Haldimand County

2022 Asset Management Plan

This Asset Management Program was prepared by:

psdcitywide

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Executive Summary

Municipal infrastructure provides the foundation for the economic, social, and environmental health and growth of a community through the delivery of services. The goal of asset management is to balance delivering critical services in a cost-effective manner. This involves the development and implementation of asset management strategies and long-term financial planning.

The overall replacement cost of the asset categories owned by Haldimand County totals $3.3 billion. 89% of all assets analysed are in fair or better condition and assessed condition data was available for 50% of assets. For the remaining assets, assessed condition data was unavailable, and asset age was used to approximate condition – a data gap that persists in most municipalities. Generally, age misstates the true condition of assets, making assessments essential to accurate asset management planning, and a recurring recommendation.

The development of a long-term, sustainable financial plan requires an analysis of whole lifecycle costs. Using a combination of proactive lifecycle strategies (roads) and replacement only strategies (all other assets) to determine the lowest cost option to maintain the current level of service, a sustainable financial plan was developed.

To meet capital replacement and rehabilitation needs for existing infrastructure, prevent infrastructure backlogs, and achieve long-term sustainability, the County's average annual capital requirement totals $72.8 million. Based on a historical analysis of sustainable capital funding sources, the County is committing approximately $29.5 million towards capital projects or reserves per year. As a result, the County is funding 40% of its annual capital requirements. This creates a total annual funding deficit of $43.3 million.

Addressing annual infrastructure funding shortfalls is a difficult and long-term endeavour for municipalities. Considering the County's current funding position, it will require many years to reach full funding for current assets. Short phase-in periods to meet these funding targets may place too high a burden on taxpayers too quickly, whereas a phase-in period beyond 20 years may see a continued deterioration of infrastructure, leading to larger backlogs.

To close annual deficits for capital contributions from tax revenues for asset needs, it is recommended the County review the feasibility of implementing a 2.8% annual increase in revenues over a 10-year phase-in period. Similarly, water and wastewater rate revenues would need to increase at 6.3% and 1.9% annually to close respective funding gaps. Funding scenarios over longer time frames are also presented which reduce the annual increases.

In addition to annual needs, there is also an infrastructure backlog of $228 million, comprising assets that remain in service beyond their estimated useful life. It is highly unlikely that all such assets are in a state of disrepair, requiring immediate replacements or full reconstruction. This makes targeted and consistent condition assessments integral to refining long-term replacement and backlog estimates.

Risk frameworks and levels of service targets can then be used to prioritize projects and help select the right lifecycle intervention for the right asset at the right time—including replacement or full reconstruction. The County has developed preliminary risk models which are integrated with its asset register. These models can produce risk matrices that classify assets based on their risk profiles.

Most municipalities in Ontario, and across Canada, continue to struggle with meeting infrastructure demands. This challenge was created over many decades and will take many years to overcome. To this end, several recommendations should be considered, including:

- Continuous and dedicated improvement to the County’s infrastructure datasets, which form the foundation for all analysis, including financial projections and needs.
- Continuous refinements to the risk and lifecycle models as additional data becomes available. This will aid in prioritizing projects and creating more strategic long-term capital budgets.
- Development of key performance indicators for all infrastructure programs to meet 2024 Ontario Regulation 588/17 requirements, and to establish benchmark data to calibrate levels of service targets for 2025 regulatory requirements.

The County has taken important steps in building its asset management program, including developing a more complete and accurate asset register—a substantial initiative. Continuous improvement to this inventory will be essential in maintaining momentum, supporting long-term financial planning, and delivering the highest affordable service levels to the Haldimand community.

About this Document

The Haldimand County Asset Management Plan was developed in accordance with Ontario Regulation 588/17 ("O. Reg 588/17"). It contains a comprehensive analysis of Haldimand County's infrastructure portfolio. This is a living document that should be updated regularly as additional asset and financial data becomes available.

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. Along with creating better performing organizations, more livable and sustainable communities, the regulation is a key, mandated 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.

Table 1 Ontario Regulation 588/17 Requirements and Reporting Deadlines

Requirement	2019	2022	2024	2025
1. Asset Management Policy	●		●	
2. Asset Management Plans		●	●	●
State of infrastructure for core assets		●		
State of infrastructure for all assets			●	●
Current levels of service for core assets		●		
Current levels of service for all assets			●	
Proposed levels of service for all assets				●
Lifecycle costs associated with current levels of service		●	●	
Lifecycle costs associated with proposed levels of service				●
Growth and risk impacts		●	●	●
Financial strategy				●

Scope

The scope of this document is to identify the current practices and strategies that are in place to manage public infrastructure and to make recommendations where they can be further refined. Through the implementation of sound asset management strategies, the County can ensure that public infrastructure is managed to support the sustainable delivery of municipal services.

The following asset categories are addressed in further sections:

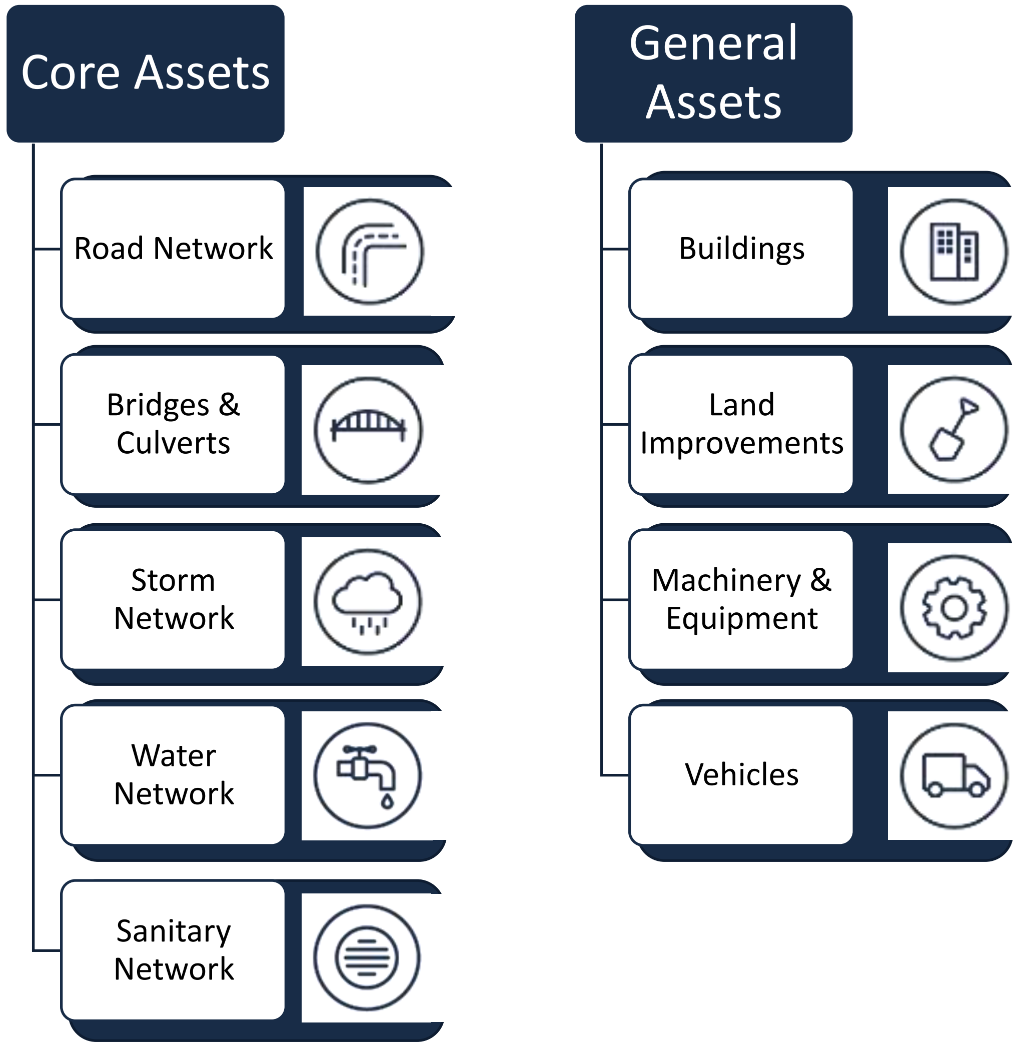


Figure 1 Asset Categories

Limitations and Constraints

The asset management program development required substantial effort by staff, it was developed based on best-available data, and is subject to the following broad limitations, constraints, and assumptions:

- The analysis is highly sensitive to several critical data fields, including an asset's estimated useful life, replacement cost, quantity, and in-service date. Inaccuracies or imprecisions in any of these fields can have substantial and cascading impacts on all reporting and analytics.
- User-defined and unit cost estimates, based typically on staff judgment, recent projects, or established through completion of technical studies, offer the most precise approximations of current replacement costs. When this isn't possible, historical costs incurred at the time of asset acquisition or construction can be inflated to present day. This approach, while sometimes necessary, can produce highly inaccurate estimates.
- In the absence of condition assessment data, age was used to estimate asset condition ratings. This approach can result in an over- or understatement of asset needs. As a result, financial requirements generated through this approach can differ from those produced by staff.
- Facilities are not effectively componentized into their individual elements, major components, and minor components. These facilities contain thousands of individual assets, including the substructures, shell, interior assets, various electrical, plumbing, HVAC systems, and other complex equipment and furnishings. Each of these assets has its own useful life and replacement cost, and individual condition rating, as well as installation history. Without componentization, the value of condition ratings, age profiles, and long- and short-term forecasts remains limited.
- The risk models are designed to support objective project prioritization and selection. However, in addition to the inherent limitations that all models face, they also require availability of important asset attribute data to ensure that asset risk ratings are valid, and assets are properly stratified within the risk matrix. Missing attribute data can misclassify assets.

These limitations have a direct impact on most of the analysis presented, including condition summaries, age profiles, long-term replacement and rehabilitation forecasts, and shorter term, 10-year forecasts that are generated from Citywide, the County's primary asset management system.

These challenges are quite common among municipalities and require long-term commitment and sustained effort by staff. As the County's asset management program evolves and advances, the quality of future AMPs and other core documents that support asset management will continue to increase.

An Overview of Asset Management

Municipalities are responsible for managing and maintaining a broad portfolio of infrastructure assets to deliver services to the community. The goal of asset management is to minimize the lifecycle costs of delivering infrastructure services, manage the associated risks, while maximizing the value and levels of service the community receives from the asset portfolio.

Lifecycle costs can span decades, requiring planning and foresight to ensure financial responsibility is spread equitably across generations. An asset management plan is critical to this planning, and an essential element of the broader asset management program. The industry-standard approach and sequence to developing a practical asset management program begins with a Strategic Plan, followed by an Asset Management Policy and an Asset Management Strategy, concluding with an Asset Management Plan (AMP).

This industry standard, defined by the Institute of Asset Management (IAM), emphasizes the alignment between the corporate strategic plan and various asset management documents. The strategic plan has a direct, and cascading impact on asset management planning and reporting.

Foundational Documents

In the municipal sector, 'asset management strategy' and 'asset management plan' are often used interchangeably. Other concepts such as 'asset management framework', 'asset management system', and 'strategic asset management plan' further add to the confusion; lack of consistency in the industry on the purpose and definition of these elements offers little clarity. To make a clear distinction between the policy, strategy, and the plan see the following sections for detailed descriptions of the document types.

Strategic Plan

The strategic plan has a direct, and cascading impact on asset management planning and reporting, making it a foundational element. At the beginning of each term of Council, Council holds strategic planning exercises and discussions to identify major initiatives and administrative improvements it wishes to achieve during its tenure. Staff then identify the scope, resources, timing & other logistical matters associated with proposed initiatives.

When it comes to budgeting, decision-making or changing/introducing services, Haldimand County's 3 Corporate Strategic Pillars serve as guiding principles.

Figure 2 Haldimand County's Corporate Strategic Pillars

Asset Management Policy

An asset management policy represents a statement of the principles guiding the County's approach to asset management activities. It aligns with the organization and provides clear direction to municipal staff on their roles and responsibilities.

Haldimand County adopted their asset management policy by resolution # 19-130 on June 24th, 2019 in accordance with Ontario Regulation 588/17. The objective of the policy is to demonstrate an organization-wide commitment to the good stewardship of municipal infrastructure assets, and to improved accountability and transparency to the community through the adoption of best practices regarding asset management planning.

Asset Management Strategy

An asset management strategy outlines the translation of organizational objectives into asset management objectives and provides a strategic overview of the activities required to meet these objectives. It provides greater detail than the policy on how Haldimand County plans to achieve asset management objectives through planned activities and decision-making criteria.

Asset Management Plan

The asset management plan is often identified as a key output within the strategy. The AMP has a sharp focus on the current state of the County's asset portfolio, and its approach to managing and funding individual service areas or asset groups. It is tactical in nature and provides a snapshot in time.

Key Technical Concepts

Effective asset management integrates several key components, including data management, lifecycle management, risk management, and levels of service. These concepts are applied throughout this asset management plan and are described below in greater detail.

Asset Hierarchy and Data Classification

Asset hierarchy illustrates the relationship between individual assets and their components, and a wider, more expansive network and system. How assets are grouped in a hierarchy structure can impact how data is interpreted. Assets were structured to support meaningful, efficient reporting and analysis. Key category details are summarized at the asset segment level.

Table 2 Core Asset Classifications

CLASS	CATEGORY	SEGMENT
Infrastructure	Road Network	Asphalt Roads Surface Treated Roads Gravel Roads Sidewalks Lights
	Bridges & Culverts	OSIM Bridges Structural Culverts
	Water Network	Valve Hydrant Water Treatment Plant Booster Station Storage Water Depot Water Pipe Water Meter
	Sanitary Network	Sanitary Pumping Station Sanitary Manhole Sanitary Valve Sanitary Pipe Water Purification Plant Sanitary Lagoon
	Storm Network	Storm Pipe Storm Structures Storm Ponds

Table 3 Non-Core Asset Classifications

Class	Category	Segment
General Capital	Buildings	Fire / Ambulance Administration Long-term Care Community Centres Libraries Parks / Recreation Museums Public Works
	Land Improvements	Administration Cemeteries Community Services Fire / Ambulance Parks / Recreation Public Works Waste Management
	Machinery & Equipment	Administration Community Services Fire / Ambulance Libraries Parks Public Works Recreation Waste Management
	Vehicles	Administration Community Services Environmental Fire / Ambulance Parks Public Works Recreation

Replacement Costs

There are a range of methods to determine the replacement cost of an asset, and some are more accurate and reliable than others. The two methodologies are:

- **User-Defined Cost and Cost/Unit**: Based on costs provided by municipal staff which could include average costs from recent contracts; data from engineering reports and assessments; staff estimates based on knowledge and experience
- **Cost Inflation/CPI Tables**: Historical cost of the asset is inflated based on Consumer Price Index or Non-Residential Building Construction Price Index

User-defined costs based on reliable sources are a reasonably accurate and reliable way to determine asset replacement costs. Cost inflation is typically used in the absence of reliable replacement cost data. It is a reliable method for recently purchased and/or constructed assets where the total cost is reflective of the actual costs that the County incurred. As assets age, and new products and technologies become available, cost inflation becomes a less reliable method.

Estimated Useful Life and Service Life Remaining

The estimated useful life (EUL) of an asset is the period over which the County expects the asset to be available for use and remain in service before requiring replacement or disposal. The EUL for each asset was assigned according to the knowledge and expertise of municipal staff and supplemented by existing industry standards when necessary.

By using an asset's in-service date and its EUL, the County can determine the service life remaining (SLR) for each asset. Using condition data and the asset's SLR, the County can more accurately forecast when it will require replacement. The SLR is calculated as follows:

Service Life Remaining (SLR) = In Service Date + Estimated Useful Life (EUL) − Current Year

Asset Condition

An incomplete or limited understanding of asset condition can mislead long-term planning and decision-making. Accurate and reliable condition data helps to prevent premature and costly rehabilitation or replacement and ensures that lifecycle activities occur at the right time to maximize asset value and useful life.

A condition assessment rating system provides a standardized descriptive framework that allows comparative benchmarking across the County's asset portfolio. The table below outlines the condition rating system used to determine asset condition. This rating system is aligned with the Canadian Core Public Infrastructure Survey which is used to develop the Canadian Infrastructure Report Card.

Figure 3 Standard Condition Rating Scale

Very Good
- **Fit for the future**
- Well maintained, good condition, new or recently rehabilitated
- 80 - 100

Good
- **Adequate for now**
- Acceptable, generally approaching mid-stage of expected service life
- 60 - 80

Fair
- **Requires attention**
- Signs of deterioration, some elements exhibit significant deficiencies
- 40 - 60

Poor
- **Increasing potential of affecting service**
- Approaching end of service life, condition below standard, large portion of system exhibits significant deterioration
- 20 - 40

Very Poor
- **Unfit for sustained service**
- Near or beyond expected service life, widespread signs of advanced deterioration, some assets may be unusable
- 0 - 20

The analysis is based on assessed condition data (only as available). In the absence of assessed condition data, asset age is used as a proxy to determine asset condition. Appendix M: Condition Assessment Guidelines includes additional information on the role of asset condition data and provides basic guidelines for the development of a condition assessment program.

Lifecycle Management Strategies

The condition or performance of most assets will deteriorate over time. This process is affected by a range of factors including an asset's characteristics, location, utilization, maintenance history and environment. Asset deterioration has a negative effect on the ability of an asset to fulfill its intended function, and may be characterized by increased cost, risk and even service disruption.

To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration.

There are several field intervention activities that are available to extend the life of an asset. These activities can be generally placed into one of three categories: maintenance, rehabilitation, and replacement. The following table provides a description of each type of activity and the general difference in cost.

Depending on initial lifecycle management strategies, asset performance can be sustained through a combination of maintenance and rehabilitation, but at some point, replacement is required. Understanding what effect these activities will have on the lifecycle of an asset, and their cost, will enable staff to make better recommendations. Figure 4 provides a description of each type of activity, the general difference in cost, and typical risks associated with each.

The County's approach to lifecycle management is described within each asset category. Developing and implementing a proactive lifecycle strategy will help staff to determine which activities to perform on an asset and when they should be performed to maximize useful life at the lowest total cost of ownership.

Figure 4 Lifecyle Management Typical Interventions

Maintenance

- General level of cost is **$**
- All actions necessary for retaining an asset as near as practicable to its original condition,but excluding rehabilitation or renewal. Maintenance does not increase the service potential of the asset or keep it in its original condition;
- it slows down deterioration and delays when rehabilitation or replacement is necessary.

Rehabilitation / Renewal

- General level of cost is **$$$**
- Works to rebuild or replace parts or components of an asset, to restore it to a required functional condition and extend its life, which may incorporate some modification.
- Generally involves repairing the asset to deliver its original level of service (i.e. milling and paving of roads) without resorting to significant upgrading or replacement, using available techniques and standards.

Replacement

- General level of cost is **$$$$$**
- The complete replacement of an asset that has reached the end of its life, so as to provide a similar, or agreed alternative, level of service.
- Existing asset disposal is generally included

Risk Management Strategies

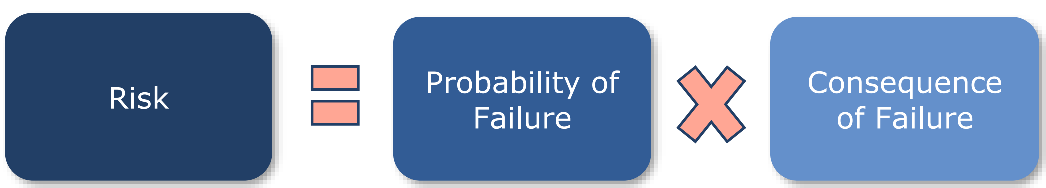
Municipalities generally take a 'worst-first' approach to infrastructure spending. Rather than prioritizing assets based on their importance to service delivery, assets in the worst condition are fixed first, regardless of their criticality. However, not all assets are created equal. Some are more important than others, and their failure or disrepair poses more risk to the community. For example, a road with a high volume of traffic that provides access to critical services poses a higher risk than a low volume rural road. These high-value assets should receive funding before others.

By identifying the various impacts of asset failure and the likelihood that it will fail, risk management strategies can identify critical assets, and determine where maintenance efforts, and spending, should be focused.

A high-level evaluation of asset risk and criticality was performed. Each asset has been assigned a probability of failure score and consequence of failure score based on available asset data. These risk scores can be used to prioritize maintenance, rehabilitation, and replacement strategies for critical assets.

Risk is a product of two variables: the probability that an asset will fail, and the resulting consequences of that failure event. It can be a qualitative measurement, (low, medium, high) or quantitative measurement (1-5), that can be used to rank assets and projects, identify appropriate lifecycle strategies, optimize short- and long-term budgets, minimize service disruptions, and maintain public health and safety.

Figure 5 Risk Equation



Probability of Failure

Several factors can help decision-makers estimate the probability or likelihood of an asset's failure, including its condition, age, previous performance history, and exposure to extreme weather events, such as flooding and ice jams—both a growing concern for municipalities in Canada.

Consequence of Failure

Estimating criticality also requires identifying the types of consequences that the organization and community may face from an asset's failure, and the magnitude of those consequences. Consequences of asset failure will vary across the infrastructure portfolio; the failure of some assets may result primarily in high direct financial cost but may pose limited risk to the community. Other assets may have a relatively minor financial value, but any downtime may pose significant health and safety hazards to residents. See Appendix L: Risk Rating Criteria for definitions and the developed risk models.

Levels of Service

A level of service (LOS) is a measure of the services that Haldimand County is providing to the community and the nature and quality of that service. Within each asset category, technical metrics and qualitative descriptions that measure both technical and community levels of service have been established and measured as data is available.

Two levels of service key performance indicators are provided: Community LOS, and Technical LOS. At this stage, three strategic levels of service are measured for every asset category and they are:

- Financial – this is target reinvestment rate compared to the actual current reinvestment rate.
- Performance – this is the condition breakdown for the asset category.
- Risk – this is the risk profile for the asset category.

Only those LOS that are required under O. Reg are included in addition to the strategic LOS for core asset categories.

Community Levels of Service

Community LOS are a simple, plain language description or measure of the service that the community receives. For core asset categories, the Province through O. Reg. 588/17, has provided qualitative descriptions that are required.

For non-core asset categories, the County must determine the qualitative descriptions that will be used by July 1, 2024. The community LOS can be found in the Levels of Service subsection within each asset category section.

Technical Levels of Service

Technical LOS are a measure of key technical attributes of the service being provided to the community. These include mostly quantitative measures and tend to reflect the impact of the County's asset management strategies on the physical condition of assets or the quality/capacity of the services they provide.

For core asset categories, the Province through O. Reg. 588/17, has provided technical metrics that are required. For non-core asset categories, the County must determine the technical metrics that will be used by July 1, 2024. The metrics can be found in the LOS subsection within each asset category.

Current and Proposed Levels of Service

Haldimand County is focused on measuring the current LOS provided to the community. Once current LOS have been measured and trended the County plans to establish their proposed LOS over a 10-year period, in accordance with O. Reg. 588/17.

Proposed levels of service should be realistic and achievable within the timeframe outlined by the County. They should also be determined with consideration of a variety of community expectations, fiscal capacity, regulatory requirements, corporate goals, and long-term sustainability. Once proposed LOS have been established, and prior to July 2025, the County must identify lifecycle management and financial strategies which allow these targets to be achieved.

Climate Change

Climate change can cause severe impacts on human and natural systems around the world. The effects of climate change include increasing temperatures, higher levels of precipitation, droughts, and extreme weather events. In 2019, Canada's Changing Climate Report (CCCR 2019) was released by Environment and Climate Change Canada (ECCC).

The report revealed that between 1948 and 2016, the average temperature increase across Canada was 1.7°C; moreover, during this period, Northern Canada experienced a 2.3°C increase. The temperature increase in Canada has doubled that of the global average. If emissions are not significantly reduced, the temperature could increase by 6.3°C in Canada by the year 2100 compared to 2005 levels. Observed precipitation changes in Canada include an increase of approximately 20% between 1948 and 2012.

By the late 21st century, the projected increase could reach an additional 24%. During the summer months, some regions in Southern Canada are expected to experience periods of drought at a higher rate. Extreme weather events and climate conditions are more common across Canada. Recorded events include droughts, flooding, cold extremes, warm extremes, wildfires, and record minimum arctic sea ice extent.

The changing climate poses a significant risk to the Canadian economy, society, environment, and infrastructure. The impacts on infrastructure are often a result of climate-related extremes such as droughts, floods, higher frequency of freeze-thaw cycles, extended periods of high temperatures, high winds, and wildfires. Physical infrastructure is vulnerable to damage and increased wear when exposed to these extreme events and climate variabilities. Canadian municipalities are faced with the responsibility to protect their local economy, citizens, environment, and physical assets.

Reinvestment Rate

As assets age and deteriorate they require additional investment to maintain a state of good repair. The reinvestment of capital funds, through asset renewal or replacement, is necessary to sustain an adequate level of service. The reinvestment rate is a measurement of available or required funding relative to the total replacement cost. By comparing the actual vs. target reinvestment rate the County can determine the extent of any existing funding gap.

Portfolio Overview

Community Profile

Haldimand County is located on the Niagara Peninsula in Southern Ontario. The County is in the Golden Horseshoe and contains landscape of 1250 square kilometres with 83 kilometres of shoreline along Lake Erie. The County is adjacent to major cities like Hamilton, Toronto, and Buffalo.

Haldimand County was established as part of the Niagara District in 1798. The County was opened for general settlement in 1832. In 1974 the County was amalgamated with Norfolk County to become the Regional Municipality of Haldimand-Norfolk.

In 2001, the regional municipality was abolished, and the local municipalities of Dunnville, Haldimand and part of Nanticoke were amalgamated into a single-tier authority. Although a city, it calls itself after its historic name Haldimand County.

Agriculture has been the predominant land use in the County for a long history and Haldimand County will continue to encourage the growth of a strong agricultural community. The County recognizes the opportunities of commercial and industrial expansion with the attraction of its unique location, resources, and rich natural environment.

There are 25 designated hamlets within Haldimand County that are developed as the residential, social, and commercial centres serving the surrounding agricultural community. The growth in Haldimand County is distributed to the six fully serviced urban areas which are Caledonia, Cayuga, Dunnville, Hagersville, Jarvis and Townsend.

