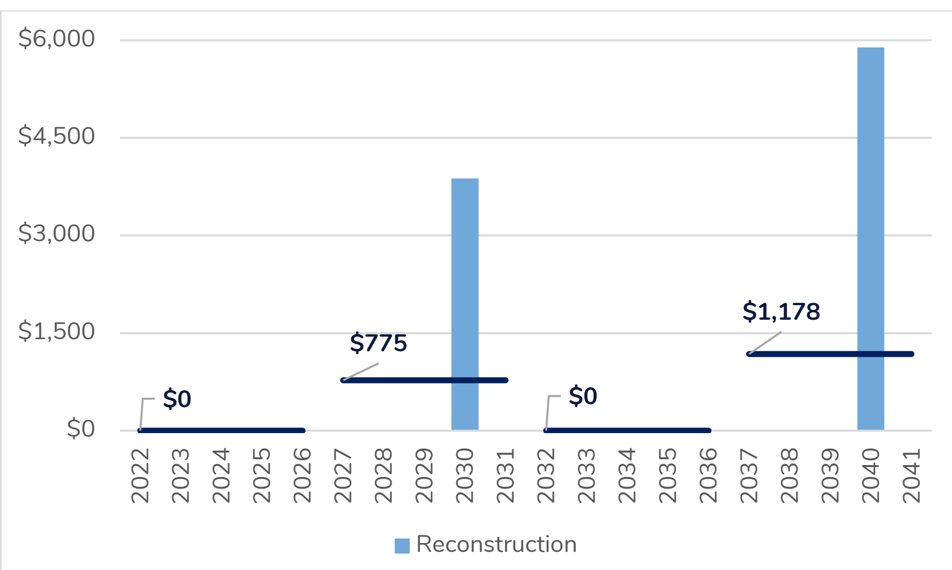

Figure 5-3: Twenty-year projection of lifecycle activities and costs for Signs

Most traffic signs will become due for replacement in the next ten years. As mentioned above, regular inspection of traffic signs will be initiated again, and therefore will identify specific assets that may require replacement.

Note that since the condition of the streetlights has not been evaluated recently, no projections were developed. In general, town staff replace streetlight fixtures (including poles, arms, and bulbs) on an as needed basis. It was noted in the Town's 2016 Asset Management Plan that all streetlights were upgraded to LED fixtures in 2015, and were therefore considered to be good condition.

5.7 Risks and Recommendations

The primary risks associated with transportation assets are related to "spikes" in costly reconstruction work required on assets in poor and very poor condition. These will require distribution of work and costs across other years to smooth planned projects and resource demands.

While the analyses contained in this plan will be updated as asset management practices mature, the development of more detailed five-year plans and sustainable financial strategies for each asset group is critical. This work has started, and is a focus for Town staff for the next year.

6 Water Assets

6.1 Inventory

The Town of Deep River provides drinking water to the majority of the households within the urban area, as well as to the AECL / CNL campus. Water-related assets include almost 47km of waterlines, 241 hydrants, 287 valves, a treatment plant, tower and booster station.

The Water system comprises the following asset types:

Table 6-1: Water-related asset types

Asset type	Description
Waterlines	The Town owns an extensive network of waterlines of varying sizes. The majority of the waterlines were installed in the 1950s and are made of ductile iron. Waterlines installed after 1990 are generally made of PVC.
Fire hydrants	The Town has a large number of hydrants within the urban boundaries of varying flow capacities, makes and ages.
Valves	Valves of various sizes are situated at various points along the water mains. These allow portions of the network to be isolated for maintenance, repairs, etc.
Water treatment plant	The Town's drinking water treatment plant was built in 2007, and has a treatment capacity of 12,500 m^3 per day.
Water tower	All drinking water passes through the water tower, which provides flow capacity for peak demand periods and fire suppression.
Booster pump station	The Town owns and operates a booster pump station situated near the corner of Banting and Balmer's Bay Road. This station provides additional pressure and chlorination for water supplied to the AECL / CNL campus.

Table 6-2 summarises the assets included in this system, their estimated current replacement value, and average condition. Only those assets owned and operated by the Town are included.

Maps of location, condition, and criticality of the various asset types can be found in Appendix A.

The total estimated Current Replacement Value of all assets in the Water category is $68,705,200.

Overall, the Water assets are in an average *Fair* condition, with 54% of assets (by CRV) in better than *Fair* condition. Note however, that the remaining 47% in poor and very poor condition includes the majority of the Town's waterlines. While this condition is based entirely on the age of the waterlines, and these remain in serviceable condition, the likelihood of failure is increased.

Table 6-2: Inventory, value and condition of Water Assets

Asset Type	# of Units		Network Replacement Cost	Average Condition of Network	% of network in Very poor condition	Poor condition	Fair condition	Good condition	Very good condition
Waterlines	*46,700*	*m*	$39,695,000	Poor	0%	79%	0%	5%	16%
Treatment Plant	*1*	*ea.*	$23,000,000	Fair-Good	0%	0%	0%	100%	0%
Water Tower	*1*	*ea.*	$3,000,000	Fair	0%	0%	100%	0%	0%
Booster Station	*1*	*ea.*	$1,300,000	Very Good	0%	0%	0%	0%	100%
Hydrants	*241*	*ea.*	$964,000	Fair	6%	23%	13%	32%	26%
Valves	*287*	*ea.*	$746,200	Poor	0%	84%	4%	6%	6%
Overall	**0**	**0**	**$68,705,200**	Fair	**0%**	**47%**	**5%**	**37%**	**12%**

6.2 Inventory not included in the Asset Management Plan

The following water-related assets fall within Deep River's municipal boundaries but are not owned or operated by the Town:

- Reservoirs and additional pump stations in the AECL / CNL campus. While these are operated by OCWA on behalf of the Town, the assets are owned by AECL.

6.3 O.Reg 588/17 Levels of Service

Ontario Regulation 588/167 under the Infrastructure for Jobs and Prosperity Act, 2015 lists several community and technical levels of service metrics. These are described in the tables below.

Table 6-3: Extract from O.Reg 588/17 Table 1: Community LOS for Water

Service Attribute	Community levels of service (qualitative descriptions)	Town of Deep River
Scope	Description, which may include maps, of the user groups or municipality areas connected to the municipal water system.	The majority of households with the Town are connected to water service, expect for the following: • All houses along Balmers Bay Road • All properties on the south side of Highway 17 from Legere Drive to Deep River Road • Some houses on Pine Point Road and Pine Point Close Appendix A contains maps showing the Town's water network and its condition.
	Description, which may include maps, of the user groups or municipality areas with fire flow.	Appendix A contains maps showing the location of fire hydrants.

Service Attribute	Community levels of service (qualitative descriptions)	Town of Deep River
Reliability	Description of boil-water advisories and service interruptions.	None.

Table 6-4: Extract from O.Reg 588/17 Table 1: Technical LOS for Water

Service Attribute	Technical levels of service (technical metrics)	Town of Deep River
Scope	Percentage of properties connected to the municipal water system.	Approximately 90% of properties in Deep River are connected to municipal water.
	Percentage of properties where fire flow is available.	Greater than 90% of properties in Deep River have fire flow available.
Reliability	The number of connection days per year where a boil water advisory notice is in place compared to the total number of properties connected to the municipal water system.	None
	The number of connection days per year due to water main breaks compared to the total number of properties connected to the municipal water system.	Detailed records of *connection-days lost* are not kept. Estimates can be made as follows: Average number of water breaks per year = 5 Average duration = 1 day Average number of affected properties = 30 Connection-days lost / year = 150 Number of connected households = 1950 % connection-days lost = 150 / (1950x365) = 0.02%

6.4 Assessing asset condition

The condition of all water system assets is estimated using the *expected useful life* approach described in section 3.3 above. In general, *euls* of 80 to 100 years are used for ductile iron waterlines, hydrants, and valves. In line with industry practice, an *eul* of 80 years has been assumed for PVC waterlines.

Note that while internal inspections of waterlines are possible using camera, electromagnetic and other technology, this is costly, and requires the watermains to be taken offline causing disruptions. Staff monitor the location and frequency of water main breaks to gain further insight into potential areas requiring replacement. In general, staff coordinate water and sewer main replacements with major road reconstruction projects where possible.

6.5 Maintenance, rehabilitation, and replacement activities

Table 6-5 describes the type of treatments that are generally available in Deep River for maintenance, rehabilitation and replacement of water-related assets.

Table 6-5: Typical Lifecycle Activities for Water

Asset Type	Type of treatment	Treatment	Typical condition range for use[1]
Water lines	Routine Maintenance	**Flushing** (regular flushing of hydrants and waterlines allow for sediment removal and performance monitoring)	All – conducted annually
	Major Rehabilitation	**Relining** (cleaning the interior of existing waterlines and installing a liner coating)	Various
	Replacement / Reconstruction	**Full Depth Reconstruction** (replacing waterlines with new pipes)	Very poor – Poor
Valves	Routine Maintenance	**Exercising** (the working and testing of valve operation)	All – conducted annually
	Replacement	**Full replacement**[2] (replacing of valves with new units)	Very poor – Poor
Hydrants	Routine Maintenance	**Flushing** (regular flushing of hydrants and waterlines allow for sediment removal and performance monitoring)	All – conducted annually
	Replacement	**Full replacement**[2] (replacing of hydrants with new units)	Very poor – Poor

[1]: Treatments are dependent on a variety of other factors, not just condition.

[2]: Only those parts of the unit in poor to very poor condition will be replaced if the rest is in good condition

6.6 Twenty-year projection of lifecycle activities and costs

Ontario Regulation 588/17 requires a description of the lifecycle activities that would need to be undertaken to maintain the current levels of service for a 10-year period, as well as the associated costs.

Figure 6-1 to Figure 6-3 below show a breakdown of the lifecycle activities that would need to be undertaken to maintain the current levels of service for a twenty-year period, as well as the associated costs.

This set of projected activities is the result of an optimization analysis performed using the Town's asset management software which attempts to minimize the overall risk rating of the system while maintaining its current level of service. Each asset's risk rating is taken into consideration, which includes the asset's criticality and condition. The optimization algorithm will prioritize higher risk assets (high criticality and/or worse condition) over assets with a lower risk rating. ***Note that for all assets in this group, condition ratings are based on age.***

No maximum yearly budget was set, resulting in a conservative estimate of the projected costs. This assumption results in all assets in very poor condition being replaced in the same year. Therefore, as noted in section 3.6 above, these projections should be regarded as guides only, and will be used as an input into the detailed rolling five-year plans for each asset group. The twenty-year average costs, however, can be viewed as representative of the investment required over that time period.\

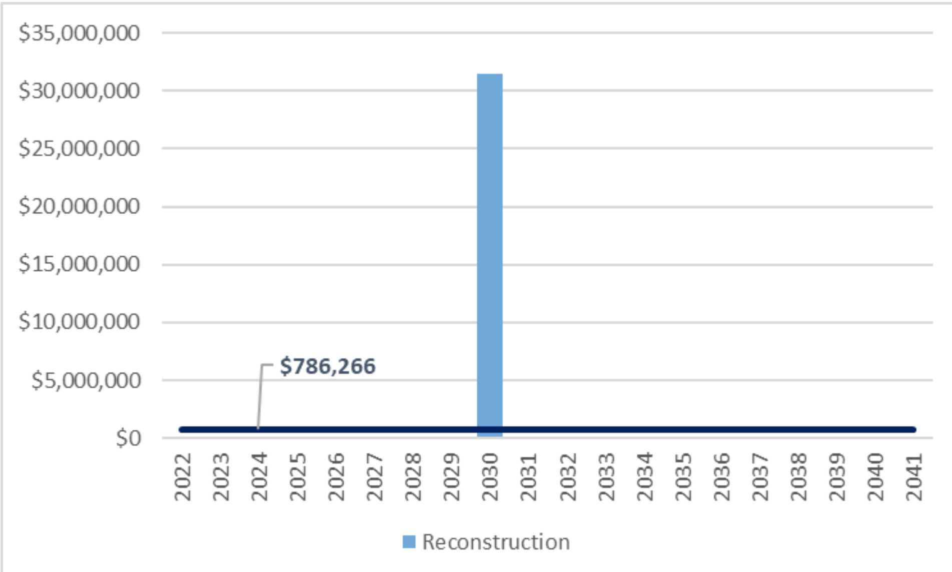

Figure 6-1: Twenty-year projection of lifecycle activities and costs for Water Mains