Table 4 Haldimand County & Ontario Census Information

Census Characteristic	Haldimand County	Ontario
Population 2021	49,216	14,223,942
Population Change 2016-2021	7.9%	5.8%
Total Private Dwellings	20,710	5,929,250
Population Density	39.4/km^2	15.9/km^2
Land Area	1252 km^2	892,411.76 km^2

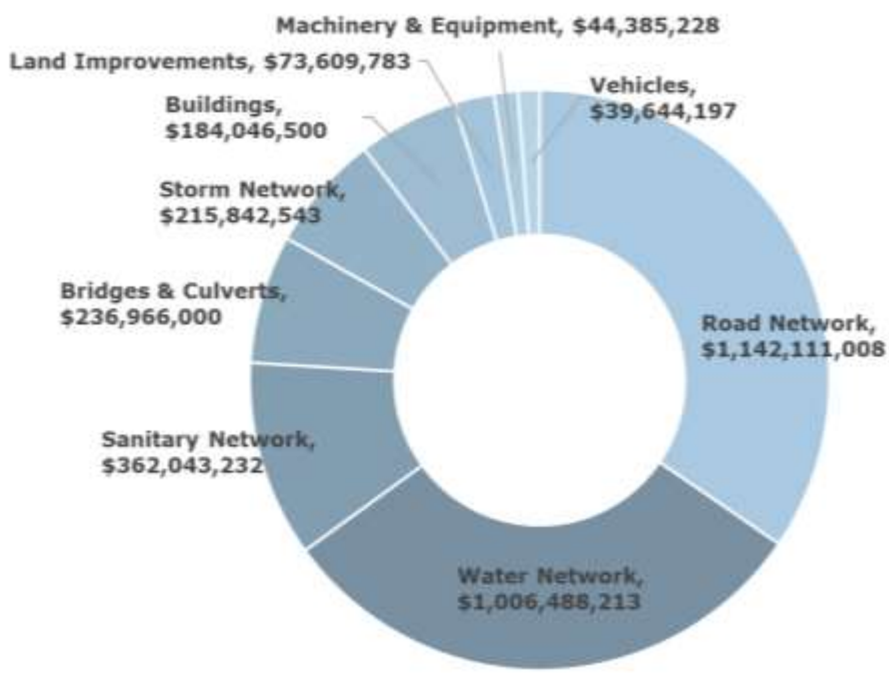
State of the Infrastructure

Asset Category	Replacement Cost	Asset Condition	Financial Capacity	
Road Network	$1,142,111,008	Good (66%)	Annual Requirement:	$25,597,099
			Funding Available:	$13,521,903
			Annual Deficit:	$12,075,196
Bridges & Culverts	$236,966,000	Good (71%)	Annual Requirement:	$4,739,320
			Funding Available:	$1,735,869
			Annual Deficit:	$3,003,451
Storm Network	$215,842,543	Good (64%)	Annual Requirement:	$2,200,147
			Funding Available:	$805,847
			Annual Deficit:	$1,394,300
Water Network	$1,006,488,213	Very Good (81%)	Annual Requirement:	$17,669,336
			Funding Available:	$5,294,406
			Annual Deficit:	$12,374,930
Sanitary Network	$362,043,232	Good (71%)	Annual Requirement:	$6,792,456
			Funding Available:	$2,323,959
			Annual Deficit:	$4,468,498
Buildings	$184,046,500	Fair (55%)	Annual Requirement:	$3,789,831
			Funding Available:	$1,388,100
			Annual Deficit:	$2,401,731
Land Improvements	$73,609,783	Fair (51%)	Annual Requirement:	$4,300,970
			Funding Available:	$1,575,315
			Annual Deficit:	$2,725,656
Vehicles	$39,644,197	Fair (53%)	Annual Requirement:	$3,046,422
			Funding Available:	$1,115,812
			Annual Deficit:	$1,930,610
Machinery & Equipment	$44,385,228	Fair (45%)	Annual Requirement:	$4,688,638
			Funding Available:	$1,717,305
			Annual Deficit:	$2,971,333
Overall	$3,305,136,703	Good (72%)	Annual Requirement:	$72,824,220
			Funding Available:	$29,478,514
			Annual Deficit:	$43,345,706

Replacement Cost

The asset categories have a total replacement cost of $3.3 billion based on available inventory data. This total was determined based on a combination of user-defined costs and historical cost inflation. This estimate reflects replacement of historical assets with similar, not necessarily identical, assets available for procurement today.

Figure 6 Asset Portfolio Replacement Value Breakdown

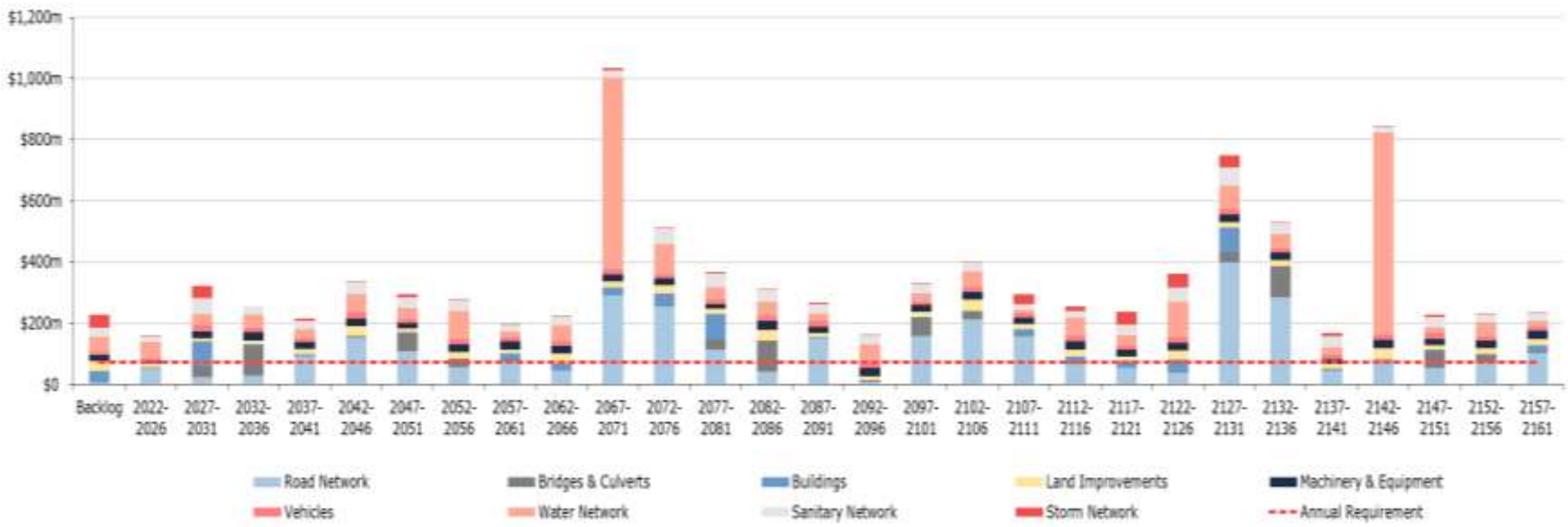


Forecasted Capital Requirements

Aging assets require maintenance, rehabilitation, and replacement. Figure 6 below illustrates the cyclical short-, medium- and long-term infrastructure replacement requirements for all asset categories analysed. On average, $72.8 million is required each year to remain current with capital replacement needs for the County's asset portfolio (red dotted line).

Although actual spending may fluctuate substantially from year to year, this figure is a useful benchmark for annual capital expenditure targets (or allocations to reserves) to ensure projects are not deferred and replacement needs are met as they arise. This figure relies on age and available condition data. Based on the current replacement cost of the portfolio, estimated at $3.3 billion, this represents an annual target reinvestment rate of 2.2%.

Figure 7 Forecasted Capital Requirements



The chart also illustrates a backlog of $228 million, comprising assets that remain in service beyond their estimated useful life. It is unlikely that all such assets are in a state of disrepair, requiring immediate replacements or major renewals. This makes targeted and consistent condition assessments integral.

Risk frameworks, proactive lifecycle strategies, and levels of service targets can then be used to prioritize projects, continuously refine estimates for both backlogs and ongoing capital needs and help select the right treatment for each asset.

Condition of Asset Portfolio

The current condition of the assets is central to all asset management planning. Collectively, 89% of assets in Haldimand County are in fair or better condition. This estimate relies on both age-based and field condition data.

Assessed condition data is available for 50% of assets; for the remaining portfolio, age is used as an approximation of condition. Assessed condition data is invaluable in asset management planning as it reflects the true condition of the asset and its ability to perform its functions. The table below identifies the source of condition data.

Table 5 Assessed Condition Data Sources

Asset Category	Assets with Assessed Condition	Source of Condition Data
Road Network	97%	Roads Needs Study - Stantec
Bridges & Culverts	100%	Vallee Consulting Engineers, Architects & Planners
Water Network	16%	Engineering Assessment
All other Categories	0%	Age-based Assessments Only

Service Life Remaining

Based on asset age, available assessed condition data and estimated useful life, 22% of the County's assets will require rehabilitation / replacement within the next 10 years. Details of the capital requirements over the next 10 years are identified by asset category in each asset section.

Risk & Criticality

The County has noted key trends, challenges, and risks to service delivery that they are currently facing:

Organizational Capacity

Staff resources have been focused primarily on accommodating infrastructure requirements. This leaves little time to dedicate towards asset management planning activities such as data refinement and lifecycle strategy development.

Asset Data & Information

There is a lack of confidence in the available inventory data for asset management purposes. Staff are in the process of evaluating the resources and activities required to build and/or improve the existing asset inventory including consolidating data sources. Staff plan to prioritize data refinement efforts to increase confidence in the accuracy and reliability of asset data and information.

The overall risk breakdown for Haldimand County's asset inventory is portrayed in Figure 8. Reviewing the list of very high-risk assets to evaluate how best to mitigate the level of risk the County is experiencing will help advance Haldimand County's asset management program.

Figure 8 Overall Asset Risk Breakdown

Haldimand County Climate Profile

Haldimand County is a rural city-status single-tier municipality on the Niagara Peninsula in southern Ontario. The County is expected to experience notable effects of climate change which include higher average annual temperatures, an increase in total annual precipitation, and an increase in the frequency and severity of extreme events. According to Climatedata.ca – a collaboration supported by Environment and Climate Change Canada (ECCC) – Haldimand

County may experience the following trends:

1. Higher Average Annual Temperature

- Between the years 1981 and 2010 the annual average temperature was 8.7ºC
- Under a high emissions scenario, the annual average temperatures are projected to increase to 10.6ºC by the year 2050 and to 14ºC by the end of the century.

2. Increase in Total Annual Precipitation

- Under a high emissions scenario, Haldimand County is projected to experience a 7% increase in precipitation by the year 2050 and a 14% increase by the end of the century.

3. Increase in Frequency of Extreme Weather Events

- It is expected that the frequency and severity of extreme weather events will change.

Integration Climate Change and Asset Management

Asset management practices aim to deliver sustainable service delivery - the delivery of services to residents today without compromising the services and well-being of future residents. Climate change threatens sustainable service delivery by reducing the useful life of an asset and increasing the risk of asset failure. Desired levels of service can be more difficult to achieve because of climate change impacts such as flooding, high heat, drought, and more frequent and intense storms.

To achieve the sustainable delivery of services, climate change considerations should be incorporated into asset management practices. The integration of asset management and climate change adaptation observes industry best practices and enables the development of a holistic approach to risk management.

Reinvestment Rate

The graph below depicts funding gaps or surpluses by comparing target vs actual reinvestment rate. To meet the long-term replacement needs, the County should be allocating approximately $72.8 million annually, for a target reinvestment rate of 2.2%. Actual annual spending on infrastructure totals approximately $29,478,514, for an actual reinvestment rate of 0.89%.

Figure 9 Target vs Actual Reinvestment Rates

Impacts of Growth

Description of Growth Assumptions

The demand for infrastructure and services will change over time based on a combination of internal and external factors. Understanding the key drivers of growth and demand will allow the County to plan for new infrastructure more effectively, and the upgrade or disposal of existing infrastructure. Increases or decreases in demand can affect what assets are needed and what level of service meets the needs of the community.

The Haldimand County Official Plan (2006)

The Haldimand County's Official Plan was originally adopted by Council in 2006 and approved by the Province in 2009. The County has undertaken a Municipal Comprehensive Review of the document and broken the project into two phases. Phase 1 was approved by the Province in November 2021 and focused on the County's Growth Strategy, including overall Growth Plan Conformity and population forecasts. Phase 2 relates to a general update of the County policies and the major themes of the Official Plan. It was adopted by Haldimand County Council on August 29th, 2022 and is currently with the Province for approval.

The Official Plan provides guidance for land use in the County and sets out the policies to guide and manage the maintenance, rehabilitation, growth and development of the County to ensure a sustainable living environment that meets the needs of the community over the 30-year planning horizon to 2051. The document facilitates the vision of the County with consideration of the policies of the Provincial Policy Statement 2020, and the Growth Plan for the Greater Golden Horseshoe, 2020.

The vision statement in the Official Plan states that Haldimand County aims to build a caring, friendly community that is an exceptional place to live, work, play and nurture future generations. Haldimand County values its diversity and unique mix of urban and rural interests and is committed to preserving its rich natural environment and small-town character. The vision includes a strong agricultural foundation and a diverse range of economic opportunities based on its strategic location, resources and unique history and heritage. The document planning horizon spans 30 years, covering it to the year 2051.

The following table outlines population, private dwellings and employment changes in the County between 2011-2021 from Statistics Canada, for which the County provides services. The County focuses on maintaining and enhancing appropriate levels of service in both physical infrastructure and social services with respect to the growth opportunities.

Year	Population	Private Dwellings	Employment
2021	49,216	20,710	N/A
2016	45,608	19,472	24,305
2011	44,876	19,108	N/A

Other Related Documents

The Growth Strategy Report for Haldimand County was developed to address the requirements of Phase 1 of the Official Plan Update work program. The report is based on the growth policies of the Provincial Policy Statement 2020 (PPS 2020) and the Growth Plan for the Greater Golden Horseshoe including the recently approved Amendment No. 1 (Growth Plan 2020).

The Growth Strategy Report includes a detailed land needs assessment for residential, community employment and employment area lands with respect to the intensification targets, density targets and the recent population, household, and employment forecasts. The Growth Plan establishes the population and employment forecasts for Haldimand County as a total population of 75,000 and a total employment of 29,000 jobs in 2051.

To accommodate sufficient land supply and affordable housing for expected future growth in the County, the growth is to be concentrated in the six urban areas. The intensification target in the Haldimand Official Plan is currently set at 32% of all new housing units. This target was based on about 68 new housing units being constructed within the delineated built-up areas of the County's six urban communities.

The County will ensure to provide sufficient water and wastewater services to accommodate residential, commercial, institutional, and industrial development in a timely manner through monitoring residual water and sewage treatment reserves.

Impact of Growth on Lifecycle Activities

By July 1, 2025, the County's asset management plan must include a discussion of how the assumptions regarding future changes in population and economic activity informed the preparation of the lifecycle management and financial strategy.

The Official Plan for Haldimand County has indicated the vision statement as fostering healthy change and growth. The County will ensure the sewage treatment, waste disposal services, water supply services, stormwater management, transport pathways, utilities and emergency services are planned and developed to provide for the growth targets outlined in the Official Plan.

As growth-related assets are constructed or acquired, they should be integrated into Haldimand County's asset management program. While the addition of residential units will add to the existing assessment base and offset some of the costs associated with growth, the County will need to review the lifecycle costs of growth-related infrastructure. These costs should be considered in long-term funding strategies that are designed to, at a minimum, maintain the current level of service.

Financial Strategy

Financial Strategy Overview

Each year, Haldimand County makes important investments in its infrastructure's maintenance, renewal, rehabilitation, and replacement to ensure assets remain in a state of good repair. However, spending needs typically exceed fiscal capacity. In fact, most municipalities continue to struggle with annual infrastructure deficits. Achieving full-funding for infrastructure programs will take many years and should be phased-in gradually to reduce burden on the community.

This financial strategy is designed for the County's existing asset portfolio and is premised on two key inputs: the average annual capital requirements and the average annual funding typically available for capital purposes. The annual requirements are based on the replacement cost of assets and their serviceable life, and where available, lifecycle modeling. This figure is calculated for each individual asset and aggregated to develop category-level values.

The annual funding typically available is determined by averaging historical capital expenditures on infrastructure, inclusive of any allocations to reserves for capital purposes. For Haldimand, the approved 2022 values were used to project available funding.

Only reliable and predictable sources of funding are used to benchmark funds that may be available on any given year. The funding sources include:

- Revenue from taxation allocated to reserves for capital purposes
- Revenue from water and wastewater rates allocated to capital reserves
- The Canada Community Benefits Fund (CCBF), formerly the federal Gas Tax Fund
- The Ontario Community Infrastructure Fund (OCIF)

Although provincial and federal infrastructure programs can change with evolving policy, CCBF, OCIF, and OMPF are considered as permanent and predictable.

Annual Capital Requirements

The annual requirements represent the amount the County should allocate annually to each asset category to meet replacement needs as they arise, prevent infrastructure backlogs, and achieve long-term sustainability. For most asset categories the annual requirement has been calculated based on a "replacement only" scenario, in which capital costs are only incurred at the construction and replacement of each asset.

However, for the road network, lifecycle management strategies have been developed to identify capital costs that are realized through strategic rehabilitation and renewal. The development of these strategies allows for a comparison of potential cost avoidance if the strategies were to be implemented.

The following table compares two scenarios for the road network:

- **Replacement Only Scenario:** Based on the assumption that assets deteriorate and without regularly scheduled maintenance and rehabilitation are replaced at the end of their service life.
- **Lifecycle Strategy Scenario:** Based on the assumption that lifecycle activities are performed at strategic intervals to extend the service life of assets until replacement is required.

Table 6 Road Network Annual Requirement Comparison

Asset Category	Annual Requirements (Replacement Only)	Annual Requirements (Lifecycle Strategy)	Difference
Road Network	$40,849,376	$25,597,099	$15,252,277

The implementation of a proactive lifecycle strategy for roads leads to a potential annual cost avoidance of approximately $15 million for the road network. This represents an overall reduction of the annual requirements by 37%.

As the lifecycle strategy scenario represents the lowest cost option available to the County, we have used this annual requirement in the development of the financial strategy.

Table 7 outlines the total average annual capital requirements for existing assets in each asset category. Based on a replacement cost of $3.3 billion, annual capital requirements total more than $72.8 million for all the asset categories analysed.

The table also illustrates the system-generated, equivalent target reinvestment rate (TRR), calculated by dividing the annual capital requirements by the total replacement cost of each category. The cumulative target reinvestment for these categories is estimated at 2.2%.

Table 7 Average Annual Capital Requirements

Asset Category	Replacement Cost	Annual Capital Requirements	Target Reinvestment Rate
Road Network	$1,142,111,008	$25,597,099	2.2%
Bridges & Culverts	$236,966,000	$4,739,320	2.0%
Stormwater Network	$215,842,543	$2,200,147	1.0%
Water Network	$1,006,488,213	$17,669,336	1.8%
Sanitary Network	$362,043,232	$6,792,456	1.9%
Buildings	$184,046,500	$3,789,831	2.1%
Land Improvements	$73,609,783	$4,300,970	5.8%
Vehicles	$39,644,197	$3,046,422	7.7%
Machinery & Equipment	$44,385,228	$4,688,638	10.6%
Total	**$3,305,136,703**	**$72,824,220**	**2.20%**

Although there is no industry standard guide on optimal annual investment in infrastructure, the TRR's above provide a useful benchmark for organizations. In 2016, the Canadian Infrastructure Report Card (CIRC) produced an assessment of the health of municipal infrastructure as reported by cities and communities across Canada. The CIRC remains a joint project produced by several organizations, including the Federation of Canadian Municipalities (FCM), the Canadian Society of Civil Engineers (CSCE), the Canadian Network of Asset Managers (CNAM), and the Canadian Public Works Association (CPWA).

The 2016 version of the report card also contained recommended reinvestment rates that can also serve as benchmarks for municipalities. The CIRC suggest that, if increased, these reinvestment rates can "stop the deterioration of municipal infrastructure." The report card contains both a range for reinvestment rates that outlines the lower and upper recommended levels, as well as current municipal averages.

Current Funding Levels

Table 8 summarizes how current funding levels compare with funding required for each asset category. At existing levels, the County is funding 40% of its annual capital requirements for all infrastructure analyzed. This creates a total annual funding deficit of $43.3 million.

Table 8 Current Funding Position vs Required Funding

Asset Category	Annual Capital Requirements	Annual Funding Available	Annual Infrastructure Deficit	Funding Level
Road Network	$25,597,099	$13,521,903	$12,075,196	53%
Bridges & Culverts	$4,739,320	$1,735,869	$3,003,451	37%
Stormwater Network	$2,200,147	$805,847	$1,394,300	37%
Water Network	$17,669,336	$5,294,406	$12,374,930	30%
Sanitary Network	$6,792,456	$2,323,959	$4,468,498	34%
Buildings	$3,789,831	$1,388,100	$2,401,731	37%
Land Improvements	$4,300,970	$1,575,315	$2,725,656	37%
Vehicles	$3,046,422	$1,115,812	$1,930,610	37%
Machinery & Equipment	$4,688,638	$1,717,305	$2,971,333	37%
Total	**$72,824,219**	**$29,478,516**	**$43,345,705**	**40%**

Closing the Gap

Eliminating annual infrastructure funding shortfalls is a difficult and long-term endeavour for municipalities. Considering the County's current funding position, it will require many years to reach full funding for current assets.

This section outlines how Haldimand County can close the annual funding deficits using own-source revenue streams, i.e., property taxation and utility rates, and without the use of additional debt for existing assets.

Full Funding Requirements Tax Revenues

In 2022, Haldimand County will have an annual tax revenue of $73,278,833. As illustrated in the following table, without consideration of any other sources of revenue or cost containment strategies, full funding would require a 36.2% tax change over time.

To achieve this increase, several scenarios have been developed using phase-in periods ranging from five to twenty years. Shorter phase-in periods may place too high a burden on taxpayers, whereas a phase-in period beyond 20 years may see a continued deterioration of infrastructure, leading to larger backlogs.

Table 9 Phasing in Annual Tax Increases

Total % Increase Needed in Annual Property Taxation Revenues	Phase-in Period			
	5 Years	10 Years	15 Years	20 Years
36.2%	6.4%	3.1%	2.1%	1.6%

Funding 100% of annual capital requirements ensures that major capital events, including replacements, are completed as required. Under this scenario, projects are unlikely to be deferred to future years. This delivers the highest asset performance and customer levels of service.

Reallocating debt payments as they become available is a financial strategy that Haldimand County currently utilizes. By utilizing the reallocating, the debt payments to capital funding Table 10 illustrates the % annual increase needed.

Table 10 Including Reallocating Debt Payment Phasing in Tax Increases

Phase In Period	5 Years	10 Years	15 Years	20 Years
Available Debt Payment Funds	$1,291,129	$3,108,695	$4,167,283	$5,607,634
% Increase in Annual Taxation	6.1%	2.8%	1.8%	1.3%

Full Funding Requirements Utility Rate Revenues

For 2022, Haldimand County's forecasted water rate revenues total $13,256,920. Annual capital requirements for the water network total $17,669,336, against available funding of $5,294,406. This creates a funding deficit of $12,374,930. To close this annual gap, the County's water revenues would need to increase.

Similarly, sanitary rate revenues are forecasted to be $9,198,840 in 2022. Average annual requirements for Haldimand County's sanitary assets total $6,792,456, against available funding of $2,323,959, creating an annual deficit of $4,468,498. Rate revenues would need to increase to close this funding gap.

To achieve these increases, several scenarios have been developed using phase-in periods ranging from five to twenty years. As with tax revenues, short phase-in periods may require excessive rate increases, whereas more protracted timeframes may lead to larger backlogs and more unpredictable spending on emergency repairs and replacements.

Table 11 Phasing in Rate Increases

Category	Phase-in Period			
	5 Years	10 Years	15 Years	20 Years
Water Network	14.1%	6.8%	4.5%	3.4%
Sanitary Network	8.2%	4.0%	2.7%	2.0%

Funding 100% of annual capital requirements ensures that major capital events, including replacements, are completed as required. Under this scenario, projects are unlikely to be deferred to future years. This delivers the highest asset performance and customer levels of service.

Reallocating debt payments as they become available is a financial strategy that Haldimand County currently utilizes. By reallocating the debt payments to capital funding Table 12 illustrates the % annual increase needed per category.

Table 12 Including Reallocating Debt Payment Phasing in Rate Increases

Phase In Period	5 Years	10 Years	15 Years	20 Years
Water Network				
Available Debt Payment Funds	$83,633	$1,276,286	$1,276,286	$1,276,286
% Annual Increase	14.0%	6.3%	4.1%	3.1%
Sanitary Network				
Available Debt Payment Funds	$373,409	$2,535,998	$2,535,998	$2,535,998
% Annual Increase	7.6%	1.9%	1.3%	1.0%

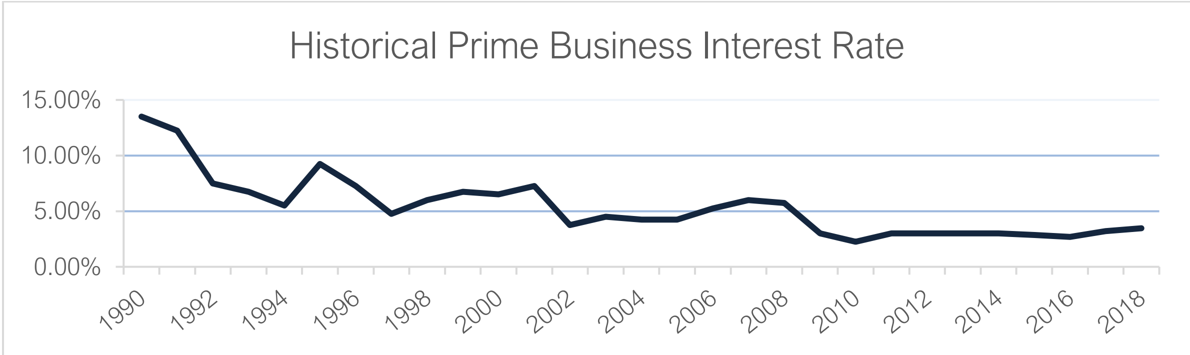
Use of Debt

For reference purposes, the following table outlines the premium paid on a project if financed by debt. For example, a $1M project financed at 3.0%[1] over 15 years would result in a 26% premium or $260,000 of increased costs due to interest payments. For simplicity, the table does not consider the time value of money or the effect of inflation on delayed projects.