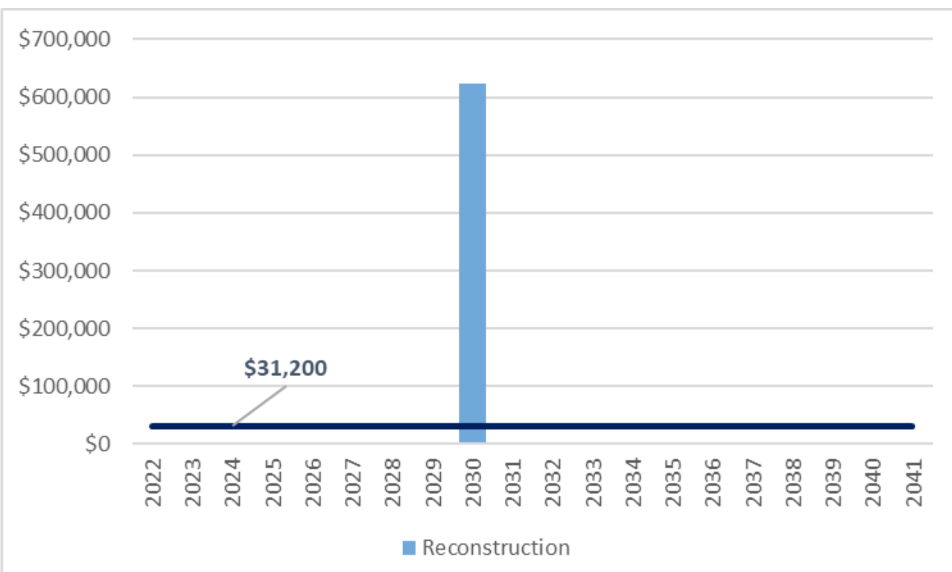

Figure 6-2: Twenty-year projection of lifecycle activities and costs for Valves

The projections for waterlines and associated valves show that it will be necessary to rehabilitate and reconstruct a significant portion of the network in the next ten to fifteen years. Where possible, waterlines and valves will be replaced alongside sewer mains and major road reconstruction projects.

The Town recently conducted a pilot project testing the feasibility of using relining methods to rehabilitate water mains without the need for trenching. In the relatively short time since the project, this section of pipe has performed well. During this project, it was noted that the ductile iron pipe was in good condition, despite it being almost 60 years old. Staff believe that, where possible and appropriate, relining is a feasible, economic alternative to full replacement.

An average of $800,000 per year is required over the twenty-year period to accommodate the projected rehabilitation and reconstruction work.

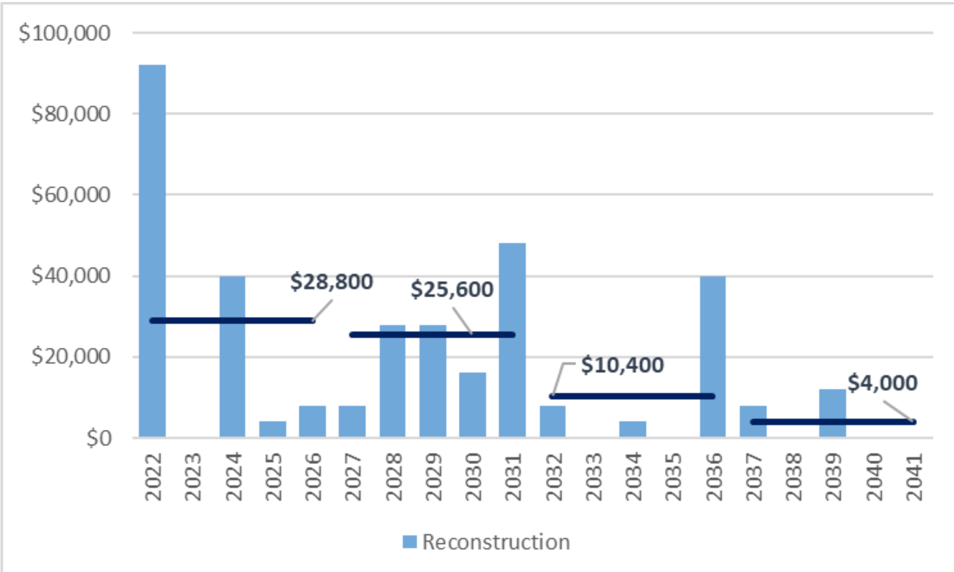

Figure 6-3: Twenty-year projection of lifecycle activities and costs for Hydrants

Fire hydrants have been regularly replaced over time as failures occur, and there is a reasonable spread of ages. Staff did note, however, that the Town has three hydrants manufactured in 1941 which are still fully operational. Once again, the projections call for a significant amount of replacement work to be done in the next ten to fifteen years. Hydrants are regularly flushed (twice annually) and cursory inspections are done. Staff intend to perform more detailed flowrate measurements on all hydrants over the next five years, and will perform in-depth inspections during this work.

6.7 Risks and Recommendations

Much of the waterline network is reaching the end of its expected useful life, representing the primary risk. However, the Town experiences a relatively low number of water main breaks, and the frequency of brown water incidents has been reduced through treatment optimization methods.

As with the other asset groups described in the document, reconstruction work will be coordinated and distributed over a number of years. The development of detailed five-year plans and sustainable financial strategies for each asset group is a focus for Town staff for the next year.

7 Wastewater Assets

7.1 Inventory

The Town of Deep River includes almost 30 km of sanitary sewers and associated manholes. The Wastewater system comprises the following asset types:

Table 7-1: Wastewater-related asset types

Asset type	Description
Sewer mains	The Town owns an extensive network of sanitary sewers of varying sizes. The majority of the sewers were installed in the 1950s and are made of vitrified clay pipe. Sewers installed after 1990 are generally made of PVC. All sanitary sewers are gravity fed.
Sanitary manholes	The Town has 470 maintenance manholes at various points along the sanitary sewers. They are generally made of concrete.
Wastewater treatment plant	The Town's wastewater treatment plant was built in 2002, and has a treatment capacity of 2727 m^3 per day. It is currently near full capacity, and the Town has initiated several projects to address this.

Table 7-2 summarises the assets included in this system, their estimated current replacement value, and average condition. Only those assets owned and operated by the Town are included.

Maps of location, condition, and criticality of the various asset types can be found in Appendix A.

The total estimated Current Replacement Value of all assets in the wastewater category is $47,301,000.

Overall, the wastewater assets are in an average *Poor to Fair* condition, with 60% of assets (by CRV) in better than *Fair* condition. Note however, that the remaining 40% very poor condition includes the majority of the Town's sanitary sewers. Condition data for sanitary sewers are a combination of physical inspection data and age/*eul* estimates. Where physical inspections have occurred, sewers are generally in poor condition, with some showing significant structural issues. The number of sewer main blockages that are reported, however, remains manageable.

Table 7-2: Inventory, value and condition of Wastewater Assets

Asset Type	# of Units		Network Replacement Cost	Average Condition of Network	% of Network in				
					Very poor condition	Poor condition	Fair condition	Good condition	Very good condition
Sanitary Mains	*28,300*	*m*	$24,621,000	Poor-Fair	66%	3%	1%	2%	28%
WWTP	*1*	*ea.*	$16,100,000	Fair	0%	0%	100%	0%	0%
Maintenance Holes	*470*	*ea.*	$6,580,000	Fair	0%	30%	60%	0%	10%
Overall			**$47,301,000**	Poor-Fair	**34%**	**6%**	**43%**	**1%**	**16%**

7.2 Inventory not included in the asset management plan

All wastewater asset inventory is included in this asset management plan.

7.3 O.Reg 588/17 Levels of Service

Ontario Regulation 588/167 under the Infrastructure for Jobs and Prosperity Act, 2015 lists several community and technical levels of service metrics. These are described in the tables below.

Table 7-3: Extract from O.Reg 588/17 Table 2: Community LOS for Wastewater

Service Attribute	Community levels of service (qualitative descriptions)	Town of Deep River
Scope	Description, which may include maps, of the user groups or municipality areas connected to the municipal wastewater system.	The majority of households with the Town are connected to wastewater service, expect for the following: • All houses along Balmers Bay Road • All properties on the south side of Highway 17 from Legere Drive to Deep River Road • Some houses on Pine Point Road, Pine Point Close, McAnulty Road, and Rocky Point Lane Appendix A contains maps showing the Town's wastewater network and its condition.
Reliability	Description of how combined sewers in the municipal wastewater system are designed with overflow structures in place which allow overflow during storm events to prevent backups into homes.	The municipality does not own or operate any combined sewers (carrying both storm- and sanitary wastewater)
	Description of the frequency and volume of overflows in combined sewers in the municipal wastewater system that occur in habitable areas or beaches.	The municipality does not own or operate any combined sewers (carrying both storm- and sanitary wastewater)
	Description of how stormwater can get into sanitary sewers in the municipal wastewater system, causing sewage to overflow into streets or backup into homes.	Stormwater may enter the sanitary system primarily through inflow (e,g, through badly-fitted manhole covers). Infiltration of groundwater may occur at pipe joints, cracks, etc. Deep River staff have identified inflow and infiltration as critical issues, and have initiated a number of projects to address these.
	Description of how sanitary sewers in the municipal wastewater system are designed to be resilient to avoid events described in paragraph 3.	Any new sanitary sewers are designed and installed according to industry standards (e.g. Ontario Sewage Design Guidelines).

	Description of the effluent discharged from sewage treatment plants in the municipal wastewater system.	All effluent discharged from the Town's wastewater plant meets the required provincial standards. No overflow events (i.e. direct discharge of raw or semi-treated effluent) have occurred since the treatment plant was commissioned in 2007.

Table 7-4: Extract from O.Reg 588/17 Table 2: Technical LOS for Wastewater

Service Attribute	Technical levels of service (technical metrics)	Town of Deep River
Scope	Percentage of properties connected to the municipal wastewater system	Approximately 90% of properties in Deep River are connected to municipal water.
Reliability	The number of events per year where combined sewer flow in the municipal wastewater system exceeds system capacity compared to the total number of properties connected to the municipal wastewater system.	The municipality does not own or operate any combined sewers (carrying both storm- and sanitary wastewater)
	The number of connection days per year due to wastewater backups compared to the total number of properties connected to the municipal wastewater system.	There have been no reported sewer main blockages in the last two years. Most sewer blockages occur in service lines.
	The number of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system.	None.

7.4 Assessing asset condition

The Town of Deep River has various methods for assessing the condition of the assets in this group:

- Sewer mains are typically inspected using closed circuit cameras. Condition ratings are allocated based on the NASSCO PACP® method, based on the number and severity of defects found in each pipe segment.
- Sanitary manholes are visually inspected on an annual basis by OCWA. Major structural defects are identified and noted. Inspection records are not digitally captured or stored, making trend analysis difficult.

Approximately a third of the sanitary sewer network has been inspected via camera in the last six years. Staff's intention is to inspect the whole network on a rolling five-year basis. For this report, sewer segments which have not been inspected has been allocated condition ratings using the estimated useful life approach described in section 3.3 above. In general, *euls* of 80 to 100 years are used for sewers. All manhole condition ratings are based on the *eul*-approach, assuming lifespans of 50 to 75 years.

7.5 Maintenance, rehabilitation, and replacement activities

Table 7-5 describes the type of treatments that are generally available in Deep River for maintenance, rehabilitation and replacement of wastewater-related assets.

Table 7-5: Typical Lifecycle Activities for Wastewater

Asset Type	Type of treatment	Treatment	Typical condition range for use[1]
Sanitary sewers	Routine Maintenance	**Flushing** (regular flushing of sewers allow for sediment removal; currently only done at the same time as camera inspection work)	All
	Major Rehabilitation	**Relining** (cleaning the interior of existing sewers and installing a cured-in-place-pipe liner coating)	Various
	Replacement / Reconstruction	**Full Depth Reconstruction** (replacing sewers with new pipes)	Very poor – Poor
Manholes	Routine Maintenance	**Flushing** (regular flushing of manholes allows for sediment removal; currently only done as the same time as sewer flushing and inspection)	All
	Replacement	**Full replacement**[2] (replacing of manholes structures with new structures; typically only done in combination with sewer main and/or road reconstruction)	Very poor – Poor

[1]: Treatments are dependent on a variety of other factors, not just condition.