Interest Rate	**Number of Years Financed**					
	5	**10**	**15**	**20**	**25**	**30**
7.0%	22%	42%	65%	89%	115%	142%
6.5%	20%	39%	60%	82%	105%	130%
6.0%	19%	36%	54%	74%	96%	118%
5.5%	17%	33%	49%	67%	86%	106%
5.0%	15%	30%	45%	60%	77%	95%
4.5%	14%	26%	40%	54%	69%	84%
4.0%	12%	23%	35%	47%	60%	73%
3.5%	11%	20%	30%	41%	52%	63%
3.0%	9%	17%	26%	34%	44%	53%
2.5%	8%	14%	21%	28%	36%	43%
2.0%	6%	11%	17%	22%	28%	34%
1.5%	5%	8%	12%	16%	21%	25%
1.0%	3%	6%	8%	11%	14%	16%
0.5%	2%	3%	4%	5%	7%	8%
0.0%	0%	0%	0%	0%	0%	0%

[1] Current municipal Infrastructure Ontario rates for 15-year lending is 3.2%.

It should be noted that current interest rates are near all-time lows. Sustainable funding models that include debt need to incorporate the risk of rising interest rates. The following graph shows where historical lending rates have been:



A change in 15-year rates from 3% to 6% would change the premium from 26% to 54%. Such a change would have a significant impact on a financial plan.

The following tables outline how Haldimand County has historically used debt for investing in the asset categories as listed.

Asset Category	**Current Debt Outstanding**	**Use of Debt in the Last Five Years**				
		2017	**2018**	**2019**	**2020**	**2021**
Tax Categories	$40,379,088	$864,700	$0	$22,909,800	$0	$524,140
Rate Categories	$23,585,305	$11,467,300	$0	$562,500	$9,178,950	$7,824,510
Total	**$63,964,393**	**$12,332,000**	**$0**	**$23,472,300**	**$9,178,950**	**$8,348,650**

The revenue options outlined in this plan allows Haldimand County to fully fund its long-term infrastructure requirements without further use of debt.

Recommendations and Key Considerations

Financial Strategies

1. Review feasibility of adopting a full-funding scenario that achieve 100% of average annual requirements for the asset categories analyzed. This involves:
    - Implementing a 2.8% annual tax increase over a 10-year phase-in period and allocating the full increase in revenue toward tax-funded asset categories
    - Implementing a 6.3% rate increase for water, and a 1.9% increase for sanitary, over a 10-year phase-in period
    - Continued allocation of OCIF and CCBF funding as previously outlined
    - Using risk frameworks and staff judgement to prioritize projects, particularly to aid in elimination of existing infrastructure backlogs

Although difficult to capture, inflation costs, supply chain issues, and fluctuations in commodity prices will also influence capital expenditures.

Asset Data

1. Ensure stormwater inventory is complete and includes appurtenances.
2. Componentize facilities data using Uniformat II Code standard for building classifications. This can be accomplished during building condition assessments. This will improve long-term replacement projections and better align system-generated forecasts with capital budgets.
3. Continuously review, refine, and calibrate lifecycle and risk profiles to better reflect actual practices and improve capital projections. In particular:
    - the timing of various lifecycle events, the triggers for treatment, anticipated impacts of each treatment, and costs
    - the various attributes used to estimate the likelihood and consequence of asset failures, and their respective weightings
4. Asset management planning is highly sensitive to replacement costs. Periodically update replacement costs based on recent projects, invoices, or estimates, as well as condition assessments, or any other technical reports and studies. Material and labour costs can fluctuate due to local, regional, and broader market trends, and substantially so during major world events. Accurately estimating the replacement cost of like-for-like assets can be challenging. Ideally, several recent projects over multiple years should be used. Staff judgement and historical data can help attenuate extreme and temporary fluctuations in cost estimates and keep them realistic.
5. Like replacement costs, an asset's established serviceable life can have dramatic impacts on all projections and analyses, including condition, long-range forecasting, and financial recommendations. Periodically reviewing and updating these values to better reflect in-field performance and staff judgement is recommended.

Risk and Levels of Service

1. Risk models and matrices can play an important role in identifying high-value assets, and developing an action plan which may include repair, rehabilitation, replacement, or further evaluation through condition assessments. As a result, project selection and the development of multi-year capital plans can become more strategic and objective. Initial models have been built into Citywide for all asset groups. These models reflect current data, which was limited. As the data evolves and new attribute information is obtained, these models should also be refined and updated.
2. Although Ontario Regulation 588/17 requires reporting on specific, prescribed KPIs for the County's core assets, municipalities have discretion on the KPIs they select to track the performance of their non-core assets, such as buildings and vehicles. This information will be required for the 2024 iteration of the AMP. KPIs should be established for all non-core asset groups to support regulatory compliance. Further, as available, data on current performance should be centralized and tracked to support any calibration of service levels ahead of O. Reg's 2025 requirements on proposed levels of service.
3. Staff should monitor evolving local, regional, and environmental trends to identify factors that may shape the demand and delivery of infrastructure programs. These can include population growth, and the nature of population growth; climate change and extreme weather events; and economic conditions and the local tax base. This data can also be used to revise service level targets.

Appendix A: List of Tables & Figures

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Appendix B: Road Network

State of the Infrastructure

Haldimand County's road network comprises the largest share of its infrastructure portfolio, with a current replacement cost of more than $1.1 billion, distributed primarily between paved and surface treated roads.

The County also owns and manages other supporting infrastructure and capital assets, including sidewalks and lights (streetlights, traffic lights and other lights).

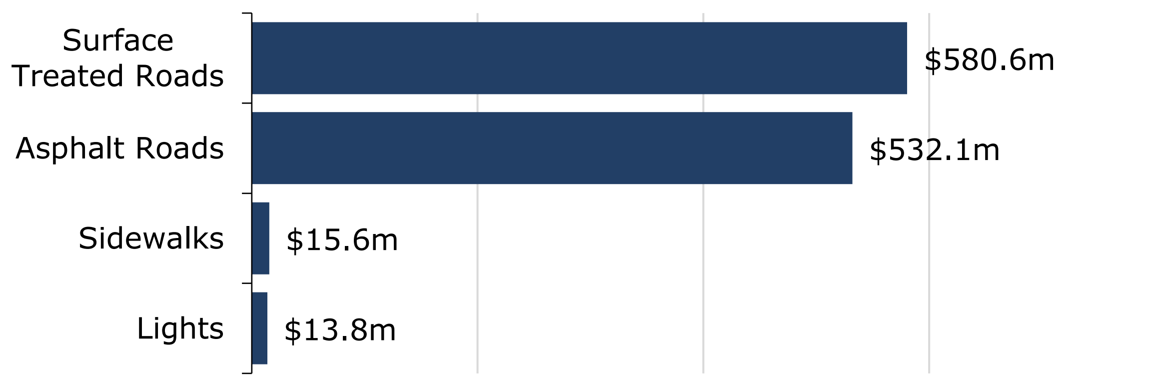
The state of the infrastructure for the road network is summarized below.

Replacement Cost	Condition	Financial Capacity	
$1,142,111,008	Good (66%)	Annual Requirement:	$25,597,099
		Funding Available:	$13,521,903
		Annual Deficit:	$12,075,196

Inventory & Valuation

The figure below displays the replacement cost of each asset segment in the County's road inventory.

Figure 10 Road Network Replacement Value

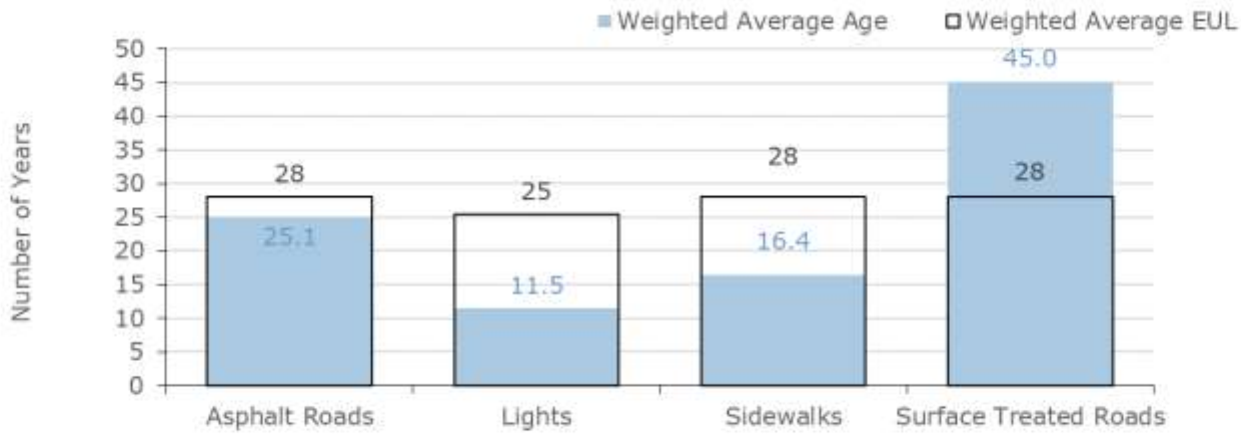


Each asset's replacement cost should be reviewed periodically to determine whether adjustments are needed to more accurate represent realistic capital requirements.

Asset Condition & Age

The graph below identifies the average age, and the estimated useful life for each asset segment. It is all weighted by replacement cost.

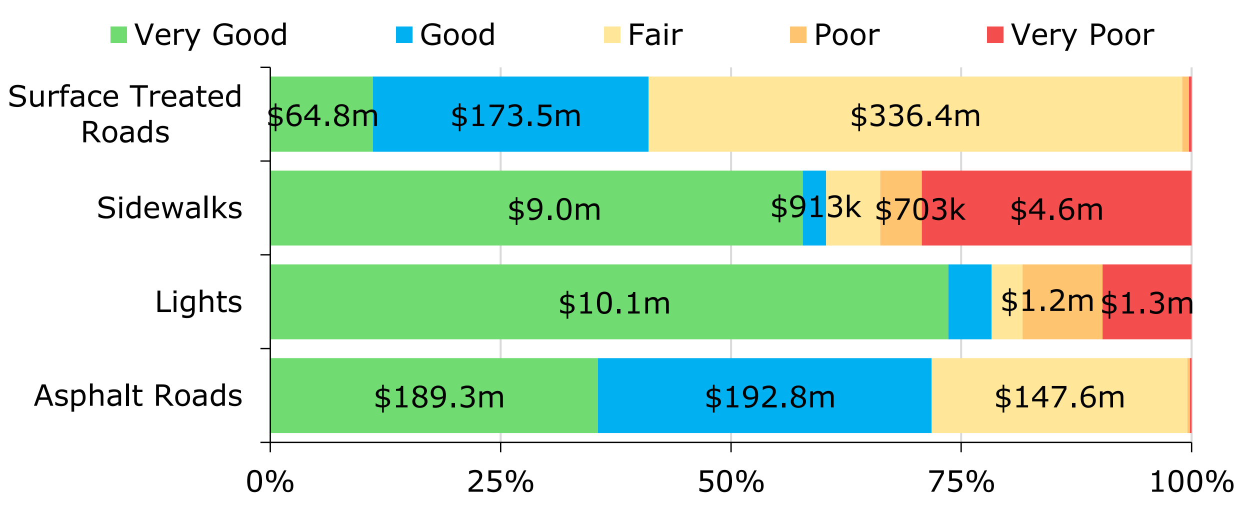
Figure 11 Road Network Average Age vs Average EUL



The analysis shows that, based on in-service dates, surface treated roads continue to remain in operation beyond their expected useful life, with an average age of 45 against an average expected serviceable life of 28 years. This is due to the life cycle management strategies currently being utilized which will be outlined in a later section.

The graph below visually illustrates the average condition for each asset segment on a very good to very poor scale.

Figure 12 Road Network Condition Breakdown



To ensure that Haldimand County's roads continue to provide an acceptable level of service, the County should monitor the average condition of all assets. If the average condition declines, staff should re-evaluate their lifecycle management strategy to determine what combination of maintenance, rehabilitation, and replacement activities is required to increase the overall condition of the roads.

Each asset's estimated useful life should also be reviewed periodically to determine whether adjustments need to be made to better align with the observed length of service life for each asset type.

Current Approach to Condition Assessment

Accurate and reliable condition data allows staff to determine the remaining service life of assets and identify the most cost-effective approach to managing assets. The County's current approach is described below.

The condition scale for roads utilized is from 0 to 100 from Very Poor to Very Good. See the following images as examples of a Very Good road and a road in Fair condition.

Figure 13 Townsend Parkway – LCB Rural (Very Good PCI=100)

Figure 14 Marshall Road – LCB Rural (Fair PCI=41)

Lifecycle Management Strategy

The condition or performance of most assets will deteriorate over time. This process is affected by a range of factors including an asset's characteristics, location, utilization, maintenance history and environment.

The following lifecycle strategies shown in Figure 15 have been developed as a proactive approach to managing the lifecycle of municipally owned roads. Instead of allowing the roads to deteriorate until replacement is required, strategic rehabilitation is expected to extend the service life of roads at a lower total cost.

Figure 15 Road Network Current Lifecycle Strategy

Maintenance

- deficiency repairs as required from patrols for minimum maintenance standards such as patching, shoulder grading, etc.

Rehabilitation / Renewal

- crack sealing within 10 years of paving or as needed once in the lifecycle
- resurfacing the roadway with a single or double depth surface overlay

Replacement

- roads are identified as needing to be replaced if the PCI reaches a condition score less than 40

PCI scores, staff judgment, traffic loads, and opportunity to bundle projects with utility work help inform the optimal lifecycle intervention, ranging from pothole repairs to potential replacements. A surface treated road lifecycle model is shown in Figure 16 and an asphalt lifecycle model is show in Figure 17.

Figure 16 Surface Treated (LCB) Road Lifecycle Model

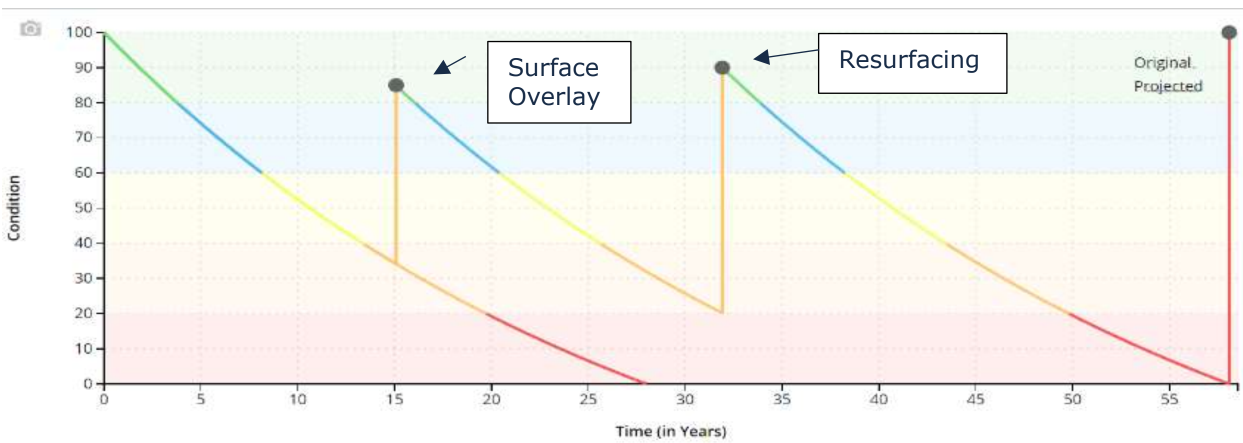
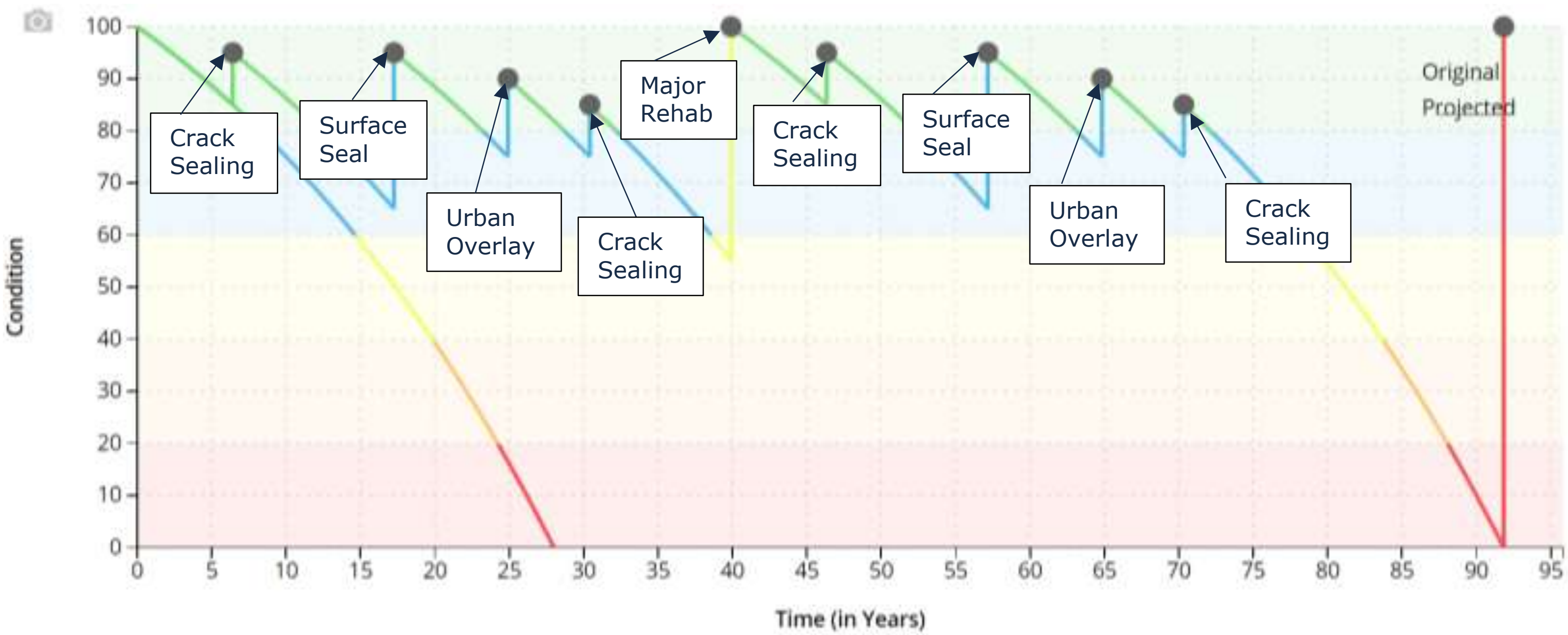


Figure 17 Asphalt (HCB) Road Lifecycle Model



Forecasted Capital Requirements

Figure 18 illustrates the cyclical short-, medium- and long-term infrastructure rehabilitation and replacement requirements for the County's road network. This analysis was run until 2121 to capture at least one iteration of replacement for the longest-lived asset in the asset register.

Haldimand County's average annual requirements (red dotted line) total $25.6 million for all assets in the road network. Although actual spending may fluctuate substantially from year to year, this figure is a useful benchmark value for annual capital expenditure targets (or allocations to reserves) to ensure projects are not deferred and replacement needs are met as they arise. The chart illustrates substantial capital needs through the forecast period in 5-year intervals.

It also shows a backlog $7 million, comprising assets that have reached the end of their useful life. The projections are designed to provide a long-term, portfolio-level overview of capital needs and should be used to support improved financial planning over several decades. They are based on asset replacement costs, age analysis, and condition data when available, as well as lifecycle modeling (roads only identified in Figure 16 and Figure 17).

Figure 18 Road Network Forecasted Capital Replacement Requirements

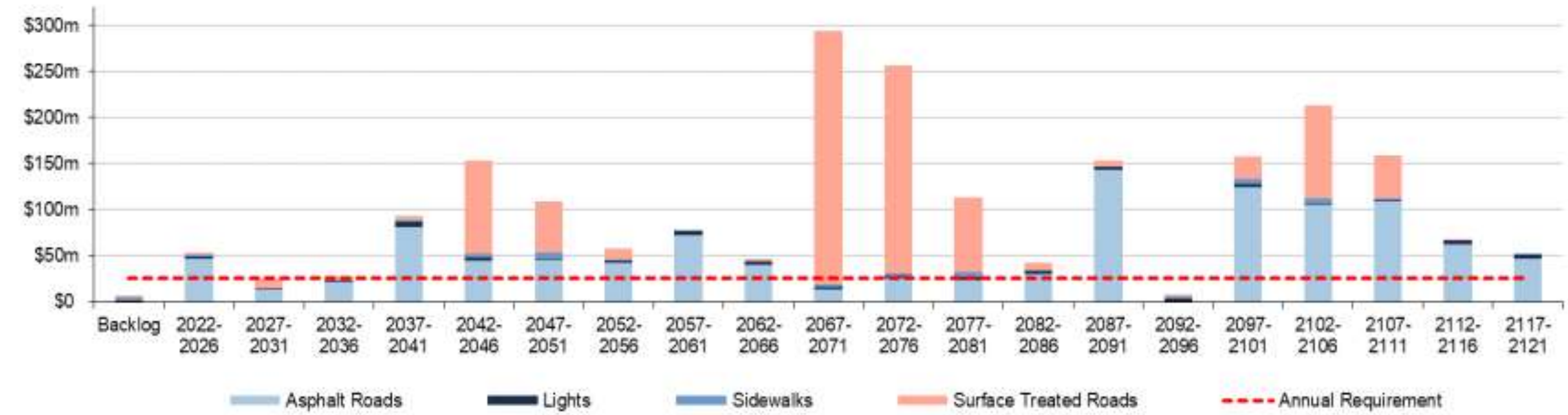


Table 13 below summarizes the projected cost of lifecycle activities (rehabilitation and replacement) that may need to be undertaken over the next 10 years to support current levels of service. These projections are generated in Citywide and rely on the data available in the asset register. These projections can be different from actual capital forecasts. Consistent data updates, especially condition, will improve the alignment between the system-generated expenditure requirements, and the County's capital expenditure forecasts.

Table 13 Road Network System-generated 10-Year Capital Costs

Segment	Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Asphalt Roads	$61.0m	$3.9m	$3.0m	$9.3m	$16.6m	$14.3m	$7.8m	$1.8m	$2.0m	$966k	$1.3m
Surface Treated Roads	$12.0m	$0	$47k	$178k	$743k	$1.3m	$2.4m	$3.3m	$1.9m	$1.1m	$1.1m
Lights	$2.4m	$333k	$55k	$340k	$913k	$58k	$345k	$74k	$112k	$82k	$67k
Sidewalks	$2.9m	$501k	$530k	$703k	$268k	$375k	$69k	$201k	$44k	$219k	$0

Gravel Road Conversion

Haldimand County has 65.8 km of gravel roads throughout the area. The current lifecycle management for gravel roads includes the addition of gravel as well as regular grading and calcium addition which are not captured as capital expenses. Haldimand County is currently undergoing a gravel road conversion to surface treatment and until the gravel roads are converted, they are accounted for as an operating expense. The conversion plan has a target completion year of 2025.

Through 2025, a total of 65.8 km of gravel roads are slated for conversion to surface treated roads, yielding higher service levels and improved user experience. Based on existing replacement costs and target reinvestment rates, this will result in an annual cost increase of $1.26 million. As roads are converted, their added lifecycle costs need to be factored into future financial planning, which will have implications on required tax revenues.

It is important to note that the capital requirements do not reflect the additional costs that will need to be accounted for as the County implements its gravel conversion program. As with all other areas, this analysis is highly sensitive to asset replacement costs and reinvestment rates.

Risk & Criticality

The following risk matrix provides a visual representation of the relationship between the probability of failure and the consequence of failure for the assets within this asset category based on available inventory data. See Appendix L: Risk Rating Criteria for the criteria used to determine the risk rating of each asset.

Figure 19 Road Network Risk Matrix

This is a high-level model developed by municipal staff and it should be reviewed and adjusted to reflect an evolving understanding of both the probability and consequences of asset failure.

The asset-specific attributes that municipal staff utilize to define and prioritize the criticality of the road network are documented below:

Table 14 Road Network Risk Criteria

Probability of Failure (POF)	Consequence of Failure (COF)
Condition (Structural)	Replacement Cost (70% Economic 50%)
Service Life Remaining (Functional)	Surface Type (30% Economic 50%)
	AADT (33% Social 50%)
	Road Type (34% Social 50%)
	Speed (33% Social 50%)

The identification of critical assets allows the County to determine appropriate risk mitigation strategies and treatment options. Risk mitigation may include asset-specific lifecycle strategies, condition assessment strategies, or simply the need to collect better asset data.

Levels of Service

The following tables identify the County's metrics to identify their current level of service for the roads. By comparing the cost, performance (average condition) and risk year-over-year, Haldimand County will be able to evaluate how their services/assets are trending. The County will use this data to set a target level of service and determine proposed levels for the regulation by 2025.

Figure 20 Road Network Target vs Actual Reinvestment Rate

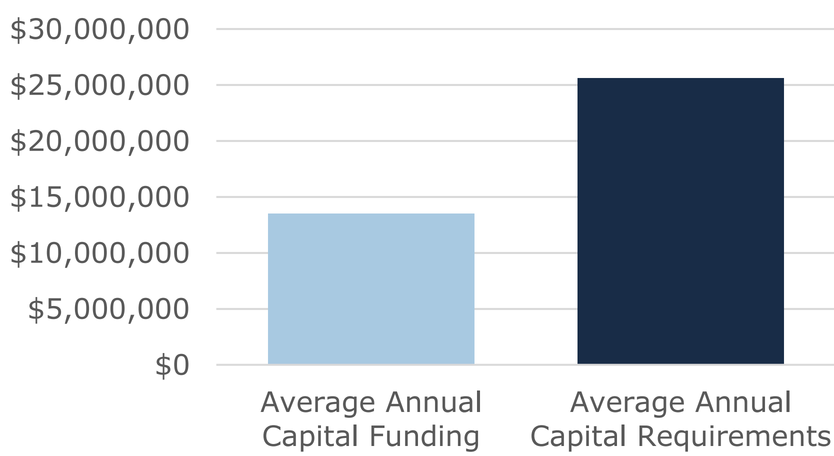


Figure 21 Road Network Average Condition

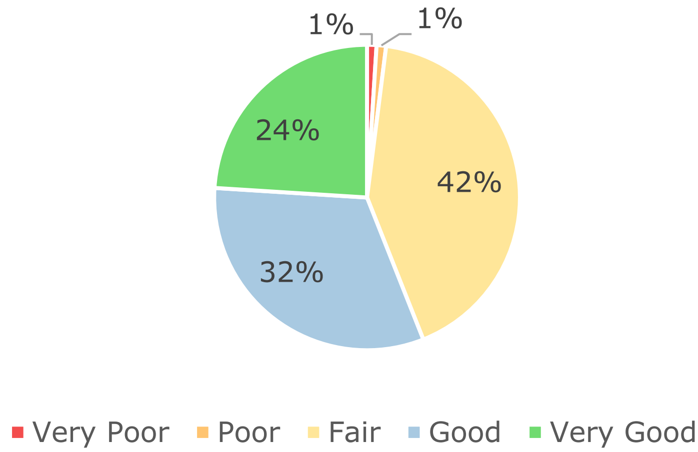
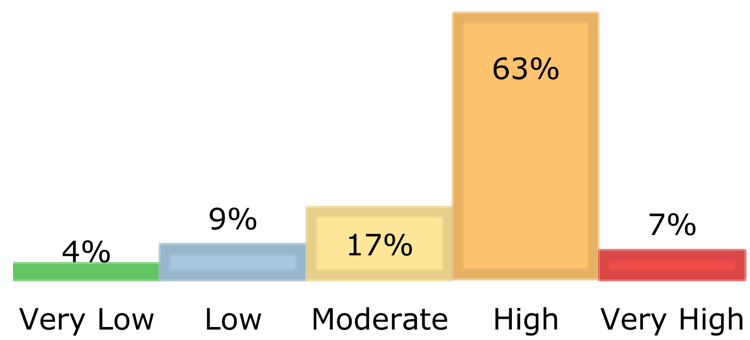


Figure 22 Road Network Risk Breakdown



The tables that follow summarize Haldimand County's current levels of service with respect to prescribed KPIs under Ontario Regulation 588/17.

Community Levels of Service

The following table outlines the qualitative descriptions that determine the community levels of service provided by the road network.

Table 15 Ontario Regulation 588/17 Road Network Community Levels of Service

Service Attribute	Qualitative Description	Current LOS
Scope	Description, which may include maps, of the road network in the municipality and its level of connectivity	See Appendix K: Level of Service Maps
Quality	Description or images that illustrate the different levels of road class pavement condition	See Figure 13 Townsend Parkway – LCB Rural (Very Good PCI=100) and Figure 14 Marshall Road – LCB Rural (Fair PCI=41)

Technical Levels of Service

The following table outlines the quantitative metrics that determine the technical level of service provided by the road network.

Table 16 Ontario Regulation 588/17 Road Network Technical Levels of Service

Service Attribute	Technical Metric	Current LOS
Scope	Lane-km of arterial roads (MMS classes 1 and 2) per land area (km/km^2)	0.694
	Lane-km of collector roads (MMS classes 3 and 4) per land area (km/km^2)	1.553
	Lane-km of local roads (MMS classes 5 and 6) per land area (km/km^2)	0.022
Quality	Average pavement condition index for paved roads	73.9 (Good)
	Average surface condition for unpaved roads (e.g. excellent, good, fair, poor)	Very Poor

Appendix C: Bridges & Culverts

State of the Infrastructure

Bridges and culverts (B&C) represent a critical portion of the transportation services provided to the community. The state of the infrastructure for bridges and structural culverts is summarized in the following table.

Replacement Cost	Condition	Financial Capacity	
$236,966,000	Good (71%)	Annual Requirement:	$4,739,320
		Funding Available:	$1,735,869
		Annual Deficit:	$3,003,451

Inventory & Valuation

Figure 23 below displays the replacement cost of each asset segment in the County's bridges and culverts inventory.

Figure 23 Bridges & Culverts Replacement Cost

Each asset's replacement cost should be reviewed periodically to determine whether adjustments are needed.

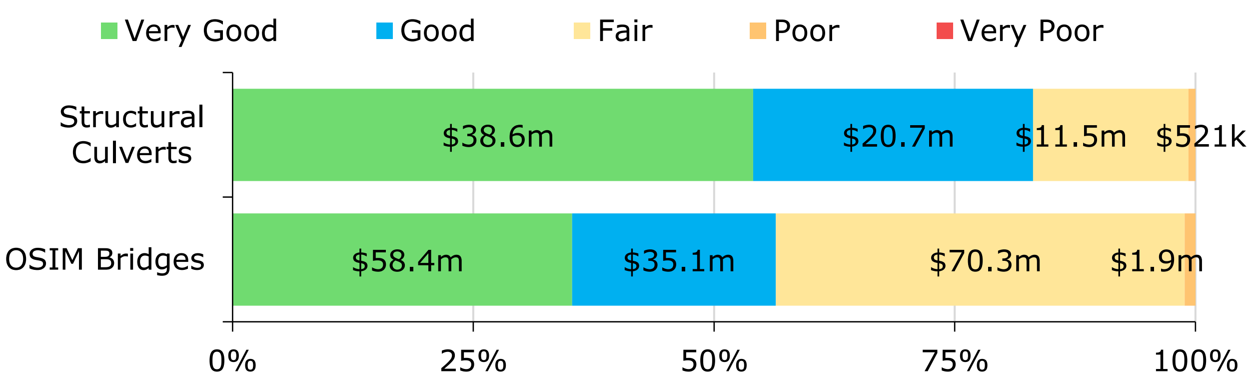
Asset Condition & Age

The graph below identifies the average age and the estimated useful life for each asset segment. The values are weighted based on replacement cost.

Figure 24 B&C Average Age vs Average EUL

The graph below visually illustrates the average condition for each asset segment on a very good to very poor scale.

Figure 25 B&C Condition Breakdown



To ensure that the County's bridges and culverts continue to provide an acceptable level of service, the staff should monitor the average condition of all assets.

Each asset's Estimated Useful Life should also be reviewed periodically to determine whether adjustments need to be made to better align with the observed length of service life for each asset type.

Current Approach to Condition Assessment

Accurate and reliable condition data allows staff to determine the remaining service life of assets and identify the most cost-effective approach to managing assets. Haldimand County's current approach is to assess the 104 bridges and 159 structural culverts every 2 years in accordance with the Ontario Structure Inspection Manual (OSIM). The most recent assessment was completed in 2021 by Vallee Consulting Engineers, Architects & Planners.

The condition scale for roads utilized is from 0 to 100 from Very Poor to Very Good. See the following images as examples of a very good bridge and structural culvert as well as a bridge and structural culvert in Fair condition.

Figure 26 Dennis Bridge (BCI=92 Very Good)

Figure 27 Balmoral Bridge (BCI=51 Fair)

Figure 28 Lakeshore Road Culvert (BCI=93 Very Good)

Figure 29 York Road Culvert (BCI=56 Fair)

Lifecycle Management Strategy

The condition or performance of most assets will deteriorate over time. To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration. The following table outlines the County's current lifecycle management strategy.

Figure 30 B&C Current Lifecycle Strategy

Maintenance / Rehabilitation / Replacement

- All lifecycle activities are driven by the results of inspections competed according to the Ontario Structure Inspection Manual (OSIM)

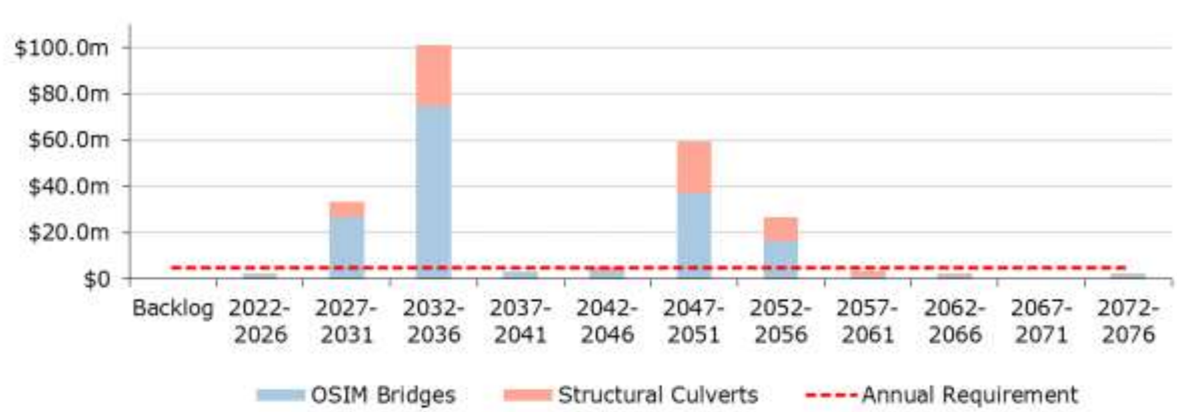
Forecasted Capital Requirements

Figure 31 illustrates the cyclical short-, medium- and long-term infrastructure rehabilitation and replacement requirements for the County's bridges and culverts. These projections are based on asset replacement costs, age analysis, and condition data. They are designed to provide a long-term, portfolio-level overview of capital needs and should be used to support improved financial planning over several decades.

The analysis was run until 2076 to capture at least one iteration of replacement for the longest-lived asset in the asset register. Haldimand's average annual requirements (red dotted line) for bridges and culverts total $4.7 million. Although actual spending may fluctuate substantially from year to year, this figure is a useful benchmark value for annual capital expenditure targets (or allocations to reserves) to ensure projects are not deferred and replacement needs are met as they arise.

OSIM condition assessments and a robust risk framework will ensure that high-criticality assets receive proper and timely lifecycle intervention, including replacements.

Figure 31 B&C Forecasted Capital Replacement Requirements



These are represented at the major asset level, i.e., full cost of bridge or culvert, rather than partial repair, rehabilitation, or replacement.

Table 17 below summarizes the projected cost of lifecycle activities (capital replacement only) that may need to be undertaken over the next 10 years to support current levels of service. These are represented at the major asset level, i.e., full cost of bridge or culvert, rather than partial repair, rehabilitation, or replacement.

Table 17 B&C System-generated 10-Year Capital Costs

Segment	Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
OSIM Bridges	$28.8m	$0	$0	$0	$1.3m	$579k	$675k	$8.6m	$2.1m	$13.2m	$2.3m
Structural Culverts	$6.6m	$0	$0	$0	$0	$144k	$683k	$365k	$594k	$1.6m	$3.2m

These projections are generated in Citywide and rely on the data available in the asset register. Assessed condition data and replacement costs were used to assist in forecasting replacement needs for bridges and structural culverts. These projections may be different from actual capital forecasts as outlined in OSIM inspections and recommended workplans. Consistent data updates, especially condition, will improve the alignment between the system-generated expenditure requirements, and the County’s capital expenditure forecasts, including long-term capital plans.

Risk & Criticality

The risk matrix provides a visual representation of the relationship between the probability of failure and the consequence of failure for the assets within this asset category based on available inventory data. See Appendix L: Risk Rating Criteria for the criteria used to determine the risk rating of each asset.

This is a high-level model developed by municipal staff and should be reviewed and adjusted to reflect an evolving understanding of both the probability and consequences of asset failure.

Figure 32 B&C Risk Matrix

The asset-specific attributes that municipal staff utilize to define and prioritize the criticality of bridges and culverts are documented in the following table.

Table 18 B&C Risk Criteria

Probability of Failure (POF)	Consequence of Failure (COF)
Condition	Replacement Cost (Economic 50%)
Service Life Remaining	MMS Class (25% Social 50%)
	Speed (25% Social 50%)
	Width (25% Social 50%)
	School Route (25% Social 50%)

The identification of critical assets allows the County to determine risk mitigation strategies and treatment options. Risk mitigation may include asset-specific lifecycle strategies, condition assessment strategies, or simply the need to collect better asset data.

Levels of Service

The following graphs identify the County's metrics to identify their current level of service for the bridges and culverts. By comparing the cost, performance (average condition) and risk year-over-year, Haldimand County will be able to evaluate how their services/assets are trending. The County will use this data to set a target level of service and determine proposed levels for the regulation by 2025.

Figure 33 B&C Target vs Actual Reinvestment Rate

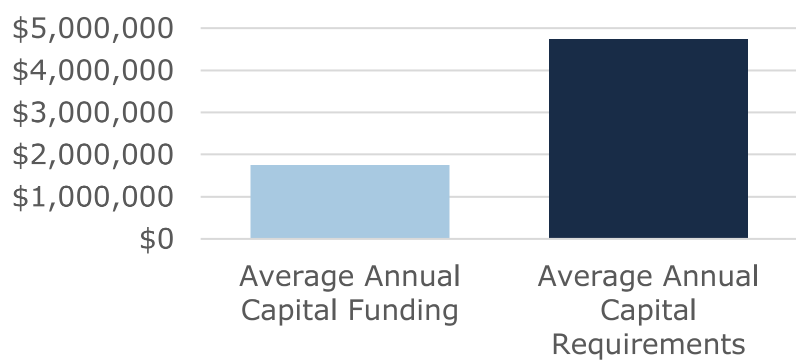


Figure 34 B&C Average Condition

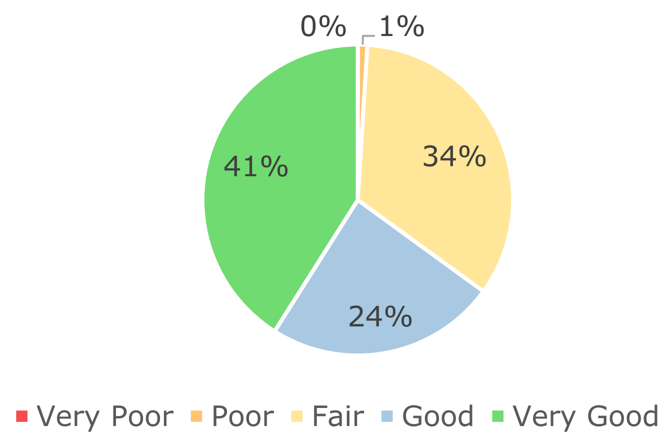
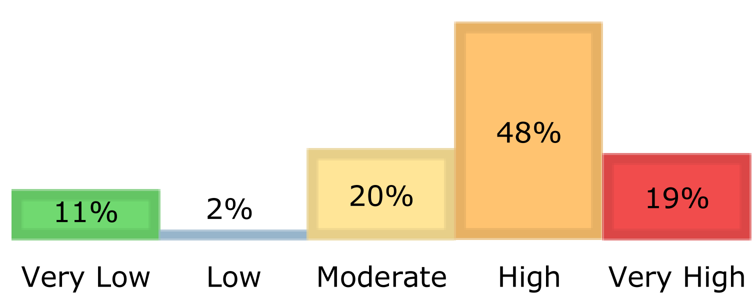


Figure 35 B&C Risk Breakdown



The metrics included below are the technical and community level of service metrics that are required as part of O. Reg. 588/17.

Community Levels of Service

The following table outlines the qualitative descriptions that determine the community levels of service provided by bridges and culverts.

Table 19 Ontario Regulation 588/17 B&C Community Levels of Service

Service Attribute	Qualitative Description	Current LOS
Scope	Description of the traffic that is supported by municipal bridges (e.g. heavy transport vehicles, motor vehicles, emergency vehicles, pedestrians, cyclists)	Bridges and culverts are a key component of the municipal transportation network.
Quality	Description or images of the condition of bridges and culverts and how this would affect use of the bridges and culverts	See Figure 26 Dennis Bridge (BCI=92 Very Good), Figure 27 Balmoral Bridge (BCI=51 Fair), Figure 28 Lakeshore Road Culvert (BCI=93 Very Good)and Figure 29 York Road Culvert (BCI=56 Fair)

Technical Levels of Service

The following table outlines the quantitative metrics that determine the technical level of service provided by bridges and culverts.

Table 20 Ontario Regulation 588/17 B&C Technical Levels of Service

Service Attribute	Technical Metric	Current LOS
Scope	% of bridges in the municipality with loading or dimensional restrictions	2%
Quality	Average bridge condition index value for bridges	73.8
	Average bridge condition index value for structural culverts	77.8

Appendix D: Stormwater Network

State of the Infrastructure

The County is responsible for owning and maintaining a storm system in the community which is generally made up of storm mains, catch basins, and manholes.

Staff are working towards improving the accuracy and reliability of their stormwater network inventory to assist with long-term asset management planning as well as assessing the system for capacity and resiliency.

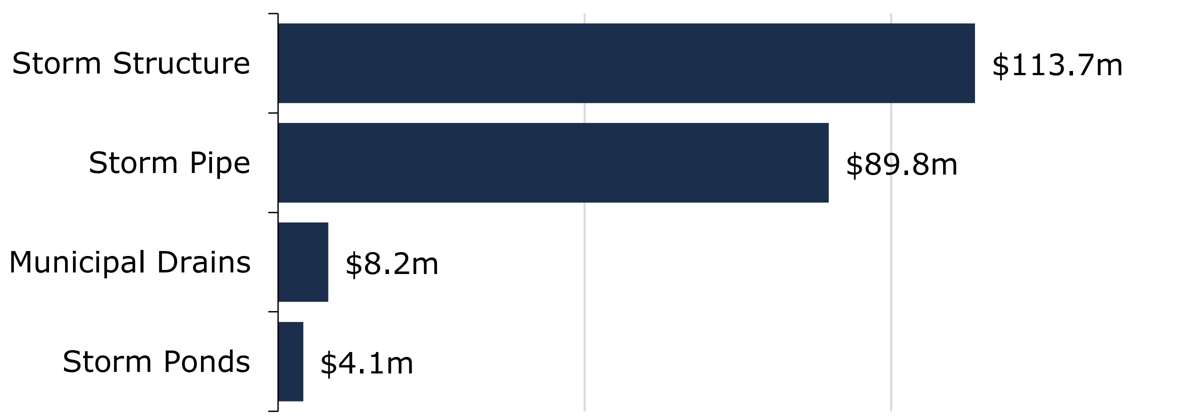
The state of the infrastructure for the stormwater network is summarized in the following table.

Replacement Cost	Condition	Financial Capacity	
$215,842,543	Good (64%)	Annual Requirement:	$2,200,147
		Funding Available:	$805,847
		Annual Deficit:	$1,394,300

Asset Inventory & Costs

Figure 36 below displays the replacement cost of each asset segment in the County's storm network inventory.

Figure 36 Storm Network Replacement Cost

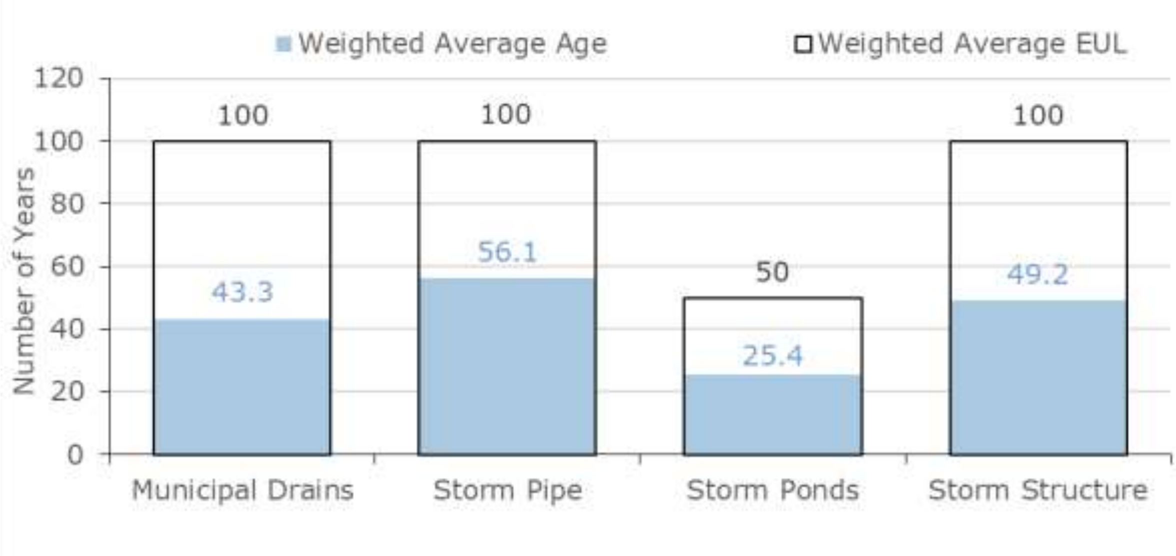


Each asset's replacement cost should be reviewed periodically to determine whether adjustments are needed to more accurately represent realistic capital requirements.

Asset Condition & Age

The graph below identifies the average age and the estimated useful life for each asset segment. The values are weighted based on replacement cost.

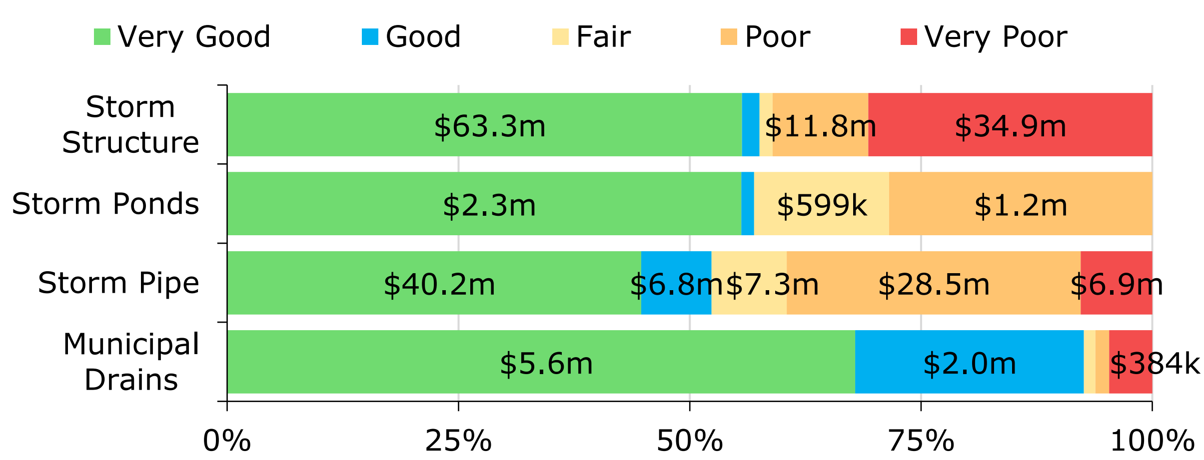
Figure 37 Storm Network Average Age vs Average EUL



Each asset's estimated useful life should also be reviewed periodically to determine whether adjustments need to be made to better align with the observed length of service life for each asset type.

Figure 38 displays the average condition for each asset segment on a very good to very poor for the storm network in the County. All the condition data for the storm network is age-based estimates.

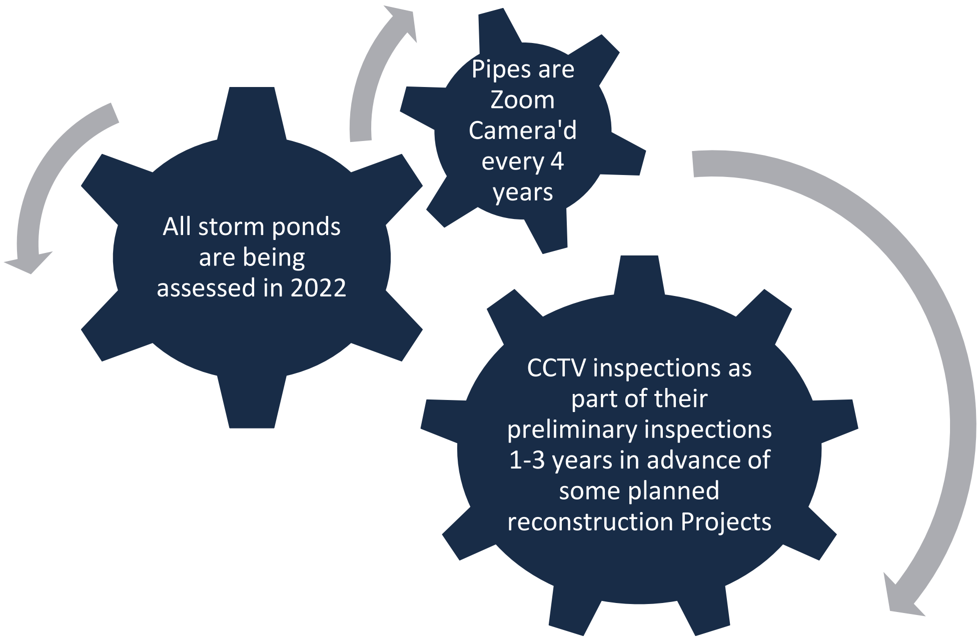
Figure 38 Storm Network Condition Breakdown



To ensure that the County's stormwater network continues to provide an acceptable level of service, the County should monitor the average condition of all assets.

Current Approach to Condition Assessment

Accurate and reliable condition data allows staff to determine the remaining service life of assets and identify the most cost-effective approach to managing assets. The following describes the County's current approach:



Lifecycle Management Strategy

To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration. The following figures outline Haldimand County's current lifecycle management strategy.

Figure 39 Linear Storm Network Current Lifecycle Strategy

Maintenance

- Annual inspections and flushing
- Zoom camera inspection on a 4 year cycle

Rehabilitation / Renewal

- CCTV inspections will determine if work is required

Replacement

- mostly reactive to known or visible flooding complaints/concerns or as part of a planned reconstruction project scheduled for other infrastructure

Figure 40 Storm Pond Current Lifecycle Strategy

Maintenance

- Vegetation/sediment management and ensuring proper storm pond functionality
- 10 year budget has been set to perform yearly maintenance

Rehabilitation / Renewal

- As per Consultant recommendations for future maintenance and current site condition

Replacement

- Site condition, effectiveness of design and operation as per original treatment plan

Forecasted Capital Requirements

Figure 41 illustrates the cyclical short-, medium- and long-term infrastructure replacement requirements for the County's storm network. This analysis was run until 2131 to capture at least one iteration of replacement for the longest-lived asset in the asset register. Haldimand County's average annual requirements (red dotted line) total $2.2 million for all assets in the stormwater network. Although actual spending may fluctuate substantially from year to year, this figure is a useful benchmark value for annual capital expenditure targets (or allocations to reserves) to ensure projects are not deferred and replacement needs are met as they arise.

The largest replacement spike is forecasted in the 2070s as mains reach the end of their useful life. These projections and estimates are based on asset replacement costs and age analysis. They are designed to provide a long-term, portfolio-level overview of capital needs and should be used to support improved financial planning over several decades.

Often, the magnitude of replacement needs is substantially higher than most municipalities can afford to fund. In addition, most assets may not need to be replaced as forecasted, while others may be replaced as part of coordinated roadwork. However, quantifying and monitoring these spikes is essential for long-term financial planning, including establishing dedicated reserves, and identifying assets that may be candidates for further inspections.