[2]: Only those parts of the unit in poor to very poor condition will be replaced if the rest is in good condition

Town staff are developing a revised program of routine maintenance for the sanitary system. This will include more frequent flushing of sewers, more routine inspections, and better inspection of manholes.

7.6 Twenty-year projection of lifecycle activities and costs

Ontario Regulation 588/17 requires a description of the lifecycle activities that would need to be undertaken to maintain the current levels of service for a 10-year period, as well as the associated costs.

Figure 7-1 and Figure 7-2 below show a breakdown of the lifecycle activities that would need to be undertaken to maintain the current levels of service for a twenty-year period, as well as the associated costs.

This set of projected activities is the result of an optimization analysis performed using the Town's asset management software which attempts to minimize the overall risk rating of the system while maintaining its current level of service. Each asset's risk rating is taken into consideration, which includes the asset's criticality and condition. The optimization algorithm will prioritize higher risk assets (high criticality and/or worse condition) over assets with a lower risk rating. ***Note that for most assets in this group, condition ratings are based on age.***

No maximum yearly budget was set, resulting in a conservative estimate of the projected costs. This assumption results in all assets in very poor condition being replaced in the same year. Therefore, as noted in section 3.6 above, these projections should be regarded as guides only, and will be used as an input into the detailed rolling five-year plans for each asset group. The twenty-year average costs, however, can be viewed as representative of the investment required over that time period.

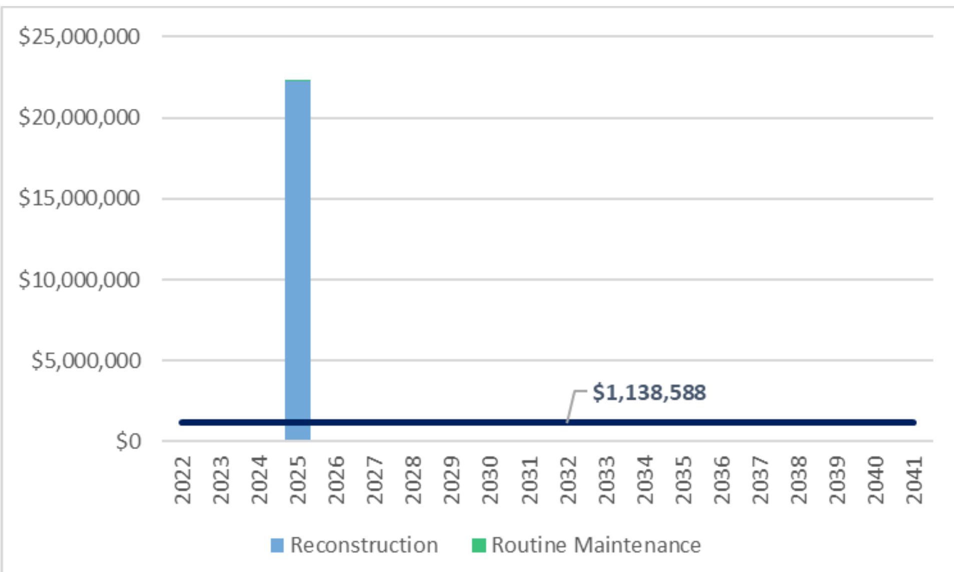

Figure 7-1: Twenty-year projection of lifecycle activities and costs for sanitary sewers

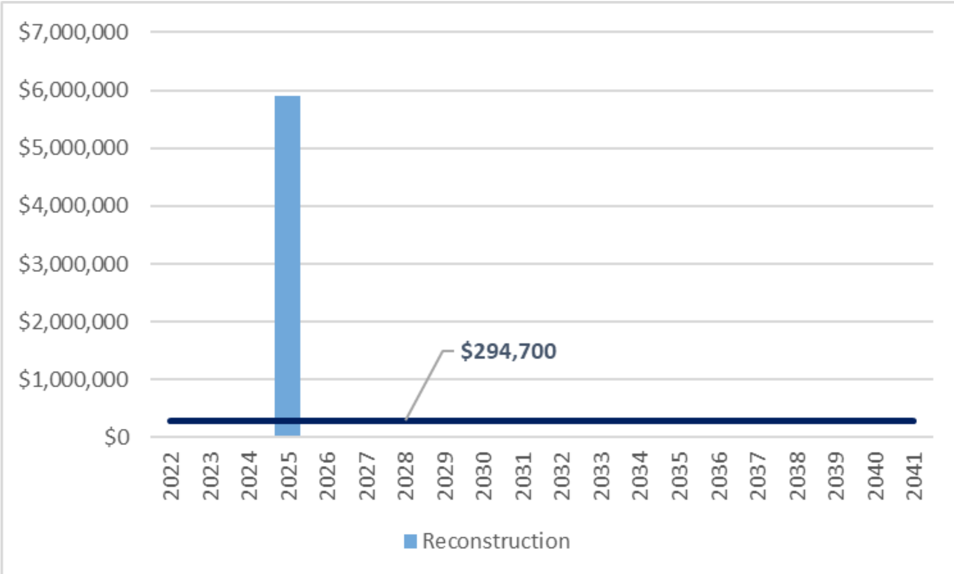

Figure 7-2: Twenty-year projection of lifecycle activities and costs for manholes

The projections for sanitary sewers and associated manholes show that it will be necessary to rehabilitate and reconstruct a significant portion of the network in the next ten to fifteen years. Where possible, sewers will be replaced alongside water infrastructure and major road reconstruction projects.

Relining of sanitary sewers is a commonly used rehabilitation method, where pipe structural integrity remains largely intact. This technique is significantly cheaper that a full-cut replacement. Town staff will consider the use of relining methods where possible.

An average of $1,400,000 per year is required over the twenty-year period to accommodate the projected rehabilitation and reconstruction work.

7.7 Risks and Recommendations

The primary risk for wastewater assets is the aged sanitary sewer network. Camera inspections have shown that pipe conditions are poor to fair, and the risk of failure is relatively high. Recent third-party studies of the wastewater system show that the network has extremely high levels of inflow and/r infiltration. Further, the wastewater treatment plant is running at near capacity.

Staff have initiated a number of projects to address these issues, in particular the identification of areas and specific pipe segments with high infiltration. These segments will be prioritized for reconstruction / relining work.

In general, staff will introduce more frequent camera inspections of sewers and more detailed inspections of manholes. Better data management practices are critical to identifying trends.

As with the other asset groups described in the document, reconstruction work will be coordinated and distributed over a number of years. The development of detailed five-year plans and sustainable financial strategies for each asset group is a focus for Town staff for the next year.

8 Stormwater Management Assets

8.1 Inventory

The Town of Deep River has a gravity-driven storm water management network that includes approximately 14km of storm mains, 186 maintenance holes, and 251 catch basins.

The Stormwater system comprises the following asset types:

Table 8-1:Stormwater-related asset types

Asset type	Description
Storm mains	The Town owns an extensive network of storm mains varying in size. Many of the storm mains were installed in the 1950s and are made of a variety of materials. Storm mains installed after 1990 are generally made of PVC, however, larger mains are constructed out of concrete.
Catch Basins	The Town has a large number of catch basins located along the storm network with varying dimensions, grate sizes, materials, and ages. These allow for the drainage of storm runoff
Maintenance Holes	Maintenance holes of varying depths and ages are located between segments of the storm mains as means of access to the mains.

Table 8-2 summarises the assets included in this system, their estimated current replacement value, and average condition. Only those assets owned and operated by the Town are included.

Maps of location, condition, and criticality of the various asset types can be found in Appendix A.

The total estimated Current Replacement Value of all assets in the Stormwater category is $14,445,500.

Overall, the Stormwater assets are in *Poor* condition, with 40% of assets (by CRV) in *Fair* or better condition. Note, however, that the 60% in very poor condition includes many the Town's storm mains and maintenance holes. While this condition is based entirely on the age of the assets, and these remain in serviceable condition, the likelihood of failure is increased.

Table 8-2: Inventory, value, and condition of Stormwater Assets

Asset Type	# of Units		Network Replacement Cost	Average Condition of Network	% of network in				
					Very poor condition	Poor condition	Fair condition	Good condition	Very good condition
Storm Mains	*14,300*	*m*	$10,582,000	Fair	58%	0%	0%	0%	42%
Maintenance Holes	*186*	*ea.*	$2,232,000	Poor	77%	0%	0%	0%	23%
Catch Basins	*251*	*ea.*	$1,631,500	Fair	51%	0%	49%	0%	0%
Overall			**$14,445,500**	Poor	**60%**	**0%**	**6%**	**0%**	**34%**

8.2 Inventory not included in the Asset Management Plan

All stormwater assets located within municipal boundaries are owned and operated by the Town.

8.3 O.Reg 588/17 Levels of Service

Ontario Regulation 588/167 under the Infrastructure for Jobs and Prosperity Act, 2015 lists several community and technical levels of service metrics. These are described in the tables below.

Table 8-3: Extract from O.Reg 588/17 Table 3: Community LOS for Stormwater

Service Attribute	Community levels of service (qualitative descriptions)	Town of Deep River
Scope	Description, which may include maps, of the user groups or areas of the municipality protected from flooding, including the extent of the protection provided by the municipal stormwater management system.	Appendix A contains maps showing the Town's stormwater network and its condition.

Table 8-4: Extract from O.Reg 588/17 Table 3: Technical LOS for Stormwater

Service Attribute	Technical levels of service (technical metrics)	Town of Deep River
Scope	Percentage of properties in municipality resilient to a 100-year storm.	Insufficient data. In 2009, the Town conducted a flood-resilience assessment, which showed that the stormwater management system was resilient to a 2-year flood, but only partially resilient to a 5-year flood.
	Percentage of the municipal stormwater management system resilient to a 5-year storm	Insufficient data. In 2009, the Town conducted a flood-resilience assessment, which showed that the stormwater management system was resilient to a 2-year flood, but only partially resilient to a 5-year flood.

8.4 Assessing asset condition

The condition of all stormwater network assets is estimated using the *expected useful life* approach described in Section 3.3 above. In general, an *eul* of 80 years is used for storm mains. In line with industry practice, *euls* of 65 years have been assumed for catch basins and maintenance holes.

Some internal inspections of storm mains have been conducted using CCTV, however, this is costly and no regular program is currently in force. Staff regularly monitor the condition of catch basins and maintenance holes to gain further insight into potential areas requiring replacement. In general, staff coordinate the replacement of storm network assets with major road reconstruction projects where possible.

8.5 Maintenance, rehabilitation, and replacement activities

Table 8-5 describes the type of treatments that are generally available in Deep River for maintenance and replacement of stormwater-related assets.

Table 8-5: Typical Lifecycle Activities for Stormwater

Asset Type	Type of treatment	Treatment	Typical condition range for use[1]
Storm mains	Routine Maintenance	**Flushing** (regular flushing of storm mains allow for sediment removal and performance monitoring)	All – as needed
	Replacement / Reconstruction	**Full Depth Reconstruction** (replacing storm mains with new pipes)	Very poor – Poor
Catch Basins	Routine Maintenance	**Inspection**	All – conducted regularly
	Replacement	**Full replacement**[2] (replacing catch basins with new units)	Very poor – Poor
Maintenance Holes	Routine Maintenance	**Inspection**	All – conducted regularly
	Replacement	**Full replacement**[2] (replacing maintenance holes with new units)	Very poor – Poor

[1]: Treatments are dependent on a variety of other factors, not just condition.

[2]: Only those parts of the unit in poor to very poor condition will be replaced if the rest is in good condition

8.6 Twenty-year projection of lifecycle activities and costs

Ontario Regulation 588/17 requires a description of the lifecycle activities that would need to be undertaken to maintain the current levels of service for a 10-year period, as well as the associated costs.

Figure 8-1 to Figure 8-3 below show a breakdown of the lifecycle activities that would need to be undertaken to maintain the current levels of service for a twenty-year period, as well as the associated costs.