Figure 41 Storm Network Forecasted Capital Replacement Requirements

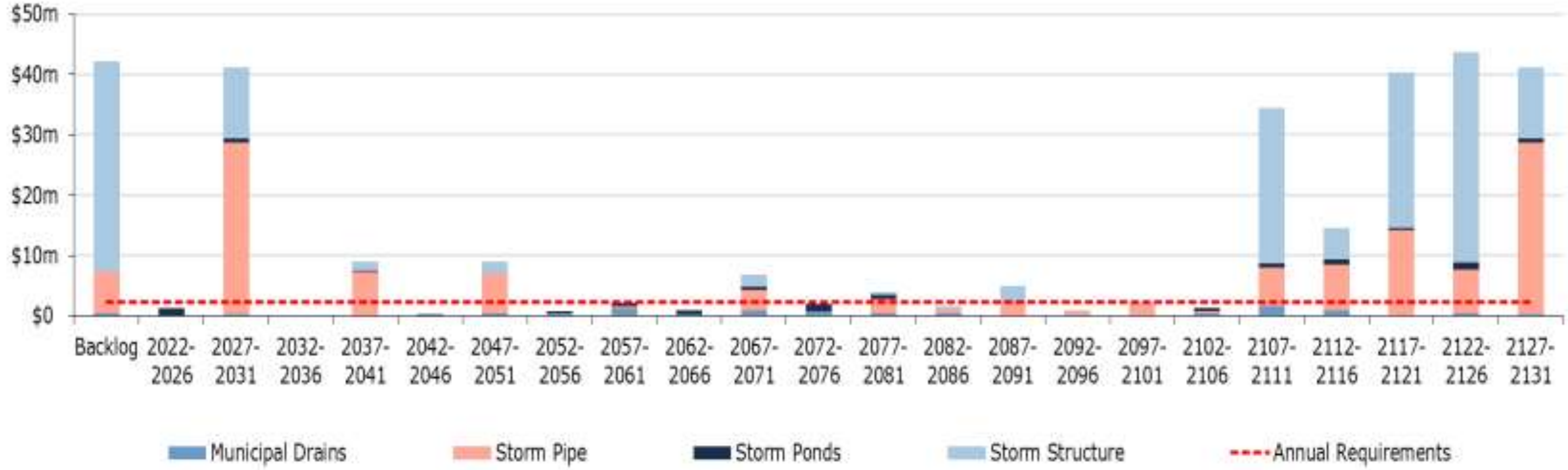


Table 21 below summarizes the projected cost of lifecycle activities (capital replacement only) that may need to be undertaken over the next 10 years to support current levels of service. These projections are generated in Citywide and rely on the data available in the asset register.

Table 21 Storm Network System-Generated 10-Year Capital Costs

Segment	Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Municipal Drains	$223k	$0	$0	$0	$0	$0	$0	$122k	$0	$0	$101k
Storm Pipe	$28.5m	$0	$0	$0	$0	$0	$0	$0	$0	$28.5m	$0
Storm Ponds	$1.8m	$0	$0	$0	$1.2m	$0	$0	$0	$599k	$0	$0
Storm Structure	$11.8m	$0	$0	$0	$0	$0	$0	$0	$0	$11.8m	$0

As no assessed condition data was available for the stormwater network, only age was used to determine forthcoming replacement needs. Further, no data was available on stormwater facilities. These projections can be different from actual capital forecasts. Consistent data updates, especially condition, will improve the alignment between the system-generated expenditure requirements, and the County's capital expenditure forecasts.

Risk & Criticality

The following risk matrix provides a visual representation of the relationship between the probability of failure and the consequence of failure for the assets within this asset category based on available inventory data. See Appendix L: Risk Rating Criteria for the criteria used to determine the risk rating of each asset.

Figure 42 Storm Network Risk Matrix

This is a high-level model developed by staff and should be reviewed and adjusted to reflect an evolving understanding of both the probability and consequences of asset failure. The asset-specific attributes that municipal staff utilize to define and prioritize the criticality of the storm system are documented below:

Table 22 Storm Main Risk Criteria

Probability of Failure (POF)	Consequence of Failure (COF)
Condition	Replacement Cost (50% Economic 70%)
Service Life Remaining	Diameter (50% Economic 70%)
	Road Surface Type (Social 30%)

Table 23 Storm Network Risk Criteria

Probability of Failure (POF)	Consequence of Failure (COF)
Condition	Replacement Cost (Economic 70%)
Service Life Remaining	AM Segment (Social 30%)

The identification of critical assets allows the County to determine risk mitigation strategies and treatment options.

Levels of Service

The following graphs identify the County's metrics to identify their current level of service for the storm network. By comparing the cost, performance (average condition) and risk year-over-year, Haldimand County will be able to evaluate how their services/assets are trending. The County will use this data to set a target level of service and determine proposed levels for the regulation by 2025.

Figure 43 Storm Network Target vs Actual Reinvestment Rate

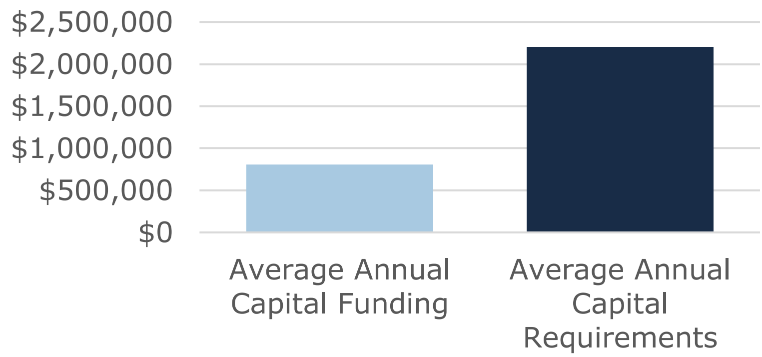


Figure 44 Storm Network Average Condition

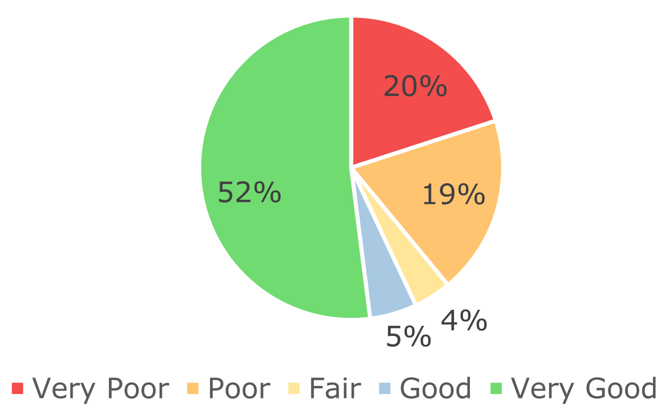
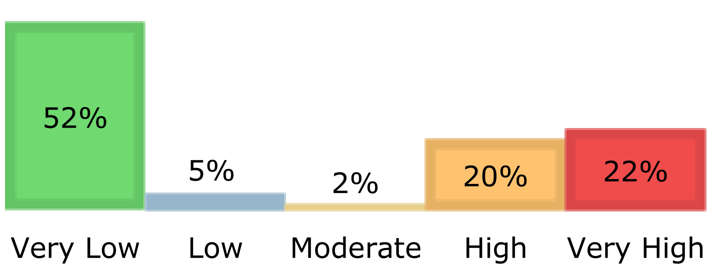


Figure 45 Storm Network Risk Breakdown



The metrics included below are the technical and community level of service metrics that are required as part of O. Reg. 588/17

Community Levels of Service

The following table outlines the qualitative descriptions that determine the community levels of service provided by the storm system.

Table 24 Ontario Regulation 588/17 Storm Network Community Levels of Service

Service Attribute	Qualitative Description	Current LOS
Scope	Description, which may include map, of the user groups or areas of the County that are protected from flooding, including the extent of protection provided by the municipal stormwater system	See Appendix K: Level of Service Maps

Technical Levels of Service

The following table outlines the quantitative metrics that determine the technical level of service provided by the storm system.

Table 25 Ontario Regulation 588/17 Storm Network Technical Levels of Service

Service Attribute	Technical Metric	Current LOS
Scope	% Properties in the municipality resilient to a 100-year storm	TBD
	% The municipal stormwater management system is resilient to a 5-year storm	TBD

The current design standards require all new storm systems to be designed for 100-year storm resilience, however it is under development how much of the existing system is resilient.

It is currently not required for the storm system to be designed based on a 5-year storm, some requirements are less, and some are substantially more. See Haldimand County's Storm Network Design Standards for the detailed design requirements currently required by the County.

Appendix E: Water Network

State of the Infrastructure

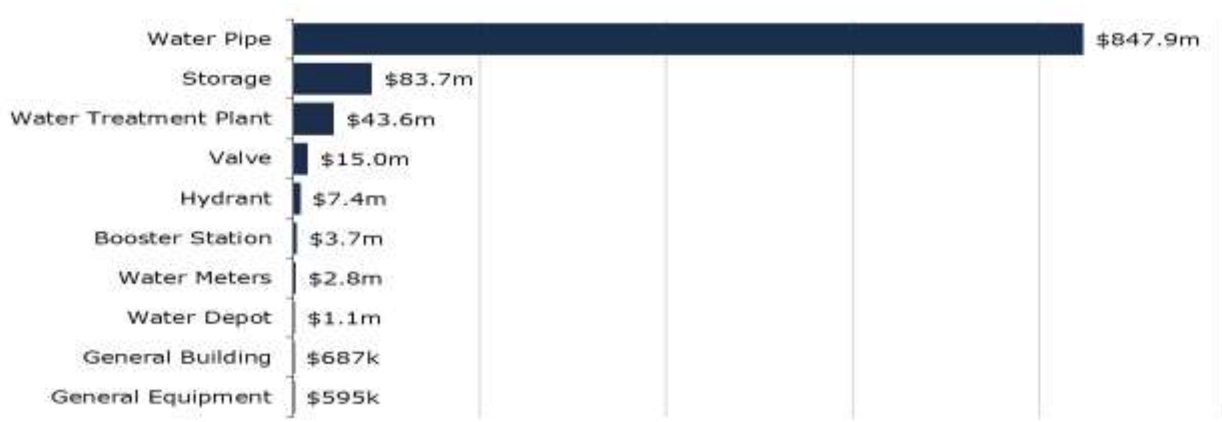
Haldimand County's water network includes mains, hydrants, valves, treatment facilities, towers, bulk water station (water depot), with a total current replacement cost of more than $306 million. The state of the infrastructure for the water network is summarized in the following table:

Replacement Cost	Condition	Financial Capacity	
$1,006,488,213	Very Good (81%)	Annual Requirement:	$17,669,336
		Funding Available:	$5,294,406
		Annual Deficit:	$12,374,930

Inventory & Valuation

The graph below displays the replacement cost of each asset segment in the County's water network inventory.

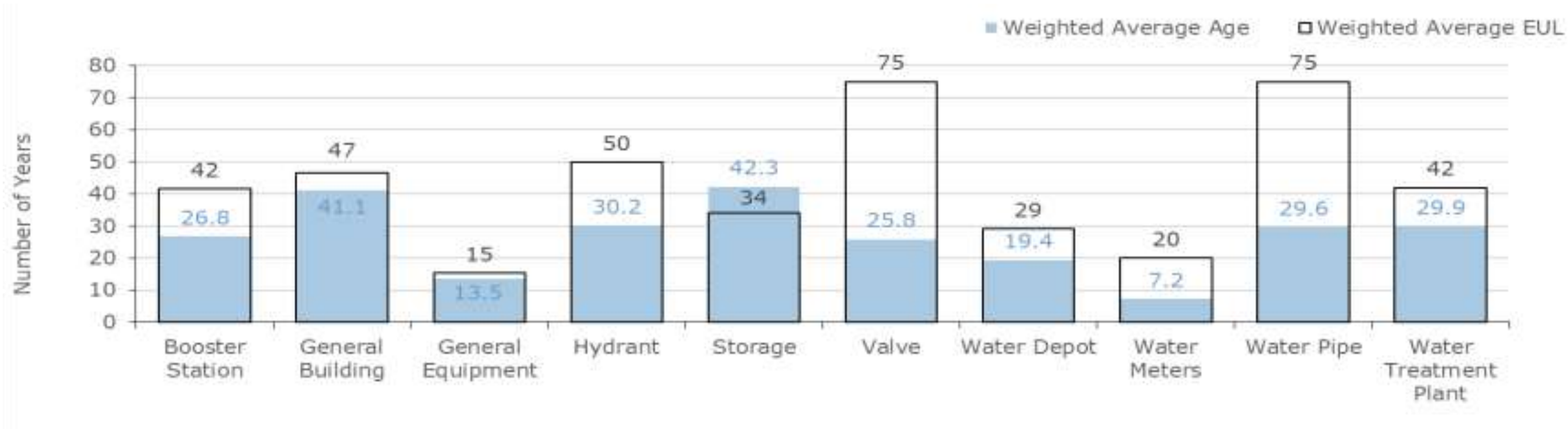
Figure 46 Water Network Replacement Cost



Asset Condition & Age

The graph below identifies the average age, and the estimated useful life for each asset segment. The values are weighted based on replacement cost.

Figure 47 Water Network Average Age vs Average EUL



The graph below visually illustrates the average condition for each asset segment on a very good to very poor scale.

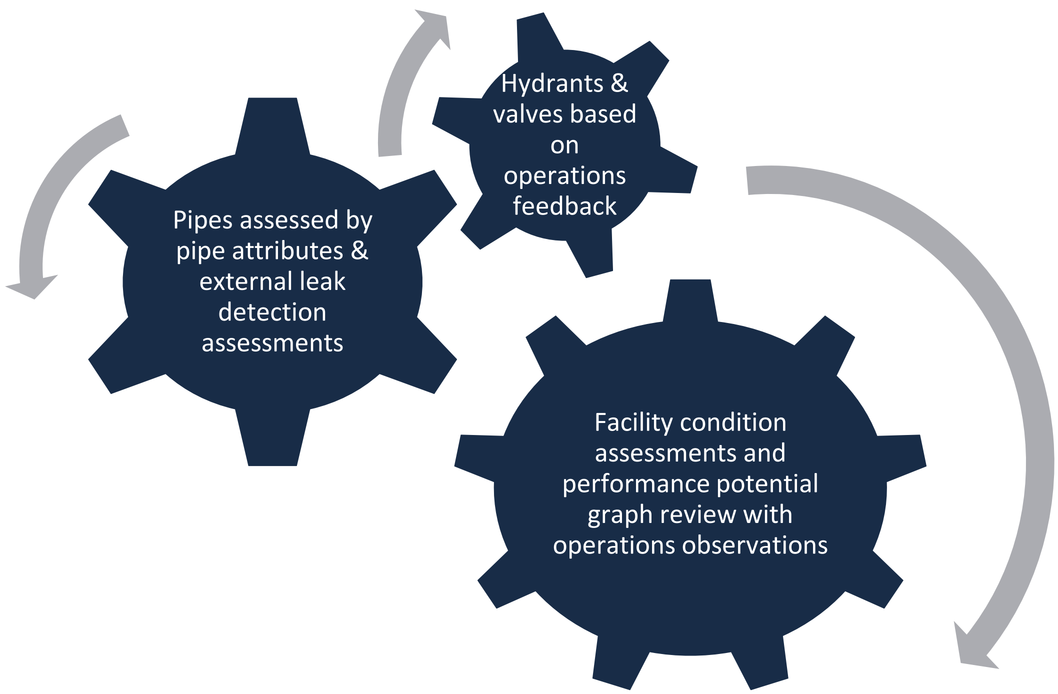
Figure 48 Water Network Condition Breakdown

To ensure that Haldimand County's water network continues to provide an acceptable level of service, the County should monitor the average condition of all assets. If the average condition declines, staff should re-evaluate the lifecycle management strategy to determine what combination of activities is required to increase the overall condition of the water network.

Each asset's Estimated Useful Life should also be reviewed periodically to determine whether adjustments need to be made to better align with the observed length of service life for each asset type.

Current Approach to Condition Assessment

Accurate and reliable condition data allows staff to determine the remaining service life of assets and identify the most cost-effective approach to managing assets. The following describes the County's current approach:



Lifecycle Management Strategy

To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration. The following figures outline Haldimand County's current lifecycle management strategy.

Figure 49 Linear Water Network Current Lifecycle Strategy

Maintenance

- Flushing, fireflow testing, sampling and residual checks

Rehabilitation / Renewal

- Failure frequencies, leak detection assessments and water modelling

Replacement

- determined using service life estimates, feedback from operations, rebuild vs. replace cost comparison.
- Engineering uses a generalized matrix utilizing condition ratings, as well as input from operations staff to create a 10 year capital replacement plan

Figure 50 Water Network Facilities Current Lifecycle Strategy

Maintenance

- operations assessments

Rehabilitation / Renewal

- Failure frequencies, service life estimates and determining if the equipment is obsolete or can no longer be serviced

Replacement

- Service life estimates, feedback from operations, rebuild vs. replace cost comparison

Forecasted Capital Requirements

Figure 51 illustrates the cyclical short-, medium- and long-term infrastructure replacement requirements for the County's water system portfolio. This analysis was run until 2101 to capture at least one iteration of replacement for the longest-lived asset in the asset register. Haldimand County's average annual requirements (red dotted line) total $17.7 million for all water network assets. Although actual spending may fluctuate substantially from year to year, this figure is a useful benchmark value for annual capital expenditure targets (or allocations to reserves) to ensure projects are not deferred and replacement needs are met as they arise.

Given the lengthy useful life for watermains, replacement needs are forecasted to remain relatively flat, and below $60 million per 5-year interval until the late 2060s. At this point, replacement needs peak at more than $620 million between 2067 and 2071. The chart also illustrates a backlog of $49.6 million, dominated by storage facilities. These projections and estimates are based on current asset records, their replacement costs, and age analysis only. They are designed to provide a long-term, portfolio-level overview of capital needs and should be used to support improved financial planning over several decades.

Figure 51 Water Network Forecasted Capital Replacement Requirements

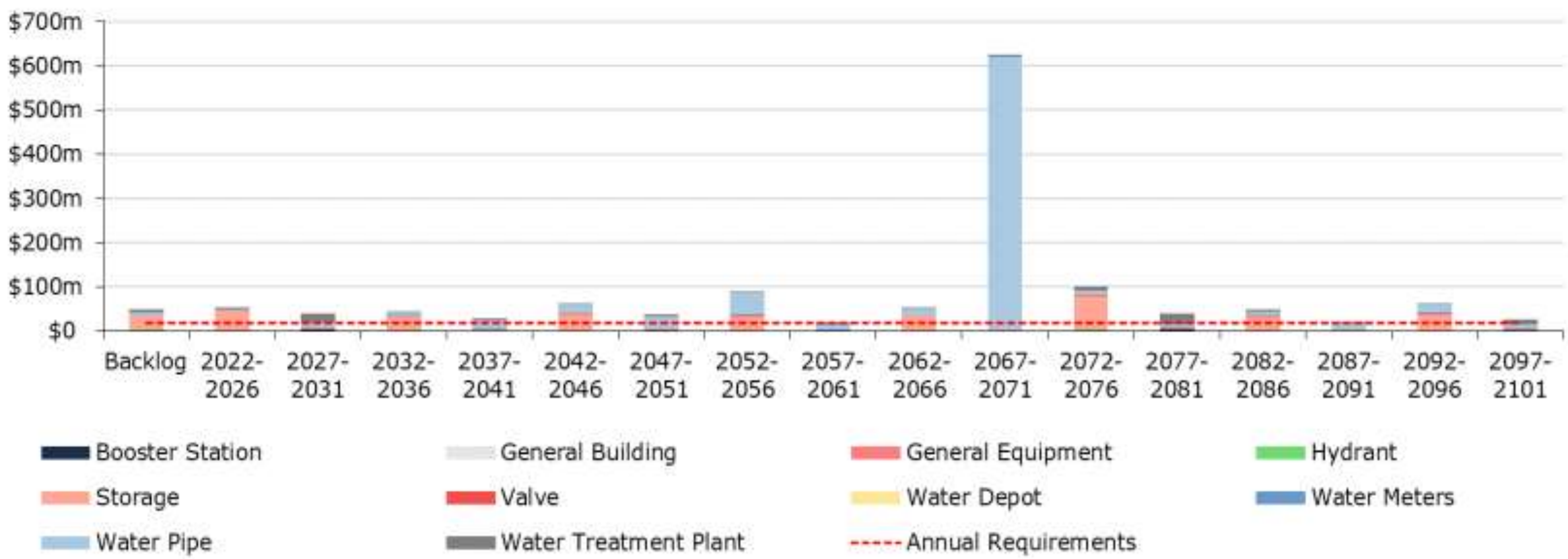


Table 26 below summarizes the projected cost of lifecycle activities (capital replacement only) that will need to be undertaken over the next 10 years to support current levels of service. These projections are generated in Citywide and rely on the data available in the asset register, which was limited to watermain assessed condition, asset age, replacement cost, and useful life. In addition, as treatment facilities are not componentized, no element- or component-level replacement needs could be forecasted.

Table 26 Water Network System-Generated 10-Year Capital Costs

Segment	Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Booster Station	$3.2m	$8k	$90k	$279k	$40k	$0	$19k	$2.7m	$39k	$0	$57k
General Building	$437k	$0	$0	$0	$0	$0	$0	$157k	$280k	$0	$0
General Equipment	$374k	$15k	$10k	$45k	$33k	$47k	$89k	$56k	$2k	$51k	$26k
Hydrant	$1.0m	$0	$101k	$43k	$195k	$144k	$29k	$22k	$166k	$217k	$94k
Storage	$44.4m	$0	$0	$0	$44.4m	$0	$4k	$12k	$0	$0	$10k
Valve	$845k	$90k	$0	$0	$45k	$0	$0	$45k	$232k	$426k	$7k
Water Depot	$60k	$0	$0	$0	$48k	$0	$12k	$0	$0	$0	$0
Water Meters	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Water Pipe	$17.8m	$393k	$171k	$510k	$1.6m	$1.5m	$2.3m	$4.0m	$2.6m	$4.4m	$523k
Water Treatment Plant	$23.6m	$52k	$61k	$771k	$2.6m	$24k	$172k	$19.0m	$517k	$104k	$239k

Consistent data updates, especially condition, will improve the alignment between the system-generated expenditure requirements, and the County's capital expenditure forecasts.

Risk & Criticality

The following risk matrix provides a visual representation of the relationship between the probability of failure and the consequence of failure for the assets within this asset category based on available inventory data. See Appendix L: Risk Rating Criteria for the criteria used to determine the risk rating of each asset.

Figure 52 Water Network Risk Matrix

This is a high-level model developed by municipal staff and should be reviewed and adjusted to reflect an evolving understanding of both the probability and consequences of asset failure. The asset-specific attributes that municipal staff utilize to define and prioritize the criticality of the water network are documented below:

Table 27 Water Pipes Risk Criteria

Probability of Failure (POF)	Consequence of Failure (COF)
Condition	Replacement Cost (50% Economic 70%)
Service Life Remaining	Diameter (50% Economic 70%)
	Surface Type (Social 30%)

Table 28 Water System Risk Criteria

Probability of Failure (POF)	Consequence of Failure (COF)
Condition	Replacement Cost (Economic 70%)
Service Life Remaining	AM Segment (Social 30%)

The identification of critical assets allows the County to determine appropriate risk mitigation strategies and treatment options.

Levels of Service

The following tables identify the County's metrics to identify their current level of service for the water network. By comparing the cost, performance (average condition) and risk year-over-year, the County will be able to evaluate how their services/assets are trending. The County will use this data to set a target level of service and determine proposed levels for the regulation by 2025.

Figure 53 Water Network Target vs Actual Reinvestment Rate

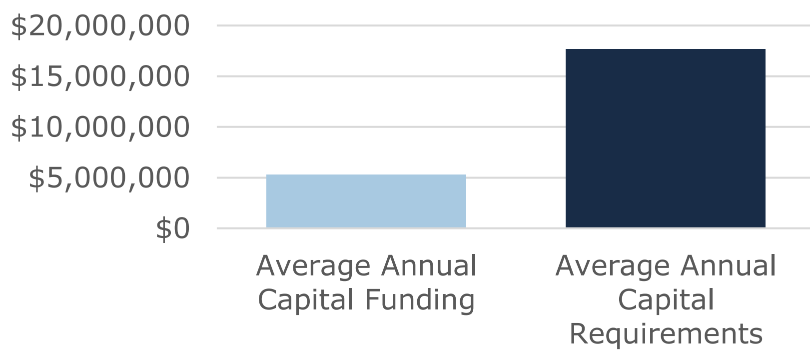


Figure 54 Water Network Average Condition

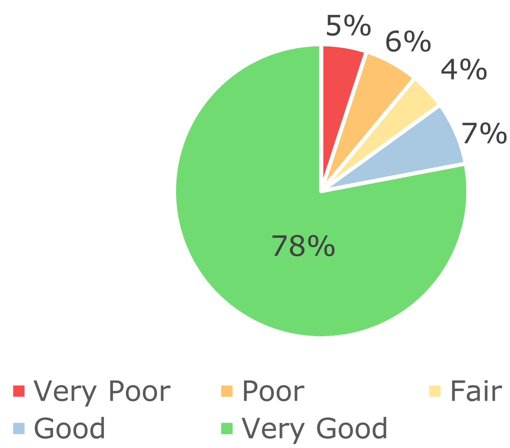
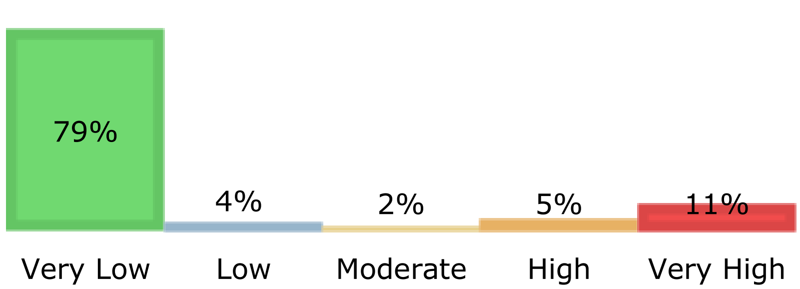


Figure 55 Water Network Risk Breakdown



These metrics include the technical and community level of service metrics that are required as part of O. Reg. 588/17.

Community Levels of Service

The following table outlines the qualitative descriptions that determine the community levels of service provided by water network.

Table 29 Ontario Regulation 588/17 Water Network Community Levels of Service

Service Attribute	Qualitative Description	Current LOS
Scope	Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal water system	See Appendix K: Level of Service Maps
	Description, which may include maps, of the user groups or areas of the municipality that have fire flow	Appendix K: Level of Service Maps
Reliability	Description of boil water advisories and service interruptions	There have been no boil water advisories in Haldimand County in 2021 and 12 main breaks

Technical Levels of Service

The following table outlines the quantitative metrics that determine the technical level of service provided by the water network.

Table 30 Ontario Regulation 588/17 Water Network Technical Levels of Service

Service Attribute	Technical Metric	Current LOS
Scope	% of properties connected to the municipal water system	44.2%
	% of properties where fire flow is available	44.2%
Reliability	# 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	0
	# of connection-days per year where water is not available to water main breaks compared to the total number of properties connected to the municipal water system	0.00106[2]

[2] The duration of water main breaks is not recorded therefore 1 day was used per break to create the metric. The duration and number of customers affected will be included in tracking going forward.

Appendix F: Sanitary Network

State of the Infrastructure

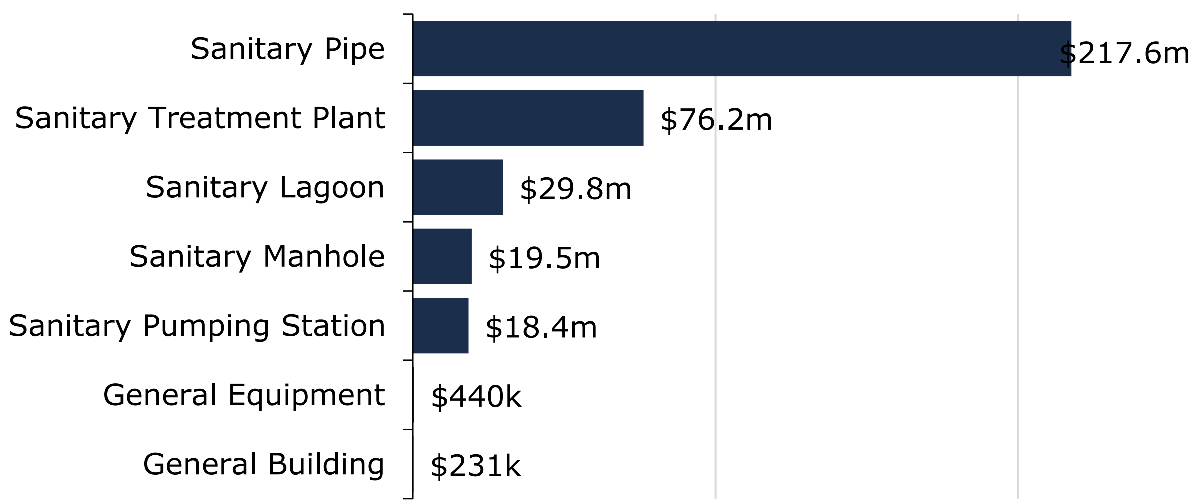
Haldimand County's Sanitary Network infrastructure includes sewer mains, treatment plants, lagoons, pumping stations and various appurtenances. The total current replacement of the County's sanitary collection and treatment infrastructure is estimated at approximately $362 million. The state of the infrastructure for the sanitary network is summarized in the following table.

Replacement Cost	Condition	Financial Capacity	
$362,043,232	Good (71%)	Annual Requirement:	$6,792,456
		Funding Available:	$2,323,959
		Annual Deficit:	$4,468,498

Asset Inventory & Valuation

The graph below displays the replacement cost of each asset segment in the County's sanitary network inventory.

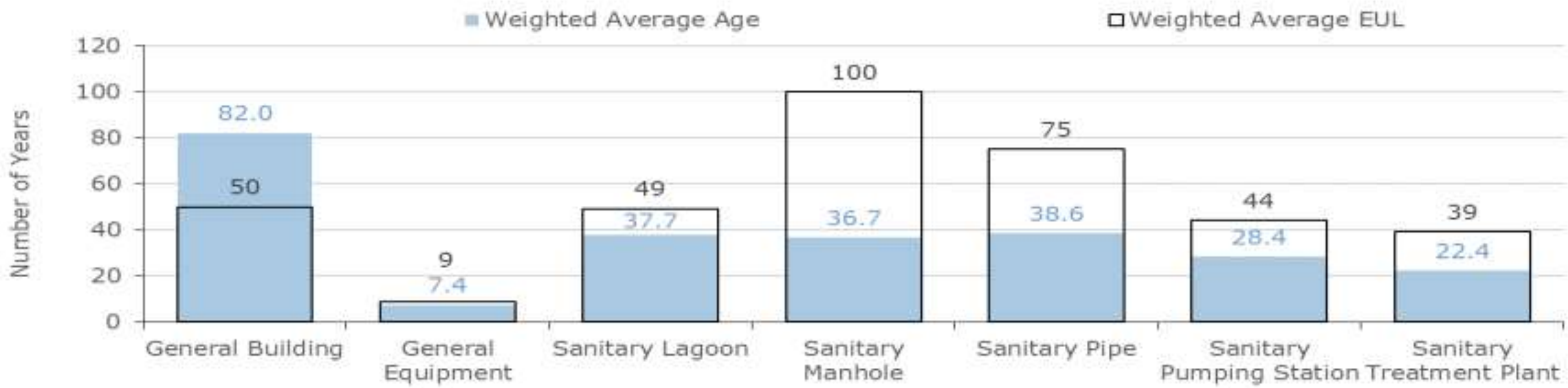
Figure 56 Sanitary Network Replacement Cost



Asset Condition & Age

The graph below identifies the average age, and the estimated useful life for each asset segment. The values are weighted based on replacement cost.

Figure 57 Sanitary Network Average Age vs Average EUL



The graph below visually illustrates the average condition for each asset segment on a very good to very poor scale.

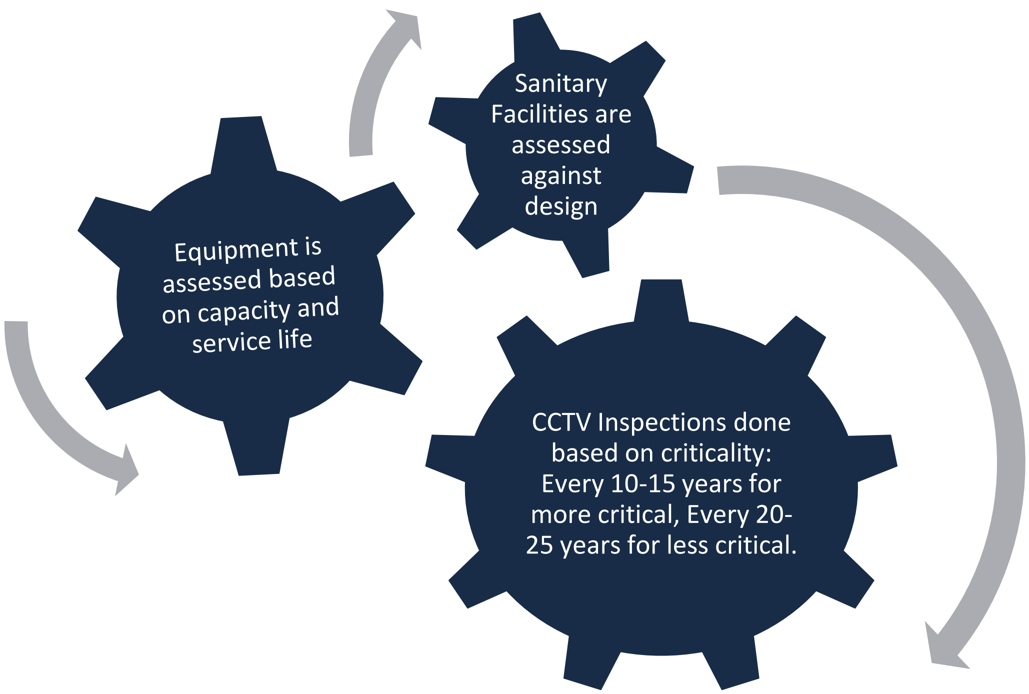
Figure 58 Sanitary Network Condition Breakdown

To ensure that the County's sanitary network continues to provide an acceptable level of service, the County should monitor the average condition of all assets. If the average condition declines, staff should re-evaluate their lifecycle management strategy to determine what combination activities is required to increase the overall condition of the sanitary network.

Each asset's Estimated Useful Life should also be reviewed periodically to determine whether adjustments need to be made to better align with the observed length of service life for each asset type.

Current Approach to Condition Assessment

Accurate and reliable condition data allows staff to determine the remaining service life of assets and identify the most cost-effective approach to managing assets. The following describes the County's current approach:



Lifecycle Management Strategy

To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration. The following figures outline Haldimand County’s current lifecycle management strategy.

Figure 59 Linear Sanitary Network Current Lifecycle Strategy

Maintenance

- Flushing, CCTV Inspections

Rehabilitation / Renewal

- Inflow & Infiltration Abatement Program
- Based on CCTV results
- Coordinated with road reconstruction - Sanitary Lining Program as needed

Replacement

- Consideration if there is planned road reconstruction identified.
- Engineering reviews Master Servicing plans in areas of planned reconstruction projects (i.e Watermain replacements) for locations identified for capacity improvements

Figure 60 Sanitary Network Facilities Current Lifecycle Strategy

Maintenance

- operations assessments

Rehabilitation / Renewal / REplacement

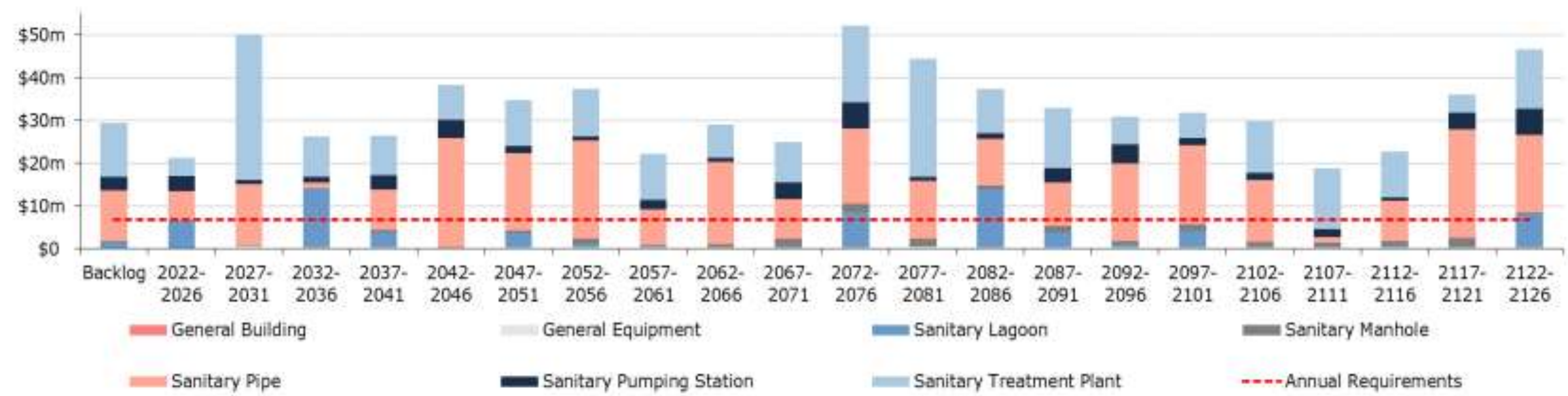
- Remaining estimated service life, noted/observed operational issues, demonstrated capability at current flows.

Forecasted Capital Requirements

Figure 61 illustrates the cyclical short-, medium- and long-term infrastructure replacement requirements for the County's wastewater infrastructure. This analysis was run until 2126 to capture at least one iteration of replacement for the longest-lived asset in the asset register. Haldimand County's average annual requirements (red dotted line) total $6.8 million for all sanitary network assets. Although actual spending may fluctuate substantially from year to year, this figure is a useful benchmark value for annual capital expenditure targets (or allocations to reserves) to ensure projects are not deferred and replacement needs are met as they arise.

Replacement needs are forecasted to fluctuate over the 100+ year time horizon, totaling more than $100 million in the current decade, and peaking at $52.1 million between 2072 and 2076 as a substantial portion of mains and sanitary treatment plant assets reach the end of their useful life. These projections and estimates are based on asset replacement costs and age analysis. They are designed to provide a long-term, portfolio-level overview of capital needs and should be used to support improved financial planning over several decades. The chart also shows an age-based backlog of $29.4 million, comprising assets that have reached the end of their useful life.

Figure 61 Sanitary Network Forecasted Capital Replacement Requirements



Treatment facilities and other assets are not componentized, limiting the accuracy of these projections. In addition, like storm and water assets, particularly mains, it is unlikely that all mains will need to be replaced as forecasted. Coordinated projects, along with CCTV inspection data, may drive replacements and rehabilitations.

Table 31 below summarizes the projected cost of lifecycle activities (capital replacement only) that will need to be undertaken over the next 10 years to support current levels of service. These projections are generated in Citywide and rely on the data available in the asset register, which was limited to asset age, replacement cost, and useful life. In addition, as treatment facilities are not componentized, no element- or component-level replacement needs could be forecasted.

Table 31 Sanitary Network System-Generated 10-Year Capital Costs

Segment	Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
General Building	$231k	$0	$0	$0	$0	$0	$0	$231k	$0	$0	$0
General Equipment	$429k	$7k	$112k	$30k	$19k	$0	$145k	$12k	$58k	$38k	$7k
Sanitary Lagoon	$6.7m	$0	$60k	$0	$6.5m	$0	$0	$7k	$19k	$60k	$37k
Sanitary Manhole	$85k	$0	$0	$0	$0	$0	$0	$66k	$0	$19k	$0
Sanitary Pipe	$21.3m	$2.5m	$0	$0	$3.4m	$907k	$0	$184k	$6.9m	$7.1m	$294k
Sanitary Pumping Station	$4.3m	$0	$64k	$0	$3.4m	$0	$122k	$0	$629k	$0	$62k
Sanitary Treatment Plant	$38.5m	$550k	$595k	$444k	$129k	$2.6m	$1.4m	$25.5m	$748k	$461k	$6.0m

Consistent data updates, especially condition, will improve the alignment between the system-generated expenditure requirements, and the County’s capital expenditure forecasts

Risk & Criticality

The following risk matrix provides a visual representation of the relationship between the probability of failure and the consequence of failure for the assets within this asset category based on available inventory data. See Appendix L: Risk Rating Criteria for the criteria used to determine the risk rating of each asset.

Figure 62 Sanitary Network Risk Matrix

This is a high-level model developed by municipal staff and should be reviewed and adjusted to reflect an evolving understanding of both the probability and consequences of asset failure. The asset-specific attributes that municipal staff utilize to define and prioritize the criticality of the sanitary network are documented below:

Table 32 Sanitary Mains Risk Criteria

Probability of Failure (POF)	Consequence of Failure (COF)
Condition	Replacement Cost (50% Economic 70%)
Service Life Remaining	Diameter (50% Economic 70%)
	Surface Type (Social 30%)

Table 33 Sanitary System Risk Criteria

Probability of Failure (POF)	Consequence of Failure (COF)
Condition	Replacement Cost (Economic 70%)
Service Life Remaining	AM Segment (Social 30%)

The identification of critical assets allows the County to determine appropriate risk mitigation strategies and treatment options.

Levels of Service

The following tables identify Haldimand County's metrics to identify the current level of service for the sanitary network. By comparing the cost, performance (average condition) and risk year-over-year, the County will be able to evaluate how their services/assets are trending. Haldimand County will use this data to set a target level of service and determine proposed levels for the regulation by 2025.

Figure 63 Sanitary Network Target vs Actual Reinvestment Rate

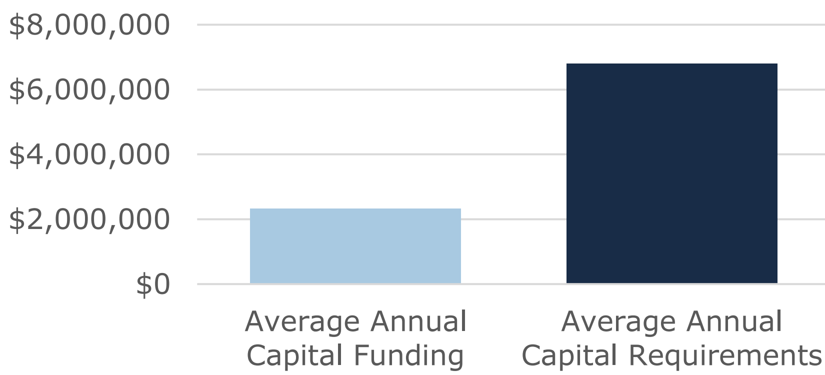


Figure 64 Sanitary Network Average Condition

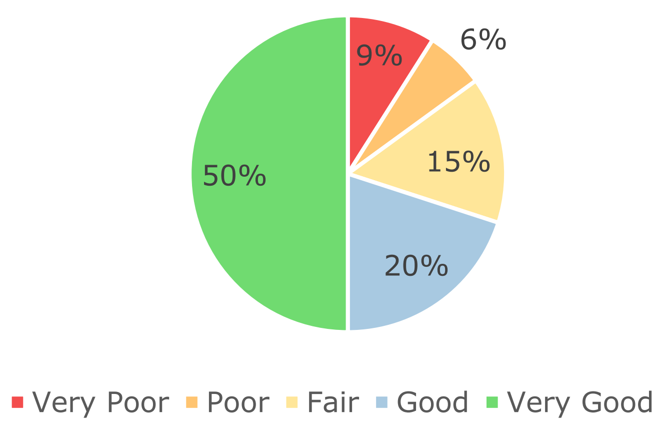
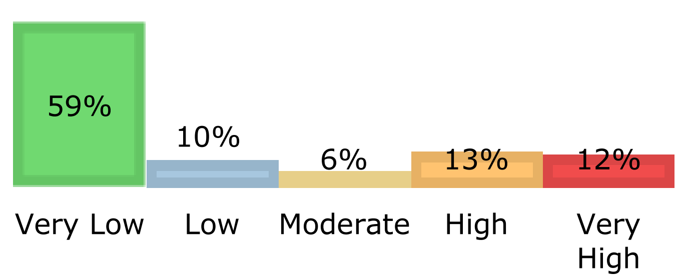


Figure 65 Sanitary Network Risk Breakdown



These metrics include the technical and community level of service metrics that are required as part of O. Reg. 588/17.

Community Levels of Service

The following table outlines the qualitative descriptions that determine the community levels of service provided by the sanitary network.

Table 34 Ontario Regulation 588/17 Sanitary Network Community Levels of Service

Service Attribute	Qualitative Description	Current LOS
Scope	Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal wastewater system	See Appendix K: Level of Service Maps
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	Haldimand County does not own any combined sewers
	Description of the frequency and volume of overflows in combined sewers in the municipal wastewater system that occur in habitable areas or beaches	Haldimand County does not own any combined sewers
	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 can enter into sanitary sewers due to cracks in sanitary mains or through indirect connections (e.g. weeping tiles). In the case of heavy rainfall events, sanitary sewers may experience a volume of water and sewage that exceeds its designed capacity.
	Description of how sanitary sewers in the municipal wastewater system are designed to be resilient to stormwater infiltration	The County follows a series of design standards that integrate servicing requirements and land use considerations when constructing or replacing sanitary sewers.
	Description of the effluent that is discharged from sewage treatment plants in the municipal wastewater system	Effluent refers to water that is discharged from a sanitary treatment plant, and may include suspended solids, total phosphorous and biological oxygen demand. The Environmental Compliance Approval (ECA) identifies the effluent criteria for municipal wastewater treatment plants.

Technical Levels of Service

The following table outlines the quantitative metrics that determine the technical level of service provided by the sanitary network.

Table 35 Ontario Regulation 588/17 Sanitary Network Technical Levels of Service

Service Attribute	Technical Metric	Current LOS
Scope	% of properties connected to the municipal wastewater system	41.6%
Reliability	# 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	n/a
	# of connection-days per year having wastewater backups compared to the total number of properties connected to the municipal wastewater system	TBD
	# of effluent violations per year due to wastewater discharge compared to the total number of properties connected to the municipal wastewater system	TBD

The number of connection-days per year having wastewater discharge is not an easily determined number currently and is under development.

See the Haldimand County 2021 Annual Reports that provide additional details on the compliance of each sanitary facility.

Appendix G: Buildings

State of the Infrastructure

Haldimand County owns and maintains several facilities that provide key services to the community. These include:

- administrative offices
- fire / ambulance stations
- long-term care facility
- public works garages and storage sheds
- community centres
- parks
- libraries & museums

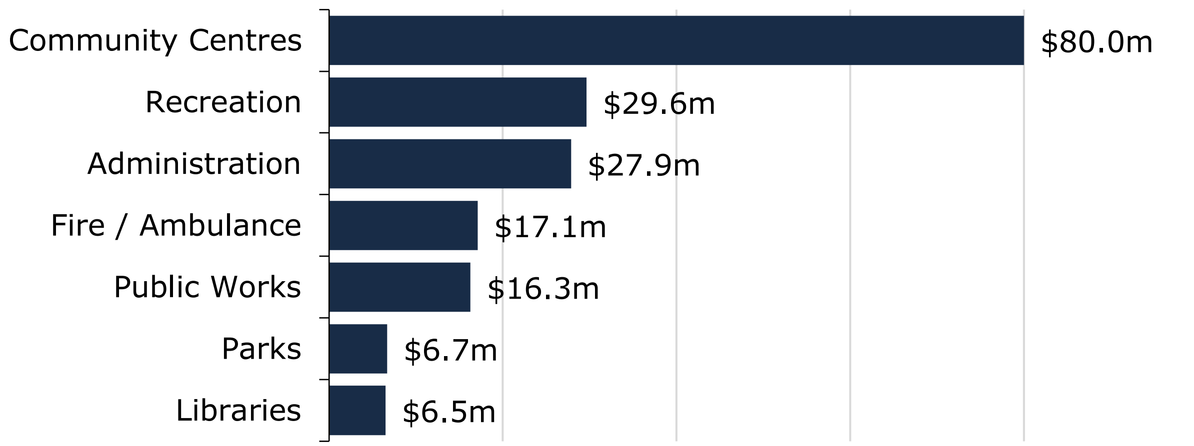
The state of the infrastructure for the buildings and facilities is summarized in the following table.

Replacement Cost	Condition	Financial Capacity	
$184,046,500	Fair (55%)	Annual Requirement:	$3,789,831
		Funding Available:	$1,388,100
		Annual Deficit:	$2,401,731

Inventory & Valuation

The graph below displays the total replacement cost of each asset segment in Haldimand County's buildings inventory. As the County is in the process of developing their building inventory structure for asset management, buildings such as museums and long-term care facilities are contained within other categories shown below.

Figure 66 Buildings Replacement Cost

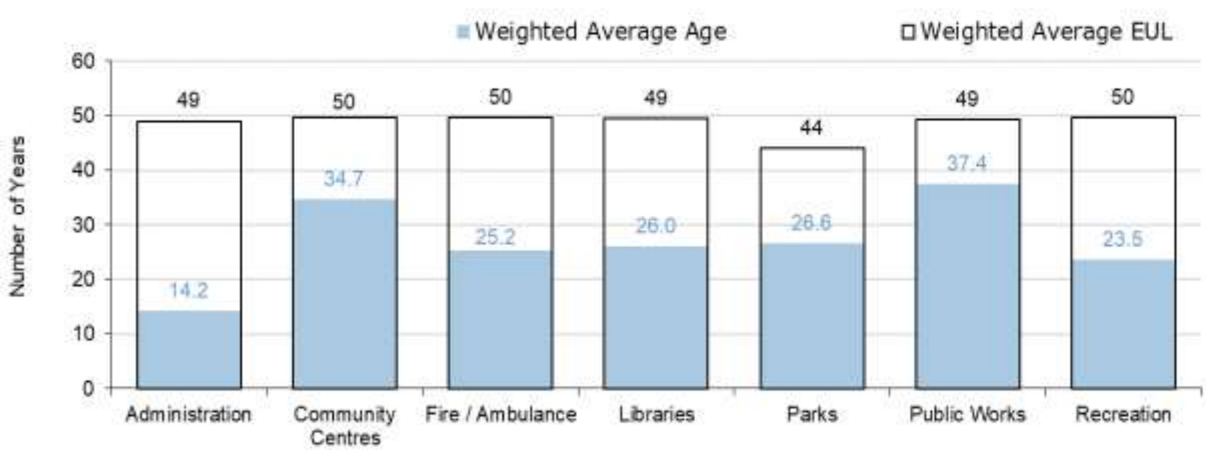


Each asset's replacement cost should be reviewed periodically to determine whether adjustments are needed to represent capital requirements more accurately.

Asset Condition & Age

The graph below identifies the average age, and the estimated useful life for each asset segment. The values are weighted based on replacement cost.

Figure 67 Buildings Average Age vs Average EUL



These assets are not componentized in detail which limits the accuracy of projections. The graph below visually illustrates the average condition for each asset segment on a very good to very poor.

Figure 68 Buildings Condition Breakdown

To ensure that the municipal buildings continue to provide an acceptable level of service, the County should monitor the average condition of all assets. If the average condition declines, staff should re-evaluate their lifecycle management strategy to determine what combination of maintenance, rehabilitation and replacement activities is required to increase the overall condition of the buildings.

Each asset's estimated useful life should also be reviewed to determine whether adjustments need to be made to better align with the observed service life.

Current Approach to Condition Assessment

Accurate and reliable condition data allows staff to determine the remaining service life of assets and identify the most cost-effective approach to managing assets. Buildings are repaired as required based on deficiencies identified by outside experts, staff or residents.

Lifecycle Management Strategy

To ensure that municipal assets are performing as expected and meeting the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration. The following table outlines the County's current lifecycle management strategy.

Figure 69 Sanitary Network Facilities Current Lifecycle Strategy

Maintenance / Rehabilitation

- Maintenance of buildings is dealt with on a case-by-case basis

Replacement

- Currently undergoing a complete building condition assessment which will provide lifecycle recommendations going forward.

Forecasted Capital Requirements

The annual capital requirement represents the average amount per year that Haldimand County should allocate towards funding rehabilitation and replacement needs. The following graph identifies capital requirements over the next 30 years. This projection is used as it ensures that every asset has gone through one full iteration of replacement. The forecasted requirements are aggregated into 5-year bins and the trend line represents the average capital requirements at $3.8 million.