This set of projected activities is the result of an optimization analysis performed using the Town's asset management software which attempts to minimize the overall risk rating of the system while maintaining its current level of service. Each asset's risk rating is taken into consideration, which includes the asset's criticality and condition. The optimization algorithm will prioritize higher risk assets (high criticality and/or worse condition) over assets with a lower risk rating. ***Note that for all assets in this group, condition ratings are based on age.***

No maximum yearly budget was set, resulting in a conservative estimate of the projected costs. This assumption results in all assets in very poor condition being replaced in the same year. Therefore, as noted in Section 3.6 above, these projections should be regarded as guides only, and will be used as an input into the detailed rolling five-year plans for each asset group. The twenty-year average costs, however, can be viewed as representative of the investment required over that period.

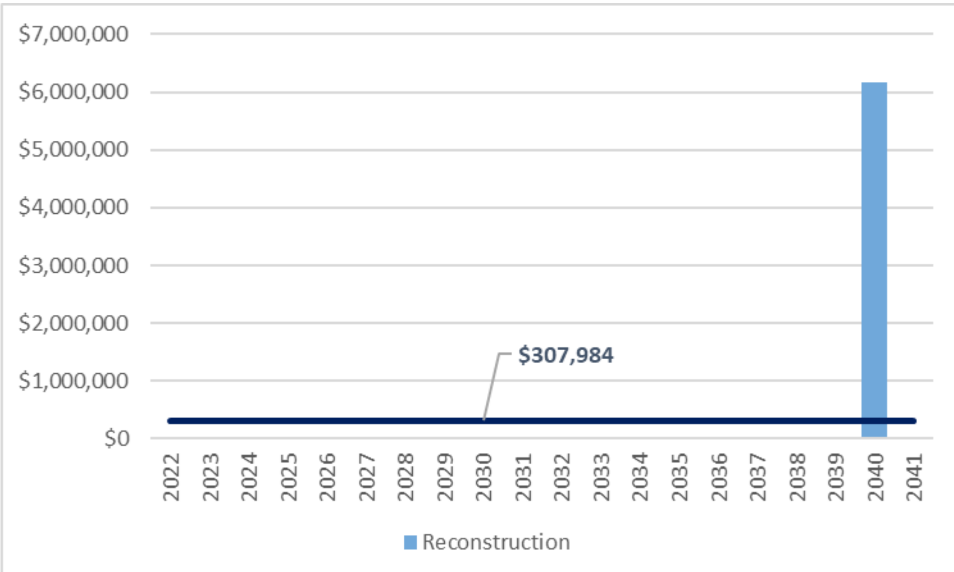

Figure 8-1: Twenty-year projection of lifecycle activities and costs for Storm Mains

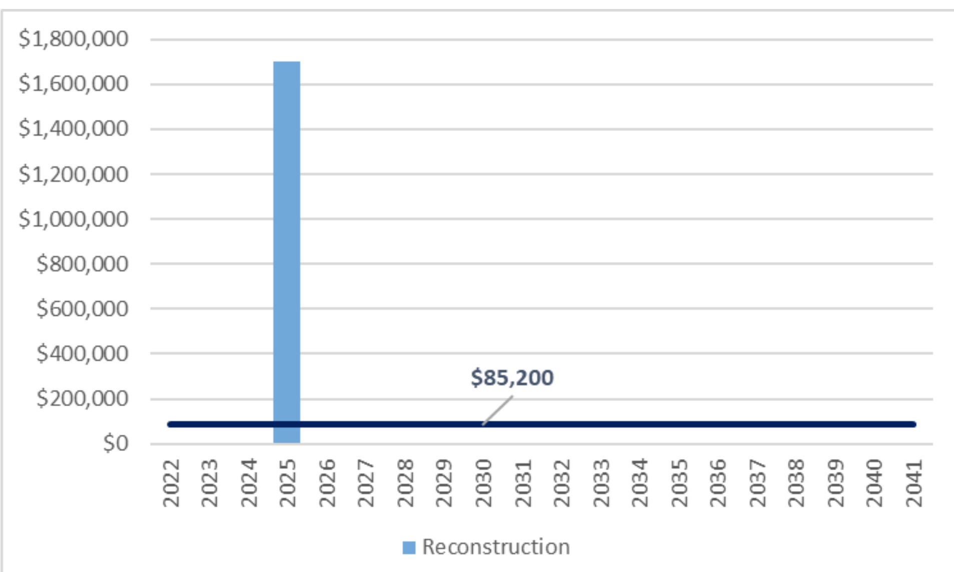

Figure 8-2: Twenty-year projection of lifecycle activities and costs for Storm maintenance holes

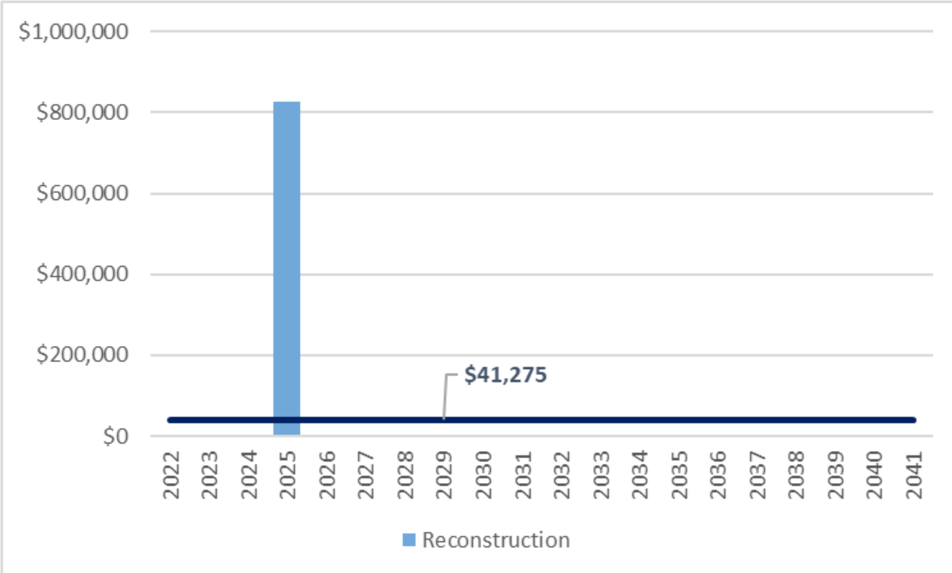

Figure 8-3: Twenty-year projection of lifecycle activities and costs for Storm catch basins

The projections for Stormwater assets show that it will be necessary to rehabilitate and reconstruct a significant portion of the network in the next ten to twenty years. Where possible, these assets will be replaced alongside water mains, sewer mains, and major road reconstruction projects.

An average of $435,000 per year is required over the twenty-year period to accommodate the projected rehabilitation and reconstruction work.

8.7 Risks and Recommendations

Much of the stormwater network is reaching the end of its expected useful life, representing the primary risk. However, the Town currently experiences a relatively low number of high precipitation days with the stormwater management network preventing flooding when they do occur.

As with the other asset groups described in the document, reconstruction work will be coordinated and distributed over several years. The development of detailed five-year plans and sustainable financial strategies for each asset group is a focus for Town staff for the next year.

Appendix A: Core Asset System Maps

Transportation - Roads

Figure A - 1: Road Asset Map

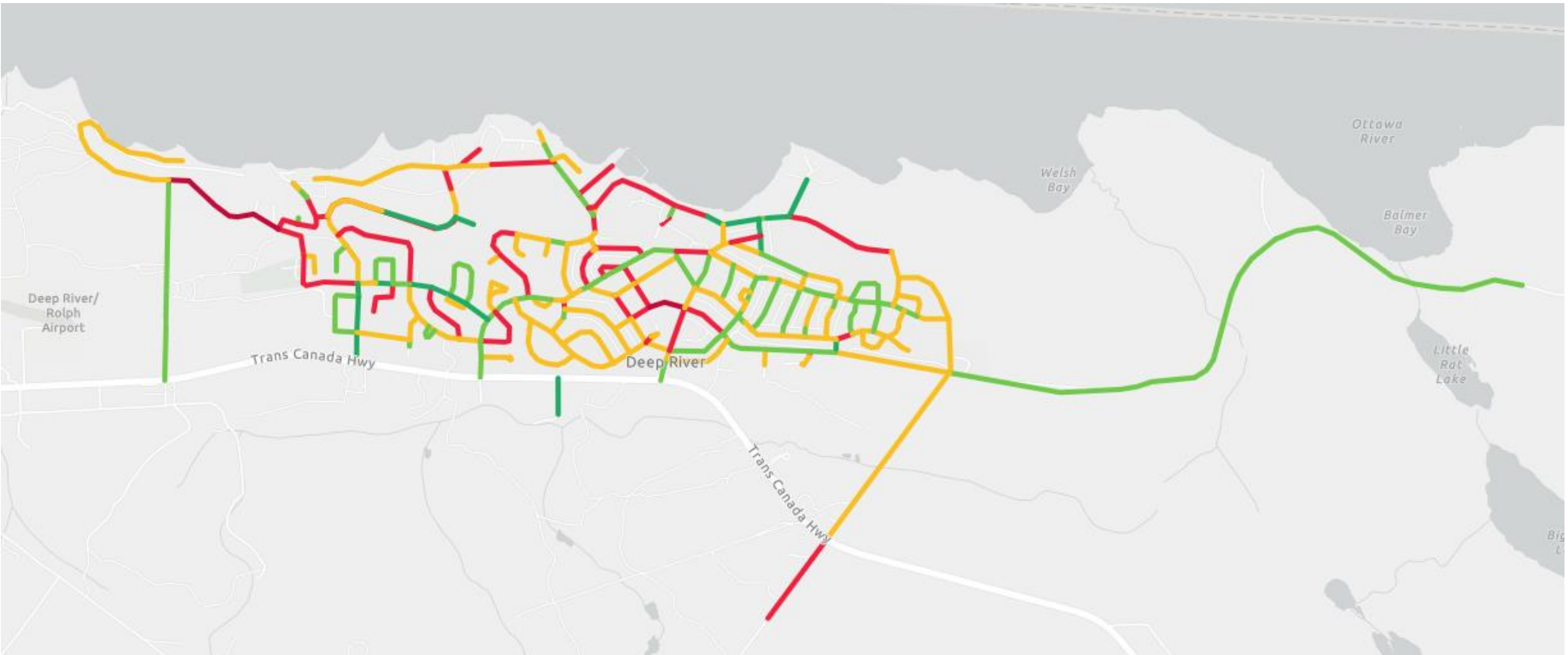

Figure A - 2: Road Condition Map

Note: condition data is based on actual inspection data.

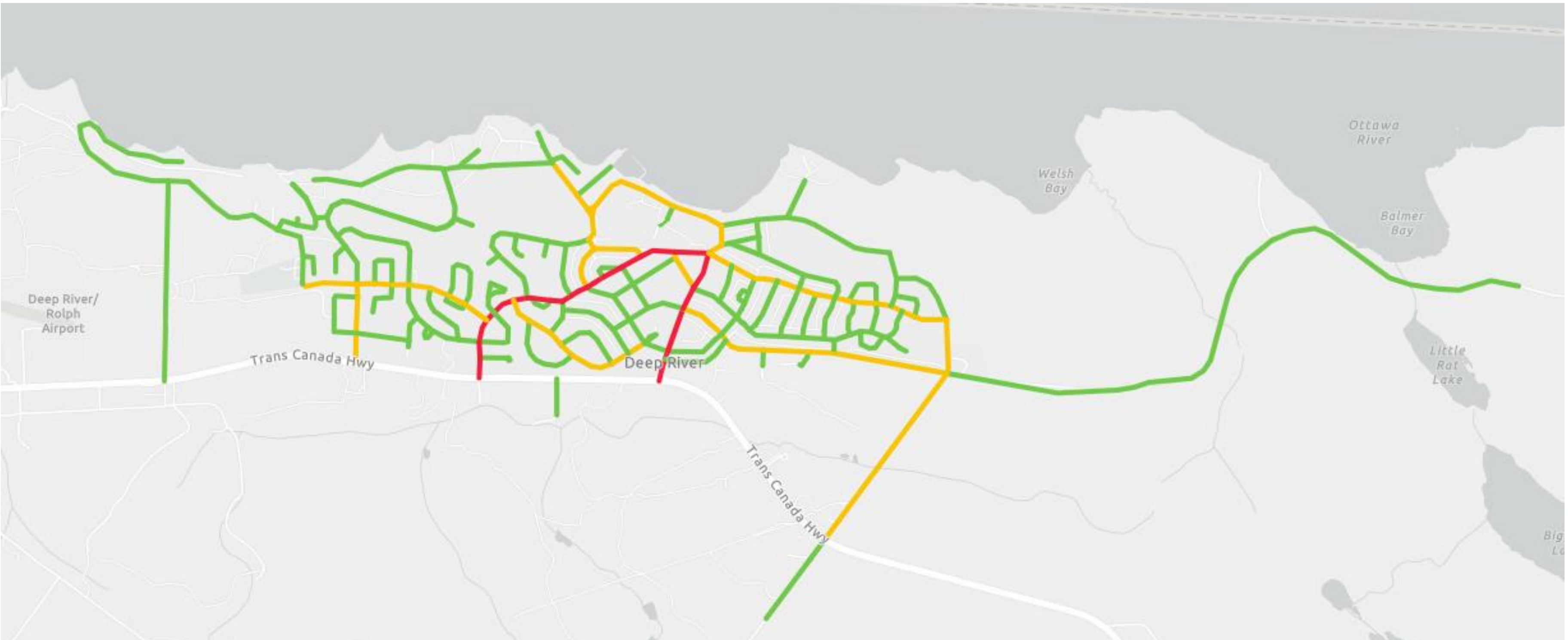

Figure A - 3: Road Criticality Map

Transportation - Sidewalks

Figure A - 4: Sidewalk Asset Map

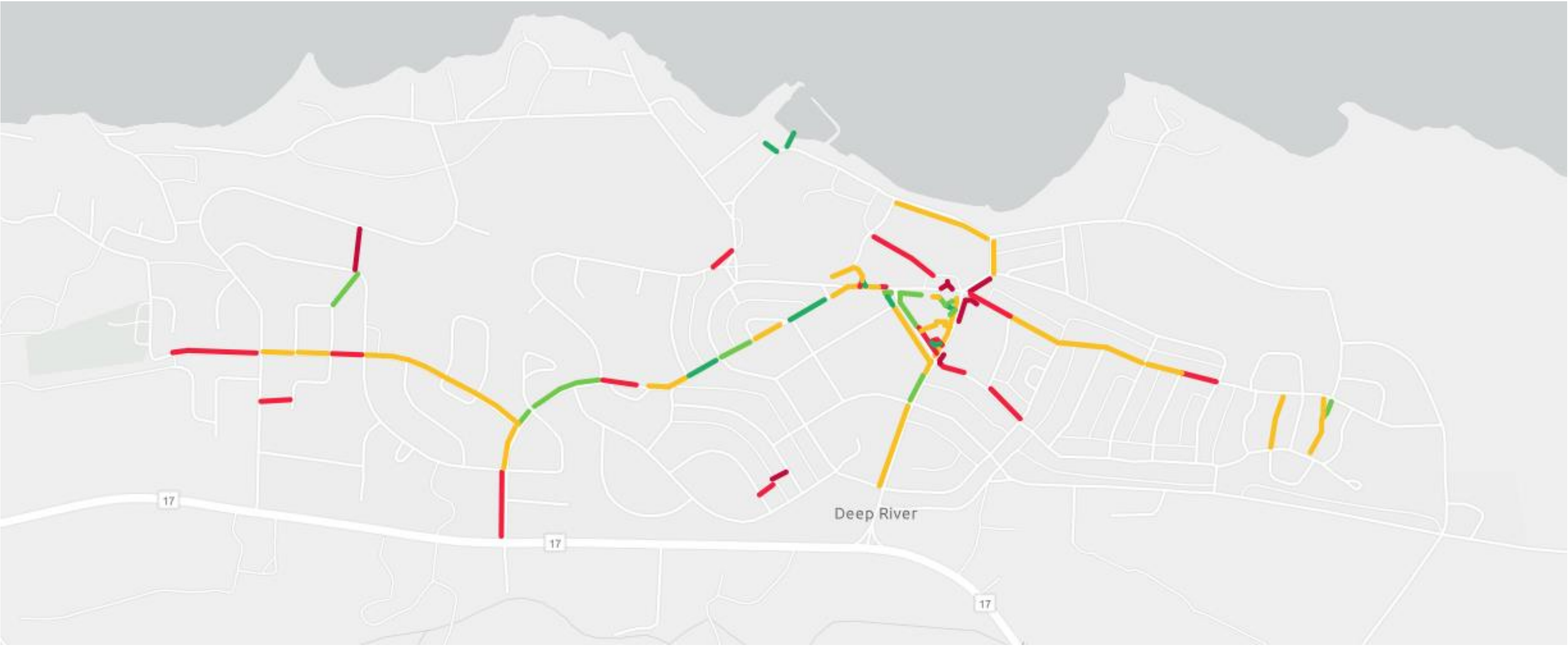

Figure A - 5: Sidewalk Condition Map

Note: condition data is based on actual inspection data.