Figure 70 Buildings Forecasted Capital Replacement Requirements

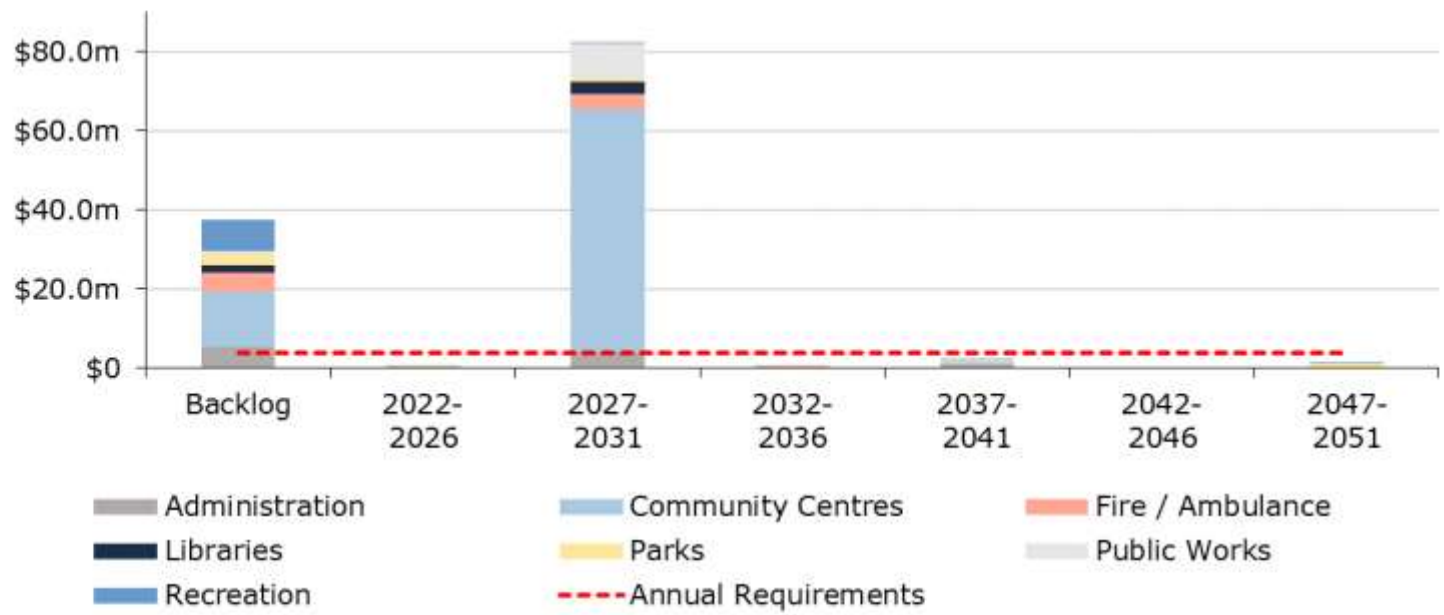


Table 36 below summarizes the projected cost of lifecycle activities (capital replacement only) that may need to be undertaken over the next 10 years to support current levels of service. These are represented at the major asset level, i.e., full cost of buildings, rather than partial repair, rehabilitation, or replacement.

Table 36 Buildings System-Generated 10-Year Capital Costs

Segment	Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Administration	$3.7m	$0	$0	$0	$0	$0	$0	$3.7m	$0	$0	$0
Community Centres	$62.0m	$396k	$0	$0	$17k	$0	$0	$61.6m	$0	$0	$0
Fire / Ambulance	$4.0m	$0	$0	$0	$0	$0	$0	$4.0m	$0	$0	$0
Libraries	$3.0m	$0	$0	$0	$0	$0	$0	$3.0m	$0	$0	$0
Parks	$932k	$0	$0	$42k	$0	$0	$0	$881k	$0	$0	$9k
Public Works	$8.8m	$0	$0	$0	$0	$0	$2.0m	$4.5m	$1.3m	$0	$988k
Recreation	$290k	$0	$0	$0	$0	$0	$0	$290k	$0	$0	$0

These projections are generated in Citywide and rely on the data available in the asset register, which was limited to asset age, replacement cost, and useful life. In addition, as buildings are not componentized, no element- or component-level replacement needs could be forecasted.

Risk & Criticality

The risk matrix provides a visual representation of the relationship between the probability of failure and the consequence of failure for the assets within this asset category based on available inventory data. See Appendix L: Risk Rating Criteria for the criteria used to determine the risk rating of each asset.

Figure 71 Buildings Risk Matrix

This is a high-level model that has been developed based on information currently available and should be reviewed and adjusted to reflect an evolving understanding of both the probability and consequences of asset failure.

The identification of critical assets allows the County to determine risk mitigation strategies and treatment options. Risk mitigation may include asset-specific lifecycle strategies, condition assessment strategies, or simply the need to collect better asset data.

Levels of Service

Buildings are considered a non-core asset category and as such, Haldimand County has until July 1, 2024, to determine the qualitative descriptions and technical metrics that measure the current level of service provided.

By comparing the cost, performance (average condition) and risk year-over-year, the County will be able to evaluate how their services/assets are trending. The County will use this data to set a target level of service and determine proposed levels for the regulation by 2025.

Figure 72 Buildings Target vs Actual Reinvestment Rate

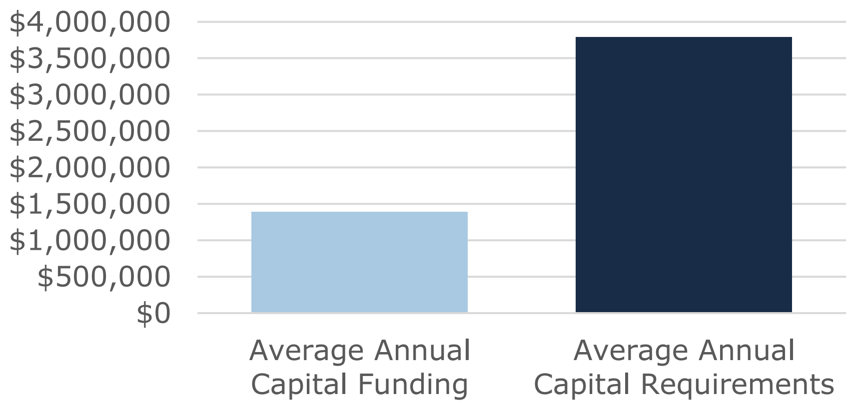


Figure 73 Buildings Average Condition

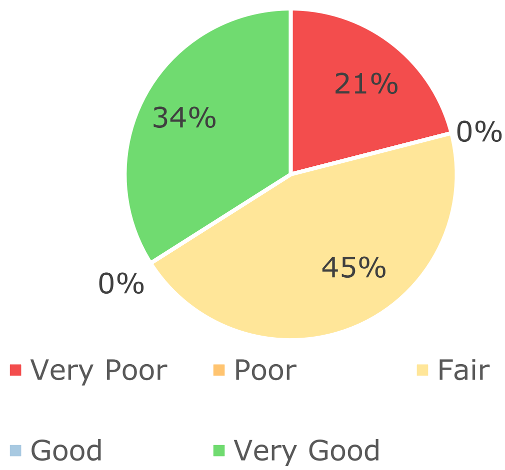
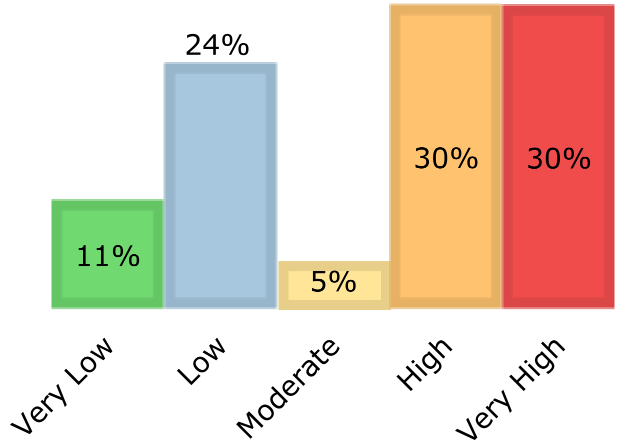


Figure 74 Buildings Risk Breakdown



Appendix H: Land Improvements

State of the Infrastructure

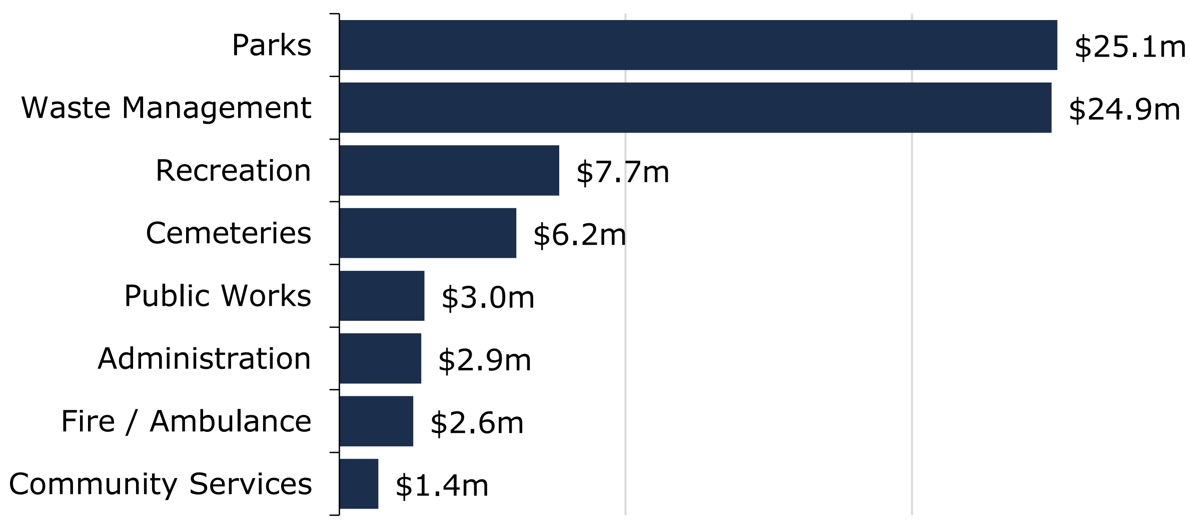
Haldimand County owns several assets that are considered Land Improvements. This category includes park and sports field assets like ball diamonds, soccer fields, outdoor rinks, and pathways. It also includes exterior facility assets such as parking lots and fencing. Cemetery facilities are included in this category as well. The state of the infrastructure for the land improvements is summarized in the following table.

Replacement Cost	Condition	Financial Capacity	
$73,609,783	Fair (51%)	Annual Requirement:	$4,300,970
		Funding Available:	$1,575,315
		Annual Deficit:	$2,725,656

Inventory & Valuation

The graph below displays the total replacement cost of each asset segment in the County's land improvement inventory.

Figure 75 Land Improvements Replacement Cost

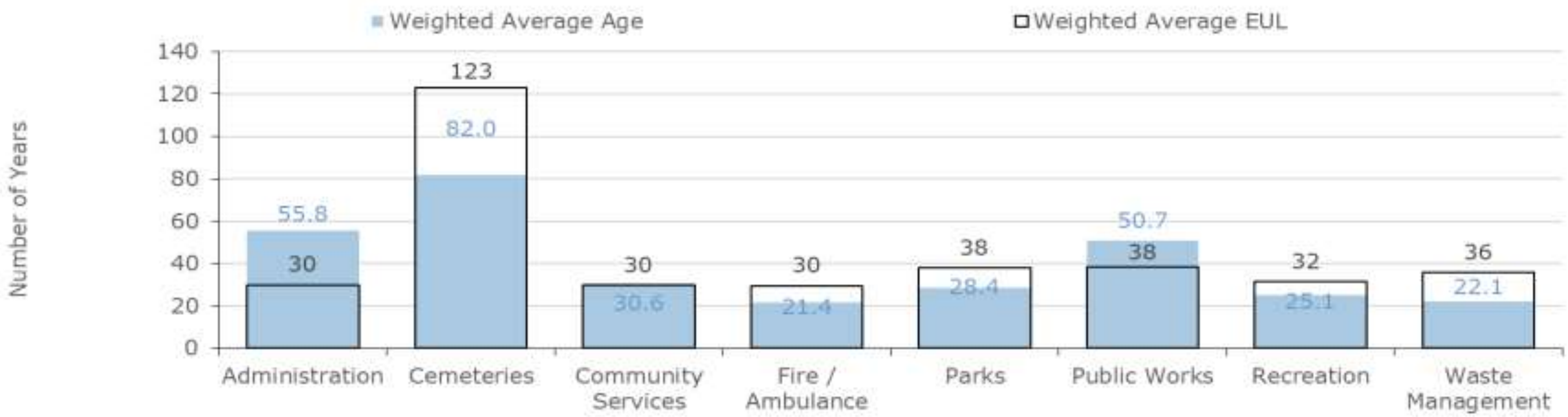


Each asset's replacement cost should be reviewed periodically to determine whether adjustments are needed to represent capital requirements more accurately.

Asset Condition & Age

The graph below identifies the average age, and the estimated useful life for each asset segment. The values are weighted based on replacement cost.

Figure 76 Land Improvements Average Age vs Average EUL



The graph below visually illustrates the average condition for each asset segment on a Very Good to Very Poor scale.

Figure 77 Land Improvements Condition Breakdown

To ensure that the County's land improvements continue to provide an acceptable level of service, Haldimand County should monitor the average condition of all assets. If the average condition declines, staff should re-evaluate their lifecycle management strategy to determine what combination of maintenance, rehabilitation and replacement activities is required to increase the overall condition.

Each asset's estimated useful life should also be reviewed periodically to determine whether adjustments need to be made to better align with the observed length of service life for each asset type.

Current Approach to Condition Assessment

Accurate and reliable condition data allows staff to determine the remaining service life of assets and identify the most cost-effective approach to managing assets. The current approach varies significantly due to the varied assets included in this category

Lifecycle Management Strategy

To ensure that municipal assets are performing as expected and meeting the needs of residents, it is important to establish a lifecycle management strategy to proactively manage asset deterioration. The following figure outlines the current lifecycle management strategy.

Figure 78 Land Improvement Current Lifecycle Strategy

Maintenance / Rehabilitation / Replacement

- To be determined in the next phase

Forecasted Capital Requirements

The annual capital requirement represents the average amount per year that should be allocate towards funding rehabilitation and replacement needs. The following graph identifies capital requirements over the next 140 years. This projection is used as it ensures that every asset has gone through one full iteration of replacement. The forecasted requirements are aggregated into 5-year bins and the trend line represents the average annual capital requirements which are $4.3 million.

Figure 79 Land Improvements Forecasted Capital Replacement Requirements

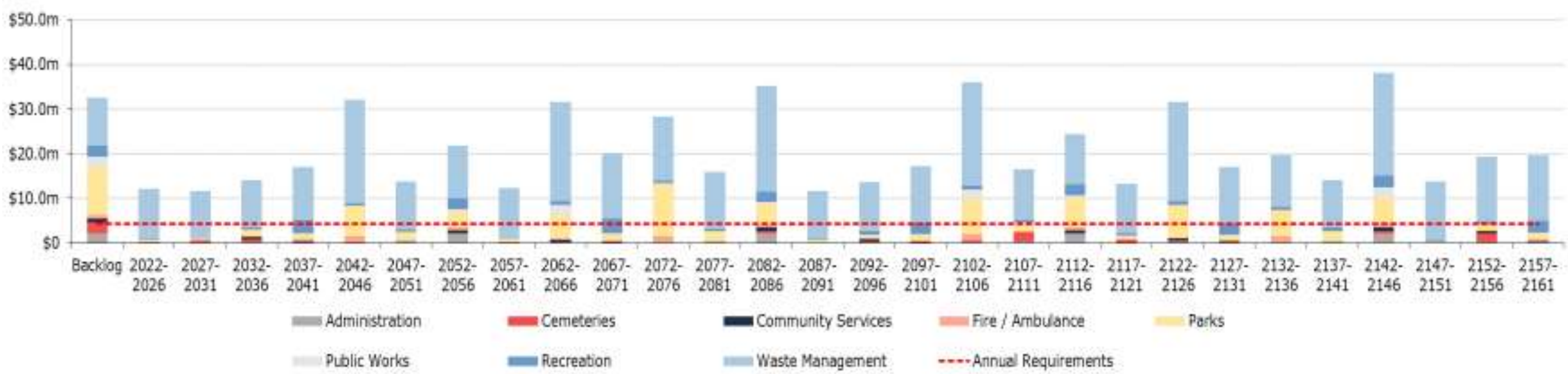


Table 37 below summarizes the projected cost of lifecycle activities (capital replacement only) that may need to be undertaken over the next 10 years to support current levels of service. These projections are generated in Citywide and rely on the data available in the asset register.

Table 37 Land Improvements System-Generated 10-Year Capital Costs

Segment	Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Administration	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Cemeteries	$603k	$0	$132k	$0	$0	$0	$56k	$297k	$119k	$0	$0
Community Services	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Fire / Ambulance	$12k	$0	$0	$0	$0	$0	$0	$0	$0	$0	$12k
Parks	$804k	$31k	$140k	$240k	$110k	$0	$0	$213k	$40k	$30k	$0
Public Works	$65k	$0	$0	$0	$0	$0	$0	$0	$0	$65k	$0
Recreation	$187k	$0	$0	$0	$109k	$26k	$0	$0	$21k	$0	$30k

Waste Management	$22.0m	$0	$0	$644k	$0	$10.7m	$19k	$0	$0	$10.7m	$0

As no assessed condition data was available for the land improvement category, only age was used to determine forthcoming replacement needs. These projections can be different from actual capital forecasts. Consistent data updates, especially condition, will improve the alignment between the system-generated expenditure requirements, and the County's capital expenditure forecasts

Risk & Criticality

The risk matrix provides a visual representation of the relationship between the probability of failure and the consequence of failure for the assets within this asset category based on available inventory data. See Appendix L: Risk Rating Criteria for the criteria used to determine the risk rating of each asset.

Figure 80 Land Improvements Risk Matrix

This is a high-level model that has been developed based on information currently available and should be reviewed and adjusted to reflect an evolving understanding of both the probability and consequences of asset failure.

The identification of critical assets allows the County to determine risk mitigation strategies and treatment options. Risk mitigation may include asset-specific lifecycle strategies, condition assessment strategies, or simply the need to collect better asset data.

Levels of Service

Assets in the Land Improvement category are considered a non-core asset category and as such, the County has until July 1, 2024, to determine the qualitative descriptions and technical metrics that measure the current level of service provided.

By comparing the cost, performance (average condition) and risk year-over-year, the County will be able to evaluate how their services/assets are trending. The County will use this data to set a target level of service and determine proposed levels for the regulation by 2025.

Figure 81 Land Improvements Target vs Actual Reinvestment Rate

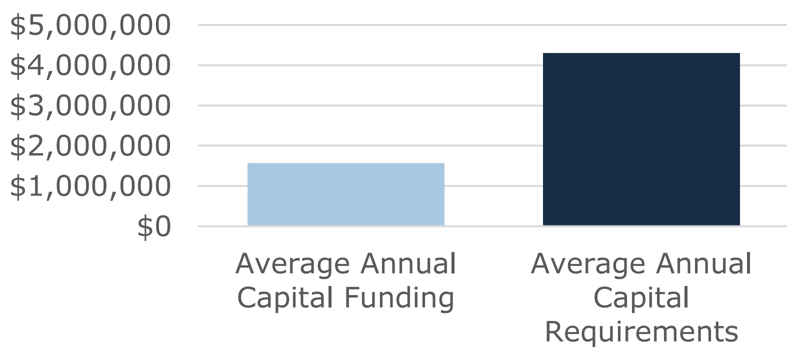


Figure 82 Land Improvements Average Condition

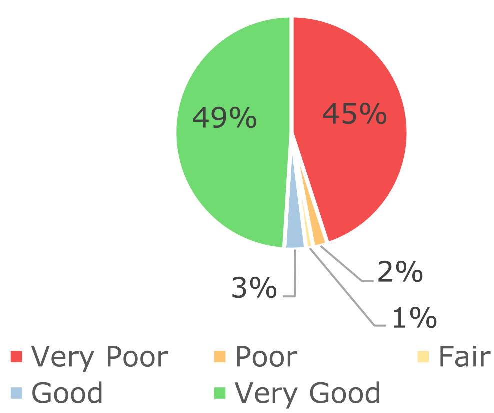
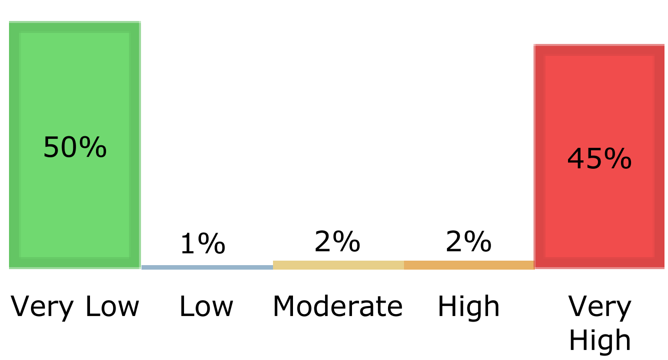


Figure 83 Land Improvements Risk Breakdown



Appendix I: Vehicles

State of the Infrastructure

Vehicles allow staff to efficiently deliver municipal services and personnel. Municipal vehicles are used to support several service areas, including:

- tandem axle trucks for winter control activities
- fire rescue vehicles and ambulances to provide protection services
- mowers to provide park maintenance services

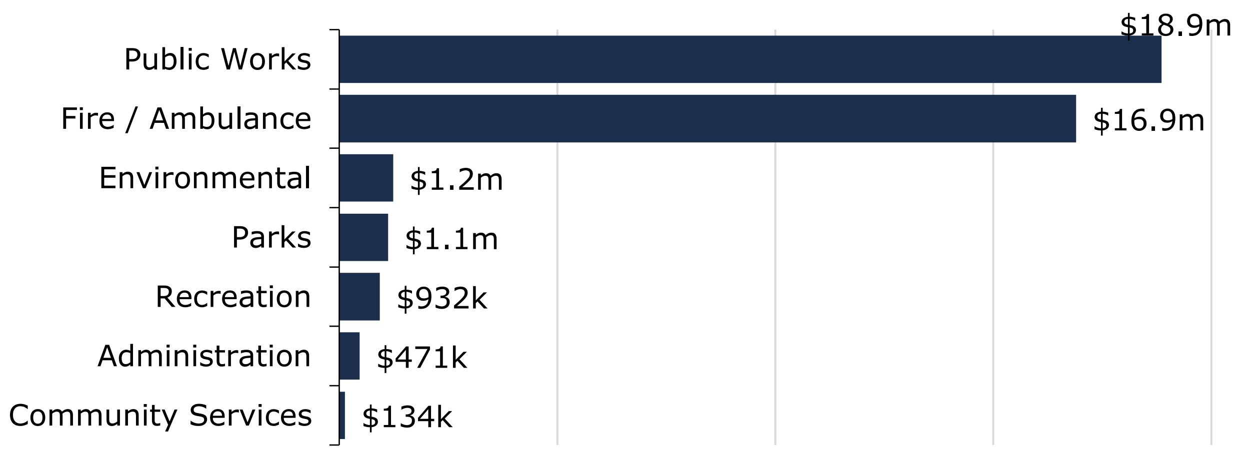
The state of the infrastructure for the vehicles is summarized in the following table.

Replacement Cost	Condition	Financial Capacity	
$39,644,197	Fair (53%)	Annual Requirement:	$3,046,422
		Funding Available:	$1,115,812
		Annual Deficit:	$1,930,610

Inventory & Valuation

The graph below displays the total replacement cost of each asset segment in the vehicle inventory.

Figure 84 Vehicle Replacement Costs

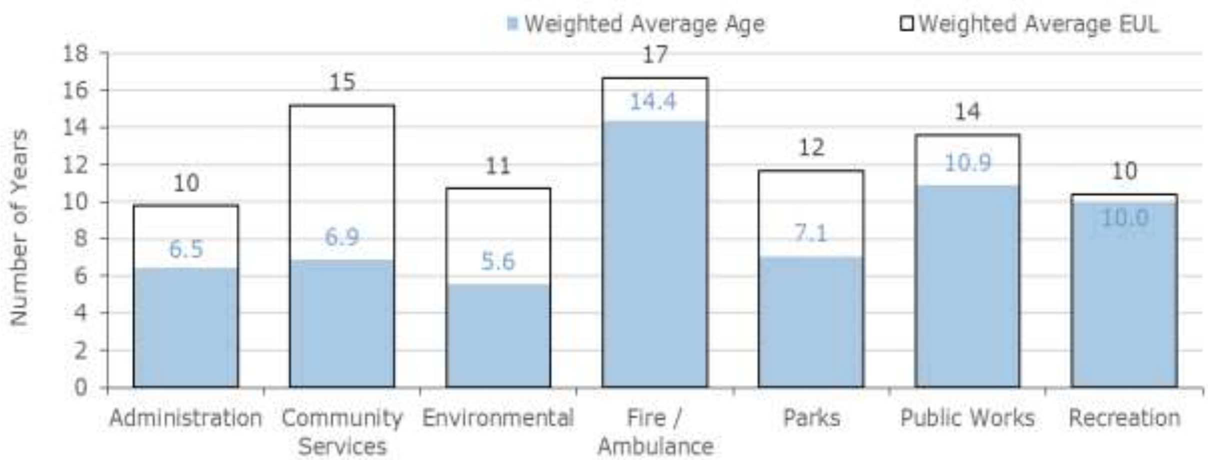


Each asset's replacement cost should be reviewed periodically to determine whether adjustments are needed to represent capital requirements more accurately.

Asset Condition & Age

The graph below identifies the average age and the estimated useful life for each asset segment. The values are weighted based on replacement cost.

Figure 85 Vehicles Average Age vs Average EUL



The graph below visually illustrates the average condition for each asset segment on a very good to very poor scale.

Figure 86 Vehicles Condition Breakdown

To ensure that the County's vehicles continue to provide an acceptable level of service, the County should monitor the average condition of all assets. If the average condition declines, staff should re-evaluate their lifecycle management strategy to determine what combination of maintenance, rehabilitation and replacement activities is required to increase the overall condition of the vehicles.

Each asset's estimated useful life should also be reviewed periodically to determine whether adjustments need to be made to better align with the observed length of service life for each asset type.

Current Approach to Condition Assessment

Accurate and reliable condition data allows staff to determine the remaining service life of assets and identify the most cost-effective approach to managing assets. Fleet department continually monitors the condition of vehicles through their preventative maintenance program which includes annual safety inspections (commercial vehicles) and maintenance/ repair activities. Fleet technicians complete thorough in-depth inspections in addition to operator visual inspections. Condition assessments are performed on every asset before replacement is recommended and replacement timelines can be brought forward or delayed depending on these condition assessment activities

Lifecycle Management Strategy

The condition or performance of assets will deteriorate over time. To ensure vehicles are performing as expected, it is important to establish a lifecycle management strategy to proactively manage asset deterioration.

Figure 87 Vehicles Current Lifecycle Strategy

Maintenance / Rehabilitation / Replacement

- To be determined in the next phase

Forecasted Capital Requirements

The annual capital requirement represents the average amount per year that the County should allocate towards funding rehabilitation and replacement needs. The following graph identifies capital requirements over the next 30 years. This projection is used as it ensures that every asset has gone through one full iteration of replacement. The forecasted requirements are aggregated into 5-year bins and the trend line represents the average annual capital requirements at $3.0 million.