Figure A - 6: Sidewalk Criticality Map

Transportation – Other

Figure A - 7: Streetlight Asset Map

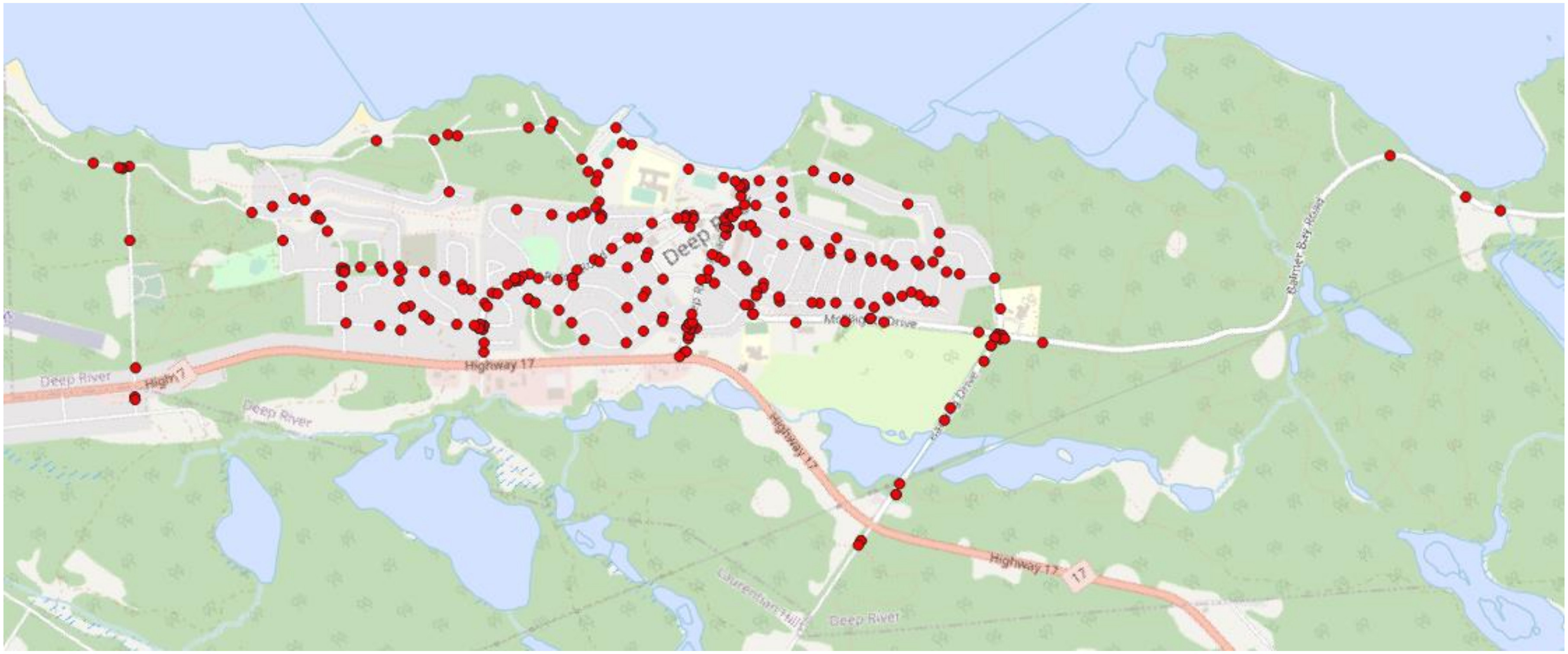

Figure A - 8: Traffic Signs Asset Map

Water – Waterlines

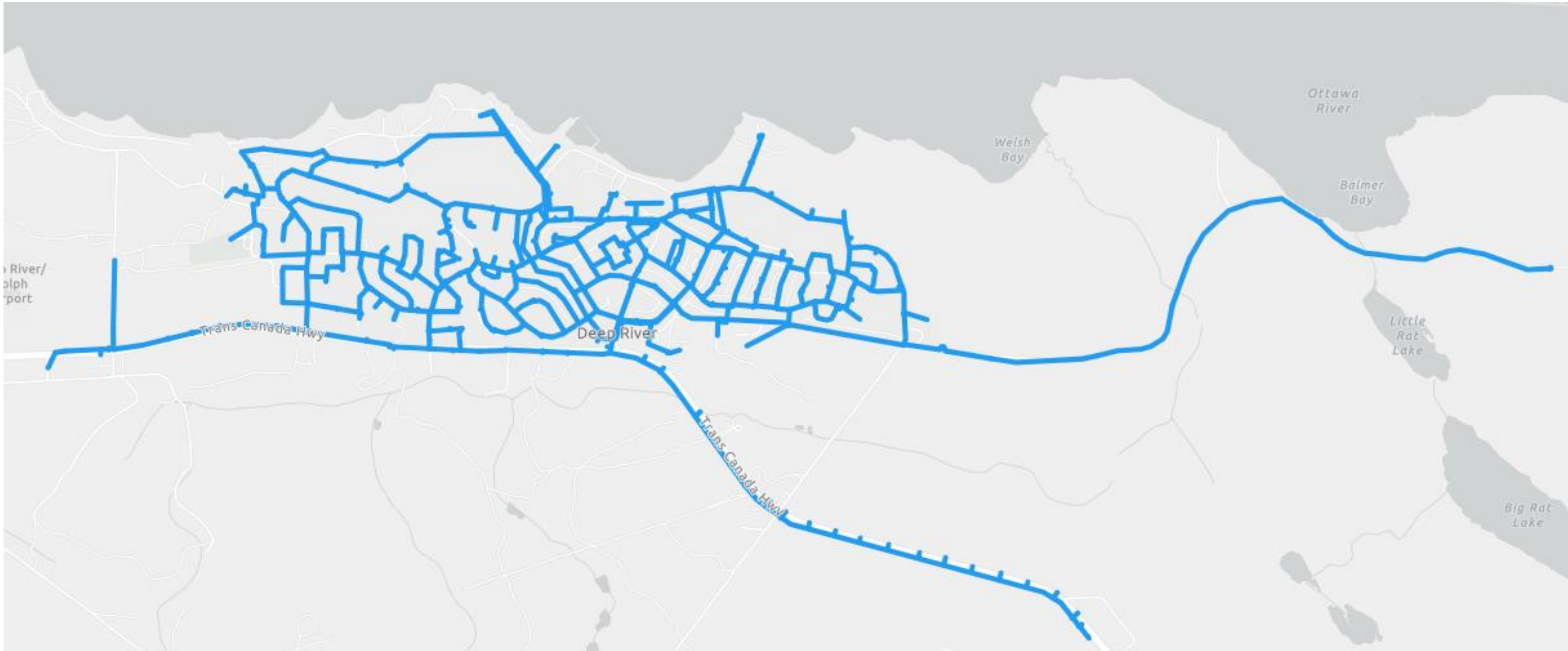

Figure A - 9: Waterline Asset Map

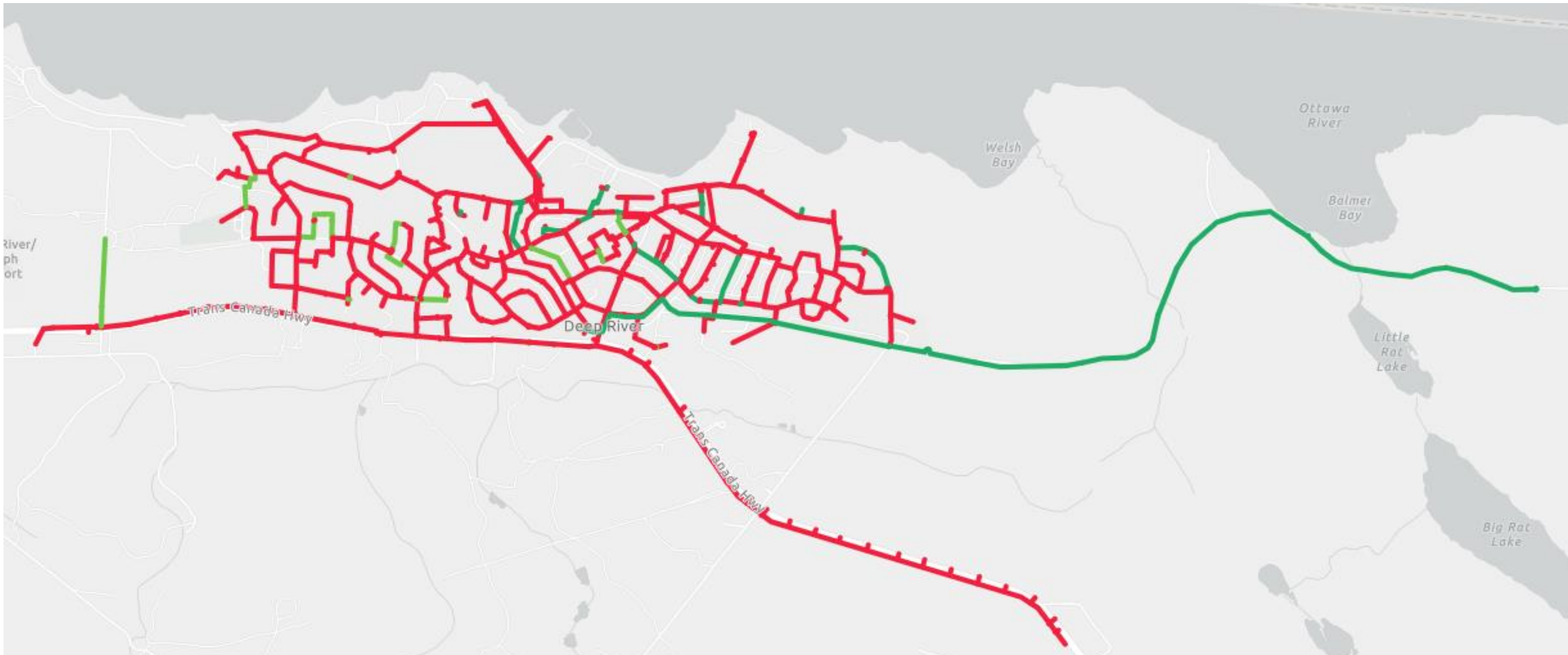

Figure A - 10: Waterline Condition Map

Note: condition data based on *eul*.

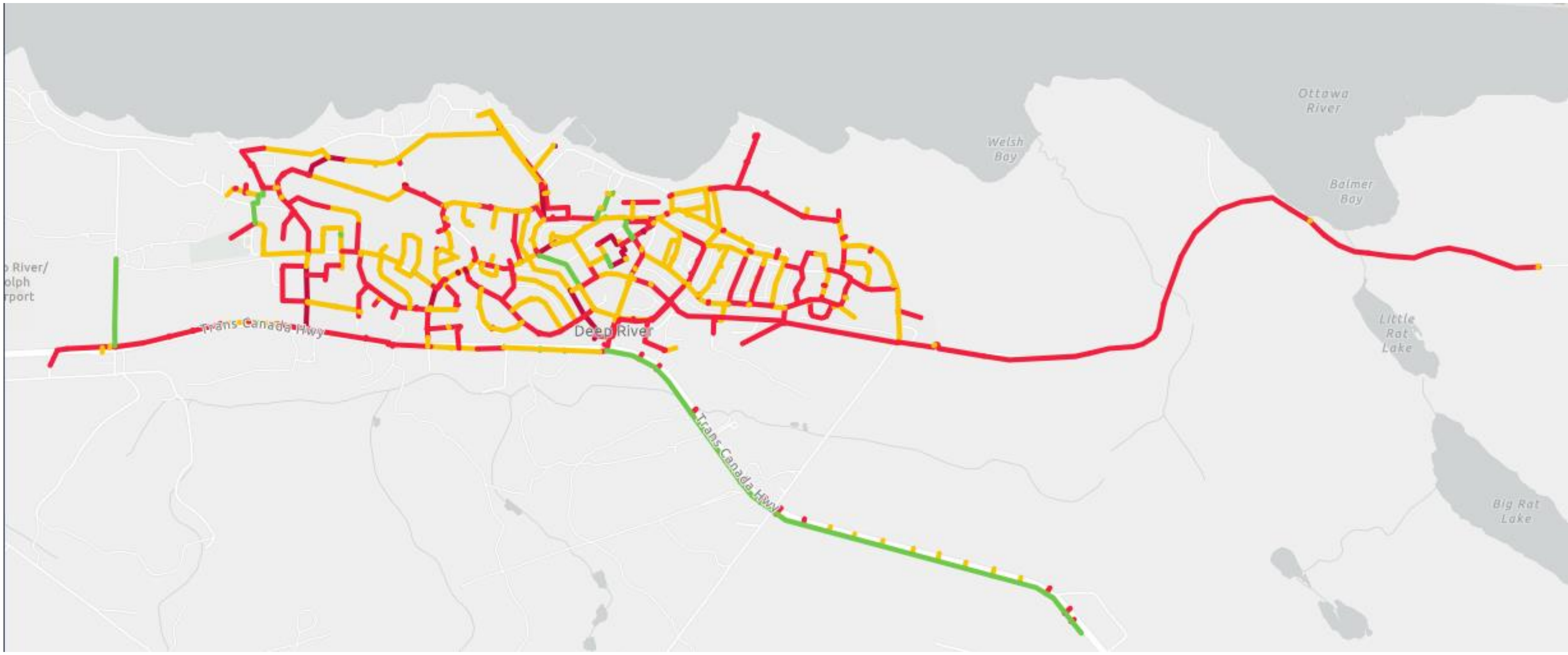

Figure A - 11: Waterline Criticality Map

Water - Other

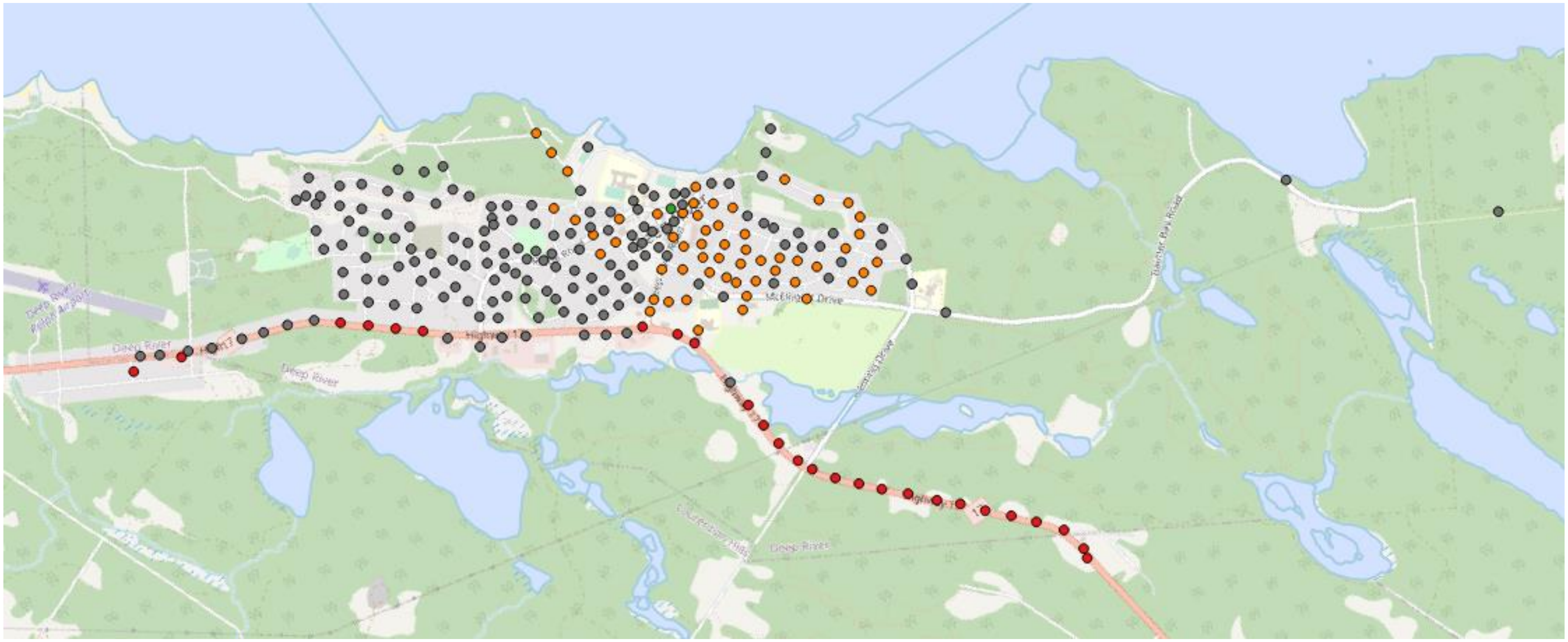

Figure A - 12: Hydrant Asset Map

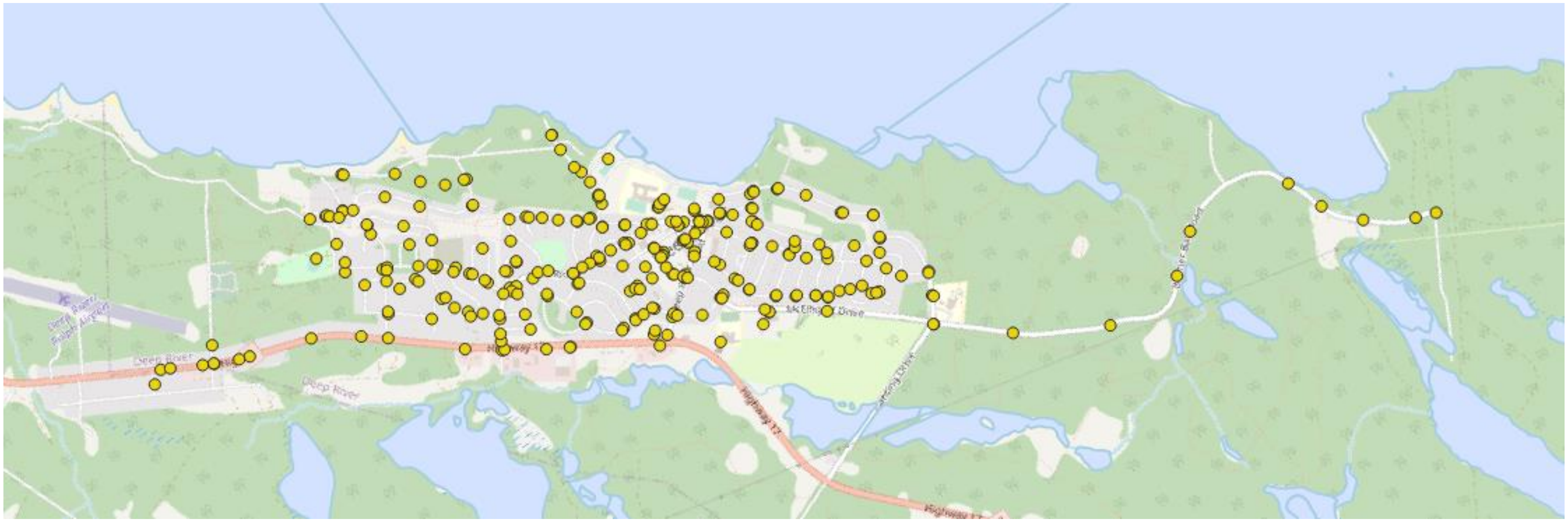

Figure A - 13: Valve Asset Map

Wastewater – Sewer Mains

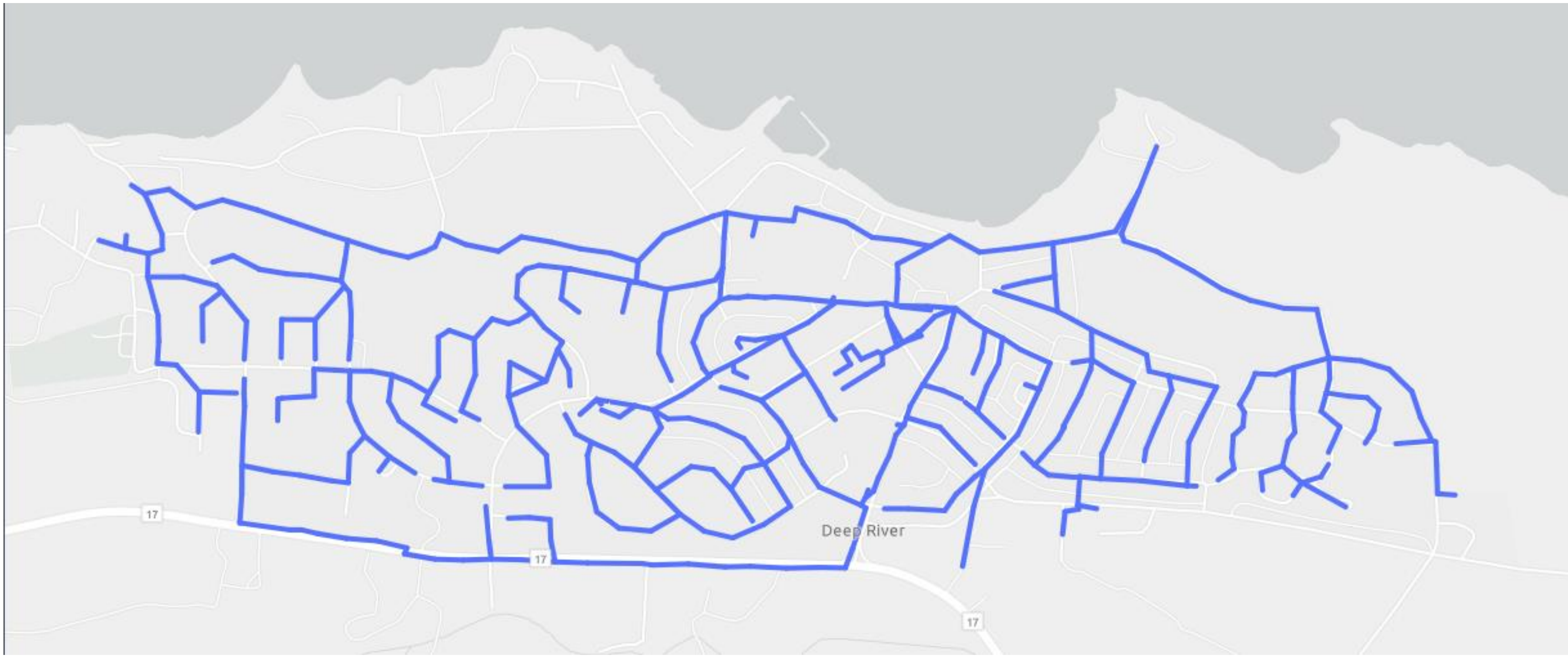

Figure A - 14: Sanitary Main Asset Map

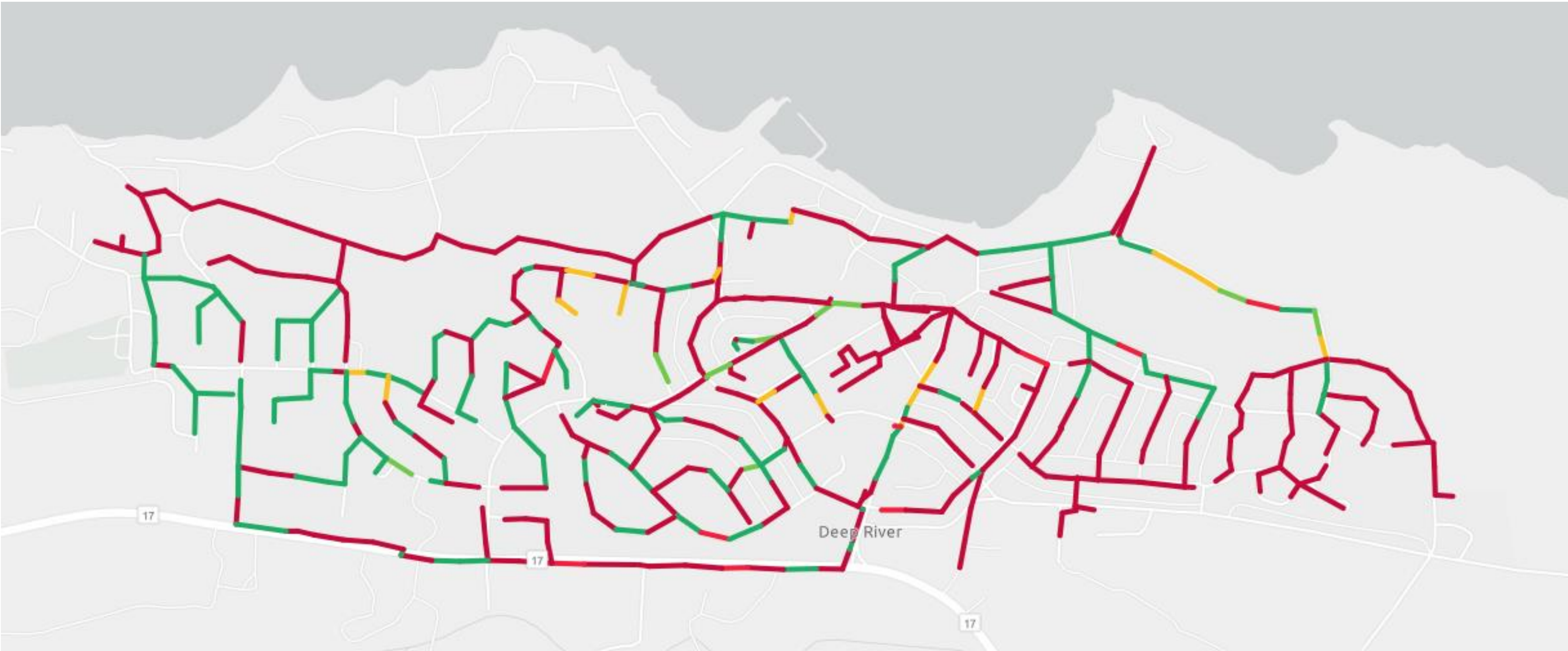

Figure A - 15: Sanitary Main Condition Map

Note: condition data for sewers is a combination of actual inspections and *eul*-based ratings.

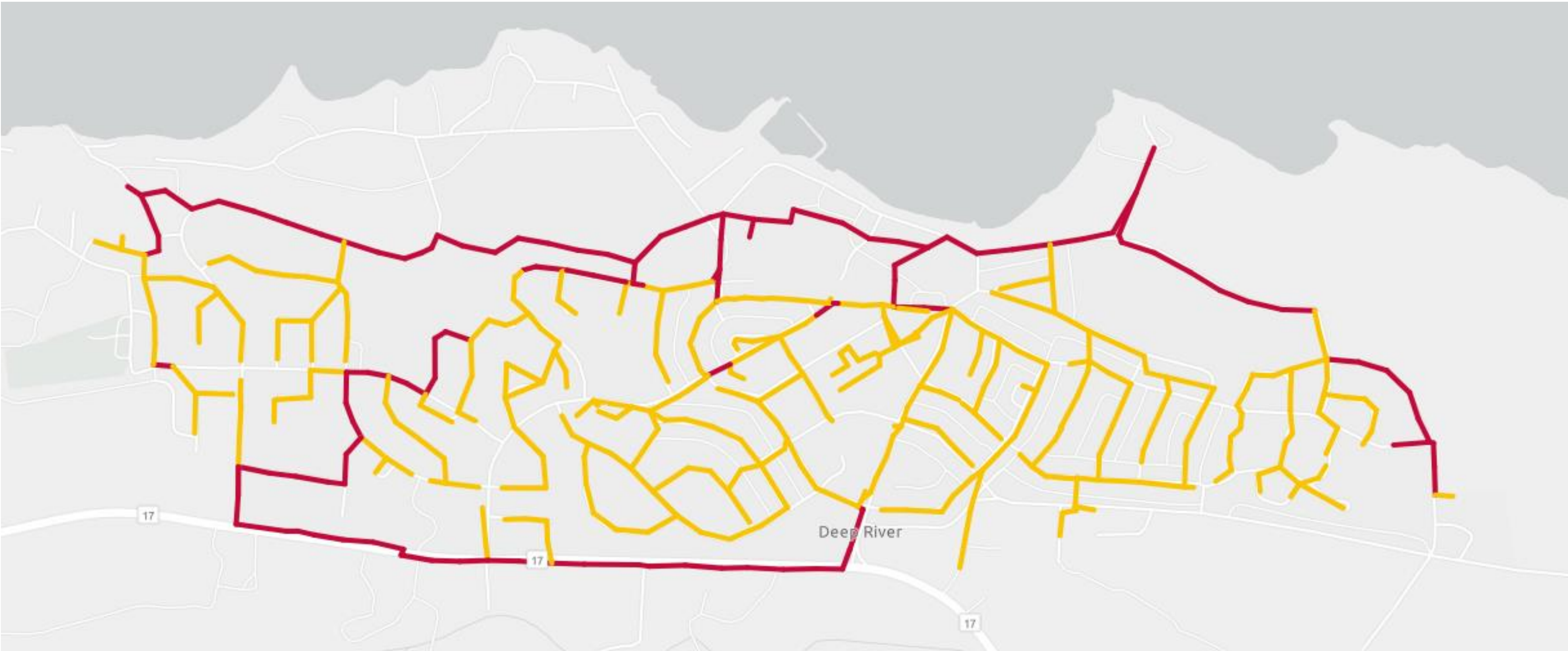

Figure A - 16: Sanitary Main Criticality Map

Wastewater - Other

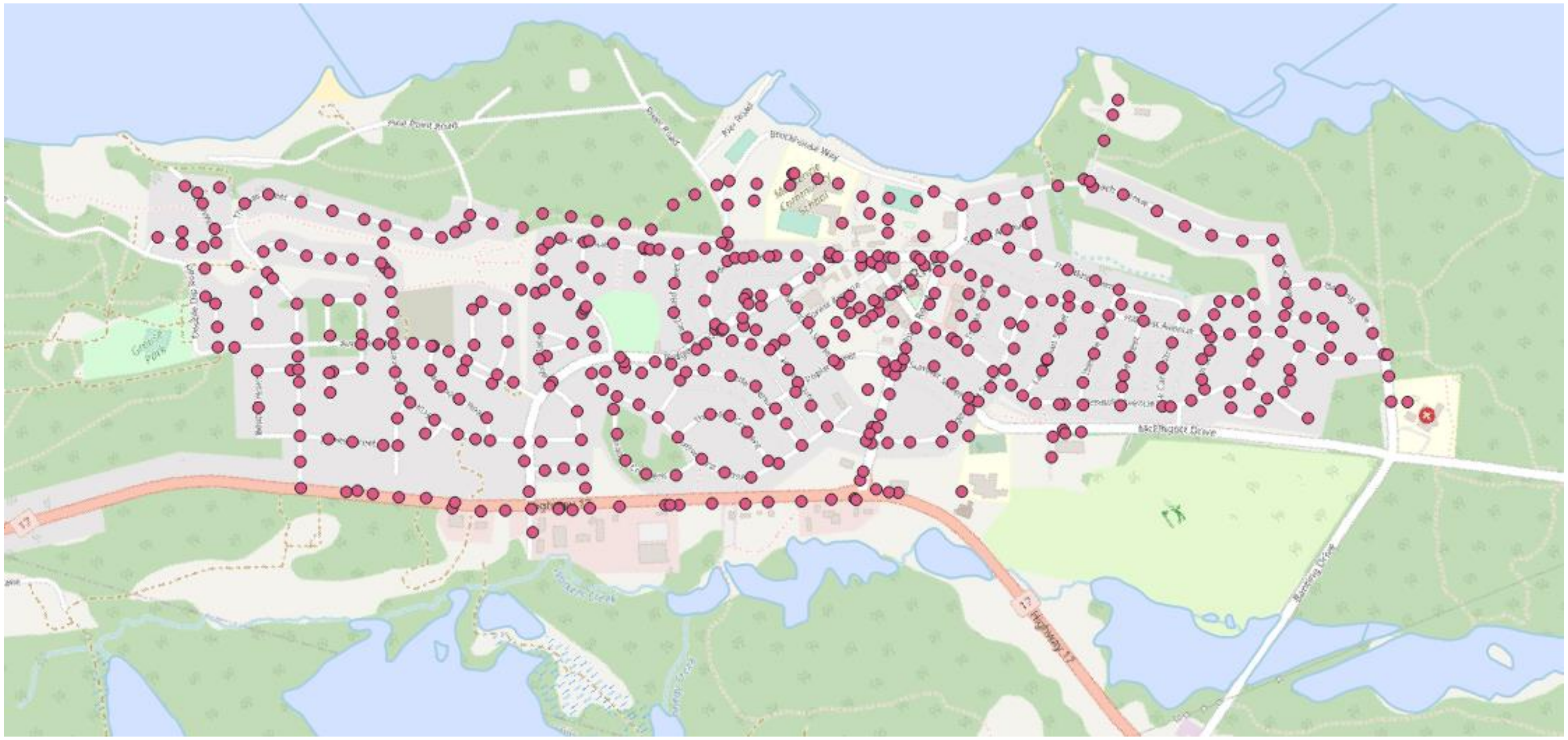

Figure A - 17: Sanitary Maintenance Hole Asset Map

Storm Water – Storm mains

Figure A - 18: Storm Main Asset Map

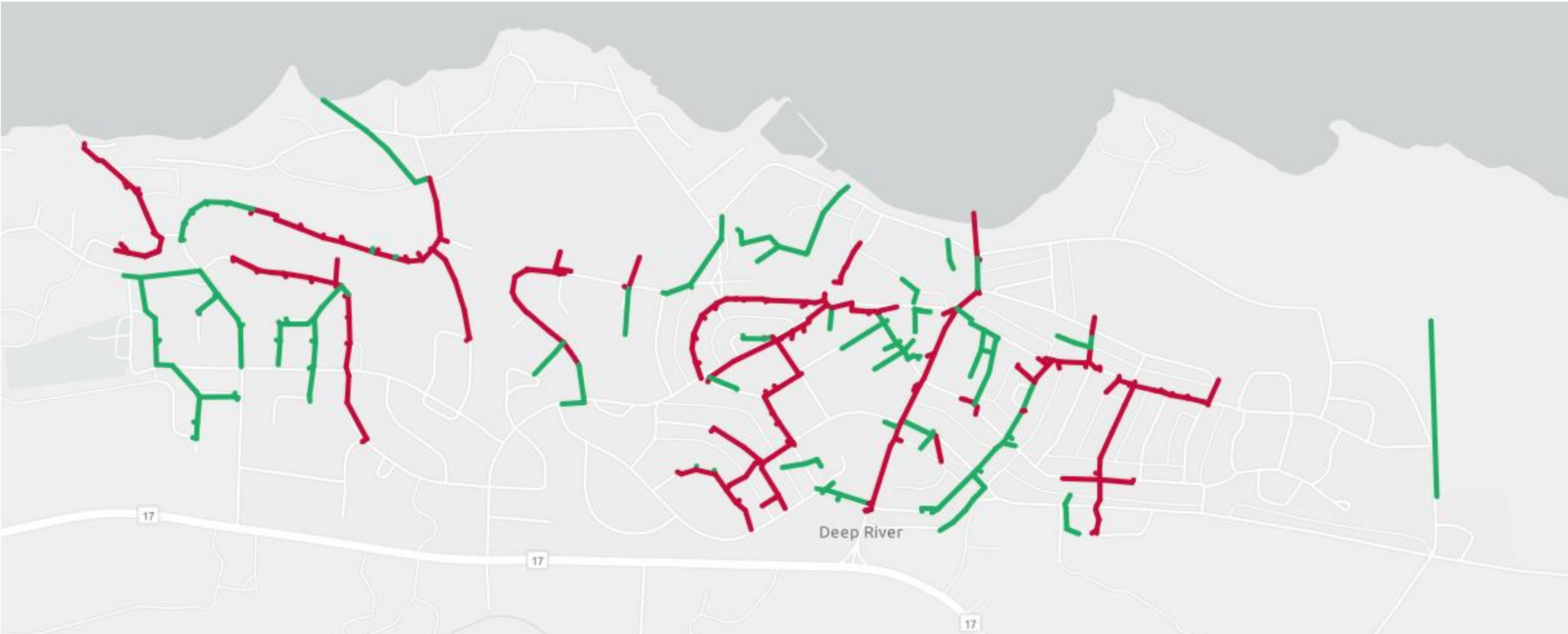

Figure A - 19: Storm Main Condition Map

Note: condition data based on *eul*.

Figure A - 20: Storm Main Criticality Map

Stormwater - Other

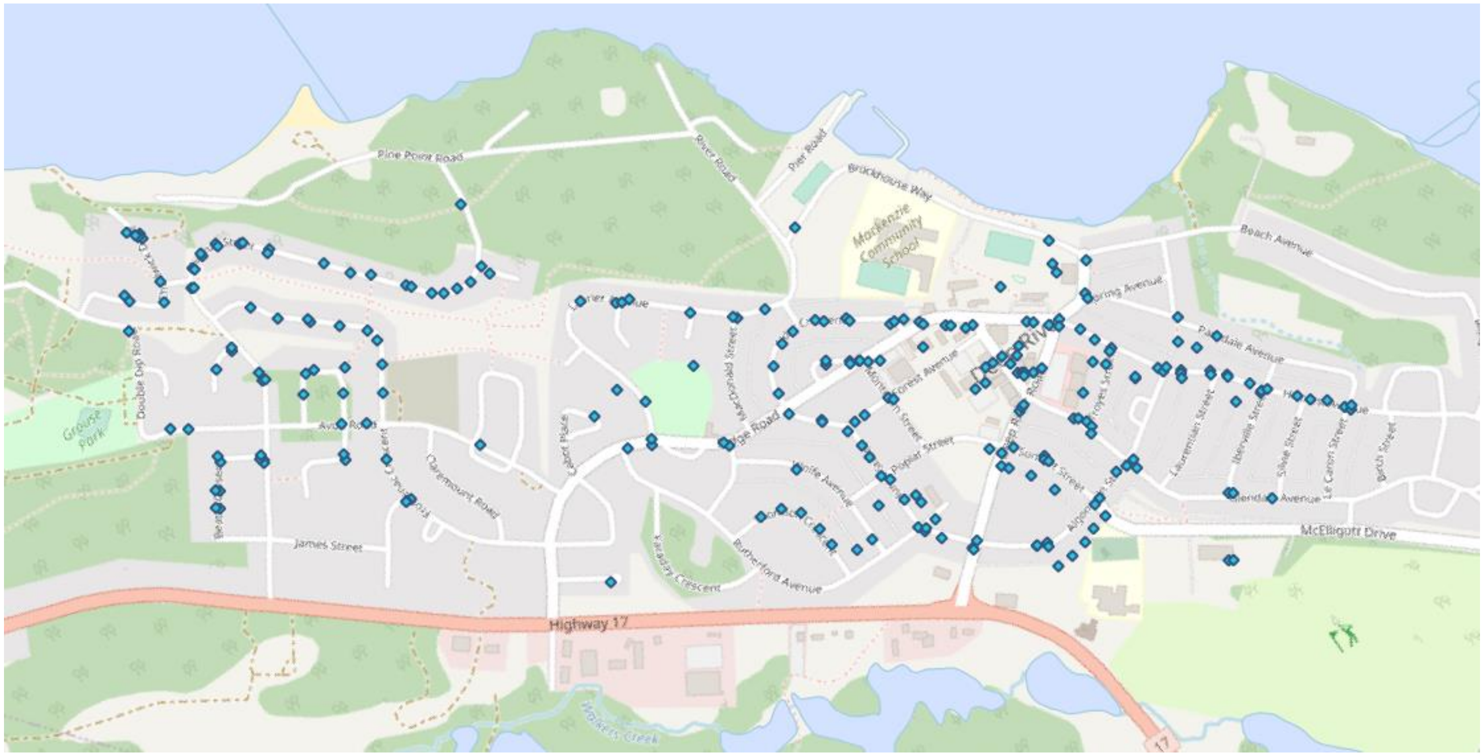

Figure A - 21: Catch Basin Asset Map

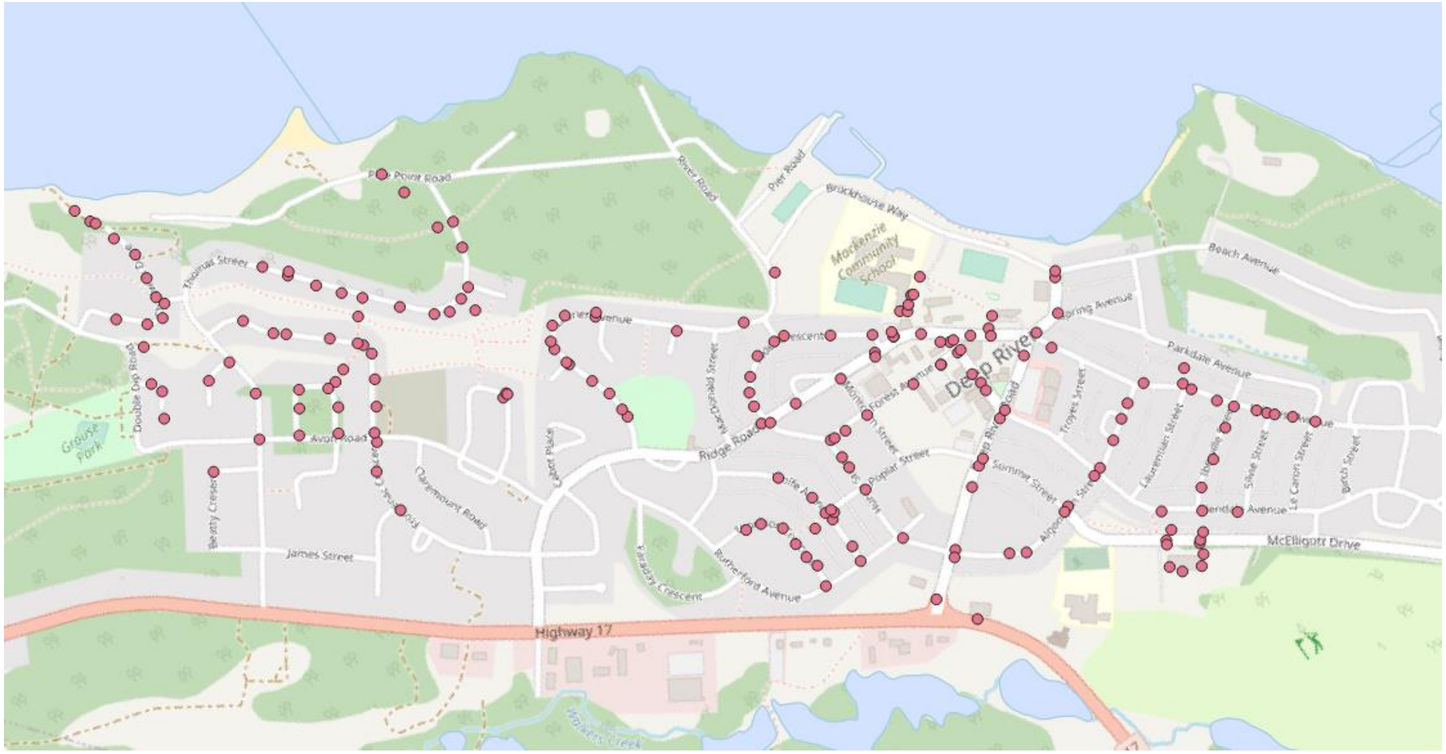

Figure A - 22: Storm Maintenance Hole Asset Map