Figure 88 Vehicle Forecasted Capital Replacement Requirements

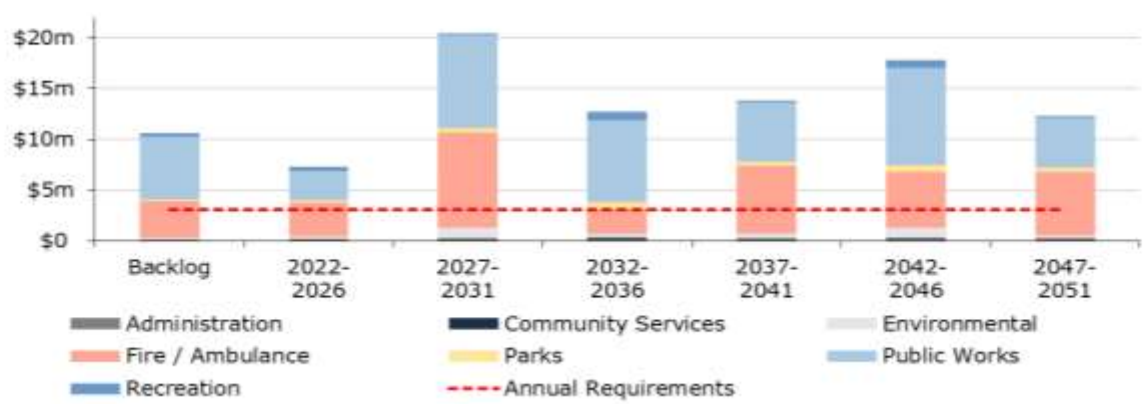


Table 38 below summarizes the projected cost of lifecycle activities (capital replacement only) that may need to be undertaken over the next 10 years to support current levels of service. These projections are generated in Citywide and rely on the data available in the asset register.

Table 38 Vehicles System-Generated 10-Year Capital Costs

Segment	Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Administration	$391k	$25k	$55k	$0	$29k	$34k	$36k	$67k	$60k	$85k	$0
Community Services	$58k	$0	$0	$0	$0	$0	$0	$58k	$0	$0	$0
Environmental	$1.3m	$66k	$110k	$0	$59k	$30k	$80k	$34k	$78k	$126k	$683k
Fire / Ambulance	$12.7m	$1.2m	$1.1m	$547k	$241k	$229k	$2.5m	$1.1m	$2.0m	$2.2m	$1.6m
Parks	$775k	$76k	$166k	$14k	$66k	$0	$114k	$38k	$218k	$48k	$35k
Public Works	$12.0m	$232k	$1.3m	$749k	$175k	$400k	$637k	$2.0m	$2.1m	$2.5m	$2.0m
Recreation	$549k	$32k	$108k	$181k	$128k	$0	$0	$0	$69k	$32k	$0

As no assessed condition data was available for the vehicles, only age was used to determine forthcoming replacement needs. These projections can be different from actual capital forecasts. Consistent data updates, especially condition, will improve the alignment between the system-generated expenditure requirements, and the County's capital expenditure forecasts

Risk & Criticality

The risk matrix provides a visual representation of the relationship between the probability of failure and the consequence of failure for the assets within this asset category based on available inventory data. See Appendix L: Risk Rating Criteria for the criteria used to determine the risk rating of each asset.

This is a high-level model that has been developed based on information currently available and should be reviewed and adjusted to reflect an evolving understanding of both the probability and consequences of asset failure.

Figure 89 Vehicles Risk Matrix

The identification of critical assets allows the County to determine appropriate risk mitigation strategies and treatment options. Risk mitigation may include asset-specific lifecycle strategies, condition assessment strategies, or simply the need to collect better asset data.

Levels of Service

Vehicles are considered a non-core asset category and as such, the County has until July 1, 2024, to determine the qualitative descriptions and technical metrics that measure the current level of service provided.

By comparing the cost, performance (average condition) and risk year-over-year, the County will be able to evaluate how their services/assets are trending. The County will use this data to set a target level of service and determine proposed levels for the regulation by 2025.

Figure 90 Vehicles Target vs Actual Reinvestment Rate

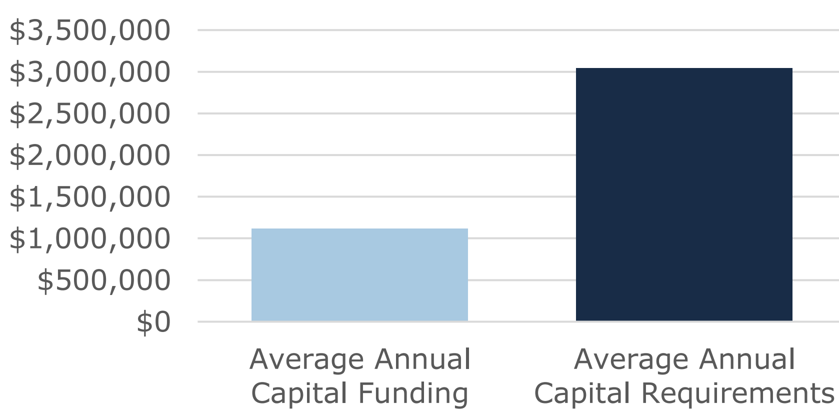


Figure 91 Vehicles Average Condition

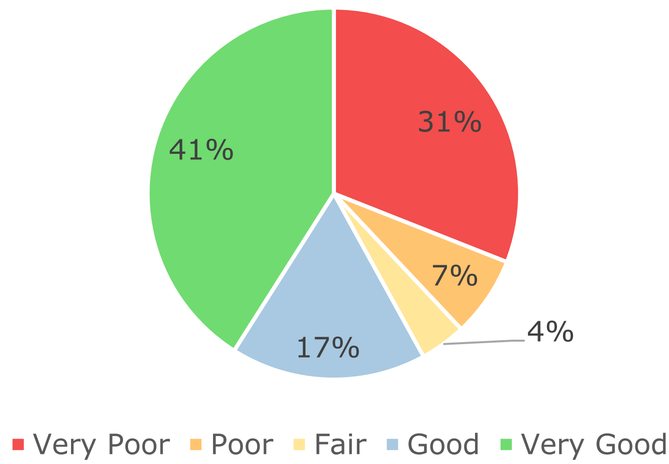
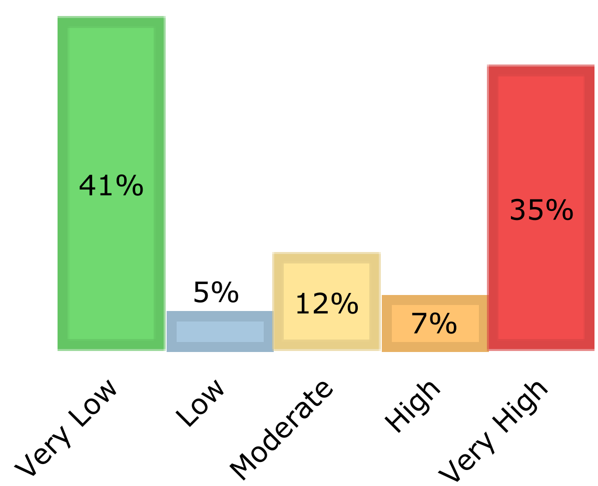


Figure 92 Vehicles Risk Breakdown



Appendix J: Machinery & Equipment

State of the Infrastructure

To maintain the quality stewardship of Haldimand County's infrastructure and support the delivery of services, municipal staff own and employ various types of equipment. This includes:

- Computer hardware, software, and phone systems to support all municipal services
- Safety equipment to support the delivery of protection services
- Books and equipment for library services
- Playground equipment and bleachers to enable the provision of recreational and parks services

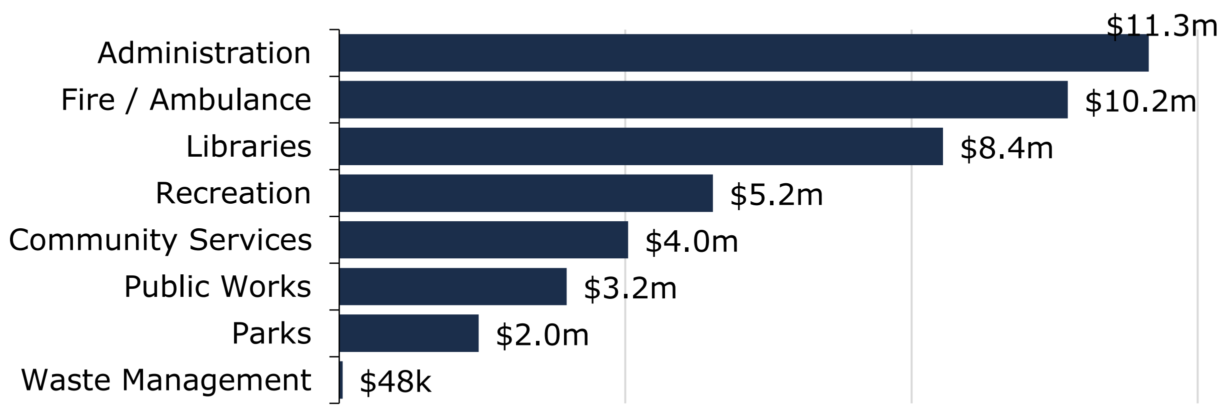
The state of the infrastructure for equipment is summarized in the following table.

Replacement Cost	Condition	Financial Capacity	
$44,385,228	Fair (45%)	Annual Requirement:	$4,688,638
		Funding Available:	$1,717,305
		Annual Deficit:	$2,971,333

Inventory & Valuation

The graph below displays the total replacement cost of each asset segment in the County's equipment inventory.

Figure 93 Machinery & Equipment Replacement Costs

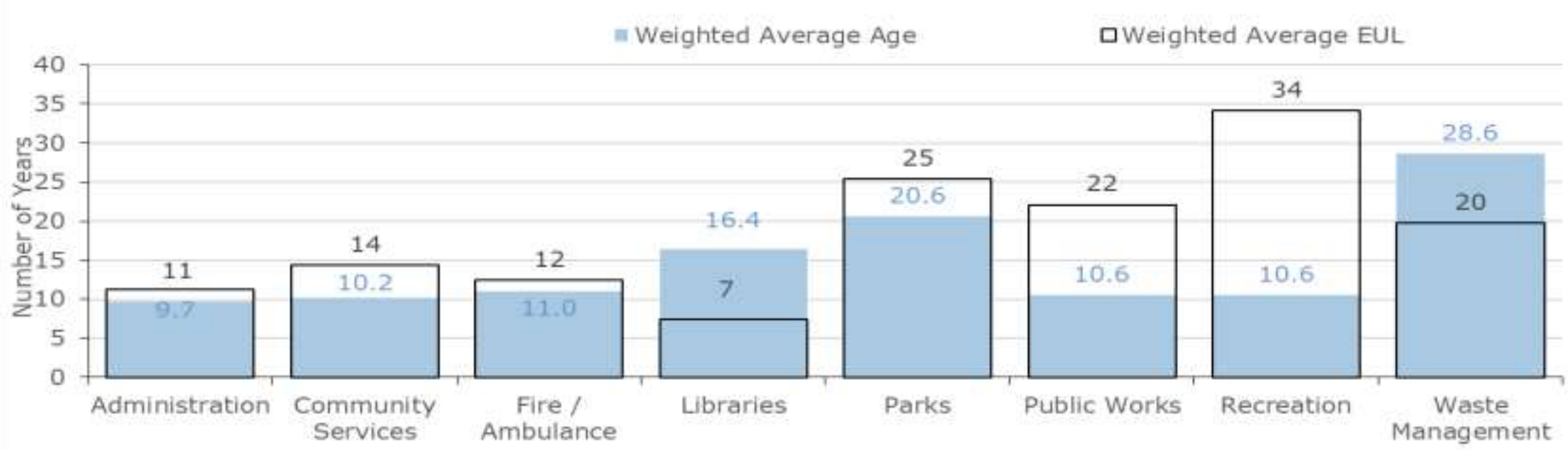


Each asset's replacement cost should be reviewed periodically to determine whether adjustments are needed to more accurate represent capital requirements.

Asset Condition & Age

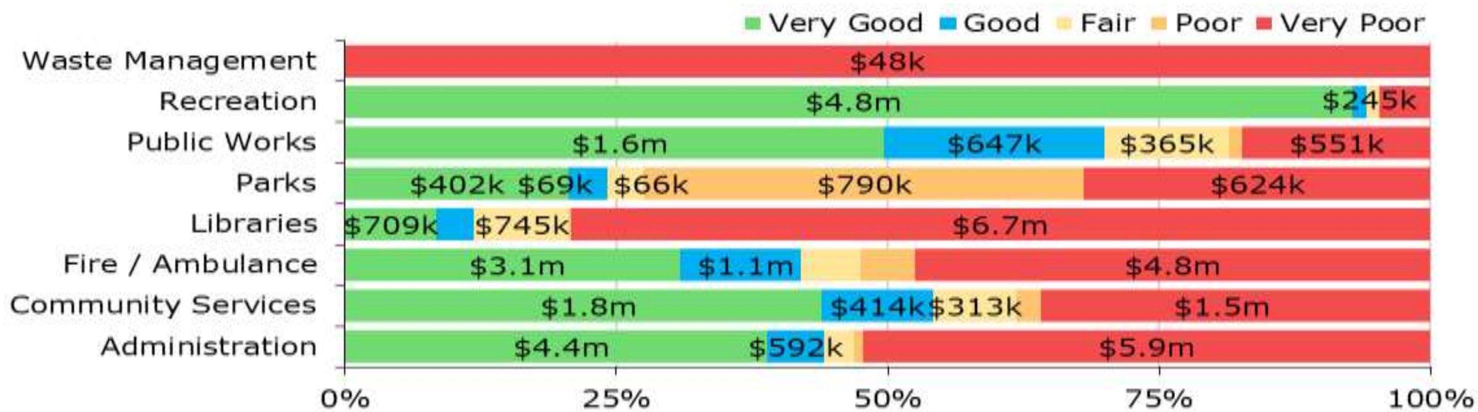
The graph below identifies the average age and the estimated useful life for each asset segment. The values are weighted based on replacement cost.

Figure 94 Machinery & Equipment Average Age vs Average EUL



The graph below visually illustrates the average condition for each asset segment on a very good to very poor scale.

Figure 95 Machinery & Equipment Condition Breakdown



To ensure that the County's equipment continues to provide an acceptable level of service, the County should continue to monitor the average condition. If the average condition declines, staff should re-evaluate their lifecycle management strategy to determine what combination of maintenance, rehabilitation and replacement activities is required to increase the overall condition.

Each asset's estimated useful life should also be reviewed periodically to determine whether adjustments need to be made to better align with the observed length of service life for each asset type.

Current Approach to Condition Assessment

Accurate and reliable condition data allows staff to determine the remaining service life of assets and identify the most cost-effective approach to managing assets.

The current approach is varied because of the broad range of types of equipment included in this category. There are some types with very established assessments (i.e. Fire Equipment), but also many don't have any assessment procedures.

Lifecycle Management Strategy

The condition or performance of most assets will deteriorate over time. To ensure that municipal assets are performing as expected and meet the needs of customers, it is important to establish a lifecycle management strategy to proactively manage asset deterioration.

Figure 96 Machinery & Equipment Current Lifecycle Strategy

Maintenance / Rehabilitation / Replacement
•To be determined in the next phase

Forecasted Capital Requirements

The following graph identifies capital requirements over the next 65 years. This projection is used as it ensures that every asset has gone through one full iteration of replacement. The forecasted requirements are aggregated into 5-year bins and the trend line represents the average annual capital requirements at $4.7 million.

The projected cost of lifecycle activities that will need to be undertaken over the next 10 years to maintain the current level of service can be found in Table 39.

Figure 97 Machinery & Equipment Forecasted Capital Replacement Requirements

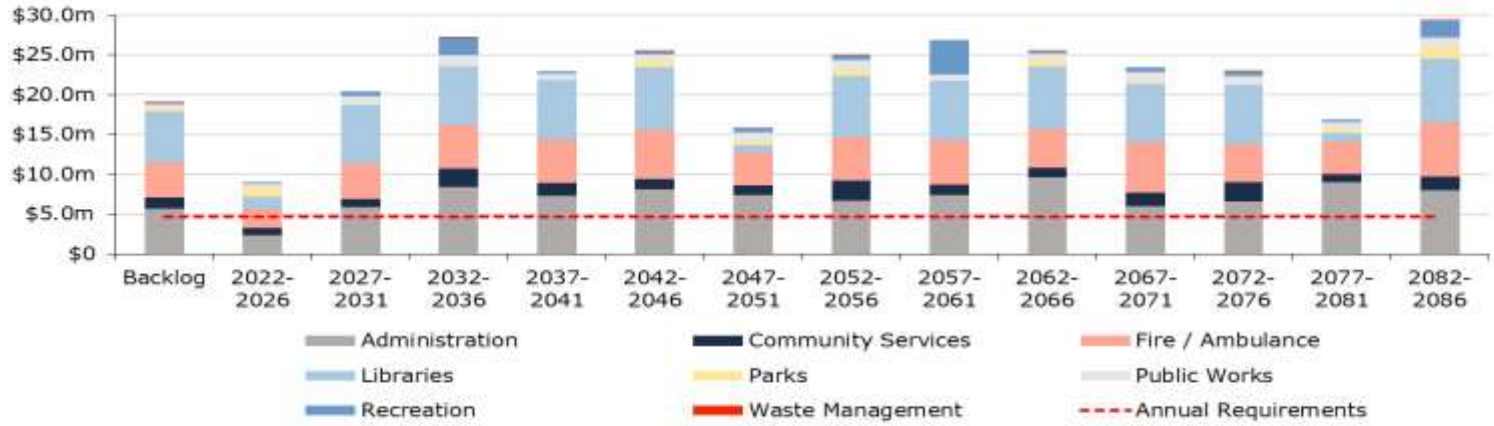


Table 39 below summarizes the projected cost of lifecycle activities (capital replacement only) that may need to be undertaken over the next 10 years to support current levels of service. These projections are generated in Citywide and rely on the data available in the asset register.

Table 39 Machinery & Equipment System-Generated 10-Year Capital Costs

Segment	Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Administration	$8.2m	$222k	$353k	$873k	$513k	$411k	$3.1m	$763k	$684k	$1.2m	$70k
Community Services	$1.9m	$101k	$110k	$213k	$202k	$245k	$248k	$180k	$270k	$206k	$99k
Fire / Ambulance	$6.8m	$427k	$552k	$568k	$395k	$376k	$2.3m	$930k	$603k	$613k	$44k
Libraries	$9.0m	$239k	$218k	$710k	$250k	$218k	$73k	$6.6m	$223k	$237k	$204k
Parks	$1.1m	$210k	$149k	$654k	$48k	$18k	$13k	$0	$56k	$0	$0
Public Works	$1.6m	$48k	$4k	$58k	$342k	$88k	$195k	$57k	$229k	$517k	$64k
Recreation	$859k	$80k	$56k	$9k	$19k	$66k	$70k	$20k	$79k	$43k	$418k
Waste Management	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

As no assessed condition data was available for the equipment, only age was used to determine forthcoming replacement needs. These projections can be different from actual capital forecasts. Consistent data updates, especially condition, will improve the alignment between the system-generated expenditure requirements, and the County's capital expenditure forecasts

Risk & Criticality

The risk matrix provides a visual representation of the relationship between the probability of failure and the consequence of failure for the assets within this asset category based on available inventory data. See Appendix L: Risk Rating Criteria for the criteria used to determine the risk rating of each asset.

Figure 98 Machinery & Equipment Risk Matrix

This is a high-level model that has been developed based on information currently available and should be reviewed and adjusted to reflect an evolving understanding of both the probability and consequences of asset failure.

The identification of critical assets allows the County to determine appropriate risk mitigation strategies and treatment options. Risk mitigation may include asset-specific lifecycle strategies, condition assessment strategies, or simply the need to collect better asset data.

Levels of Service

Equipment is considered a non-core asset category and as such, the County has until July 1, 2024, to determine the qualitative descriptions and technical metrics that measure the current level of service provided.

By comparing the cost, performance (average condition) and risk year-over-year, the County will be able to evaluate how their services/assets are trending. The County will use this data to set a target level of service and determine proposed levels for the regulation by 2025.

Figure 99 Machinery & Equipment Target vs Actual Reinvestment Rate

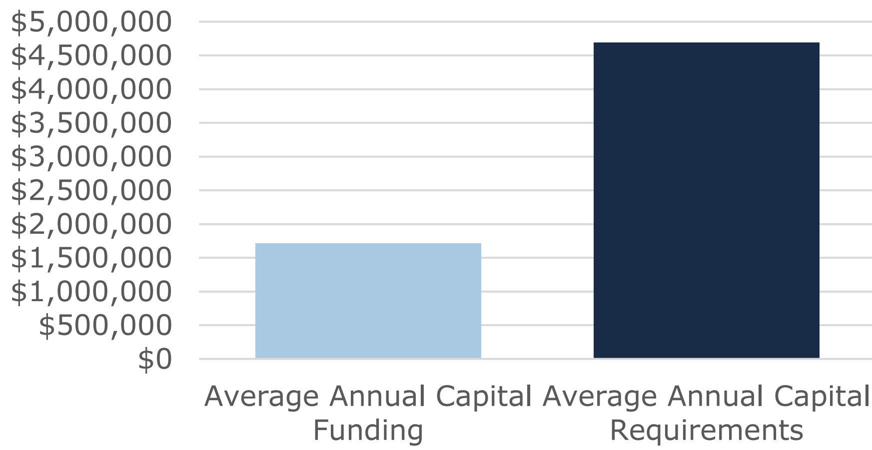


Figure 100 Machinery & Equipment Average Condition

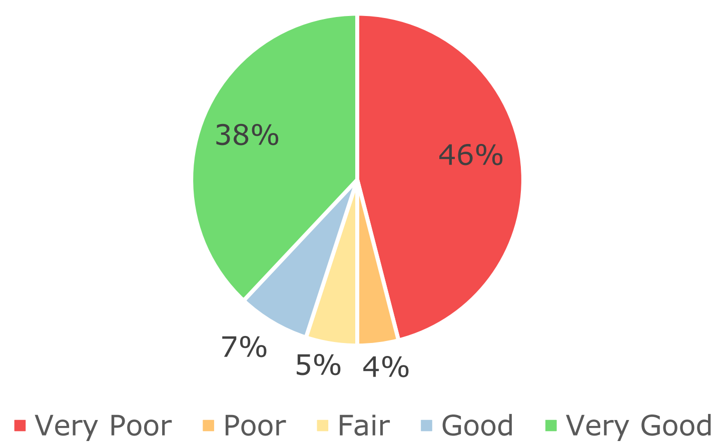
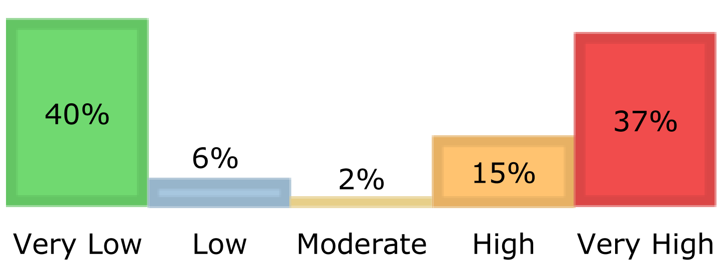


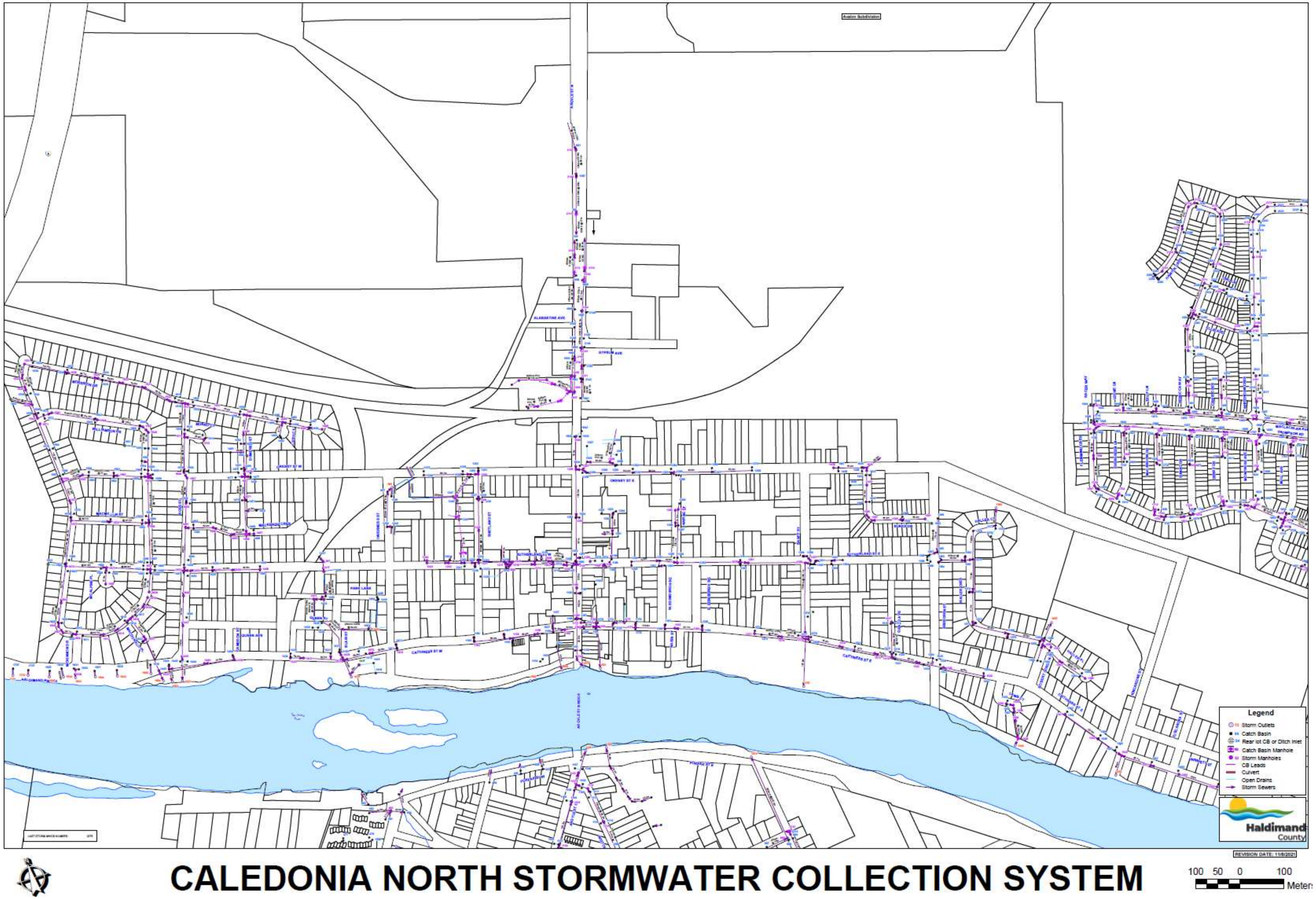
Figure 101 Machinery & Equipment Risk Breakdown

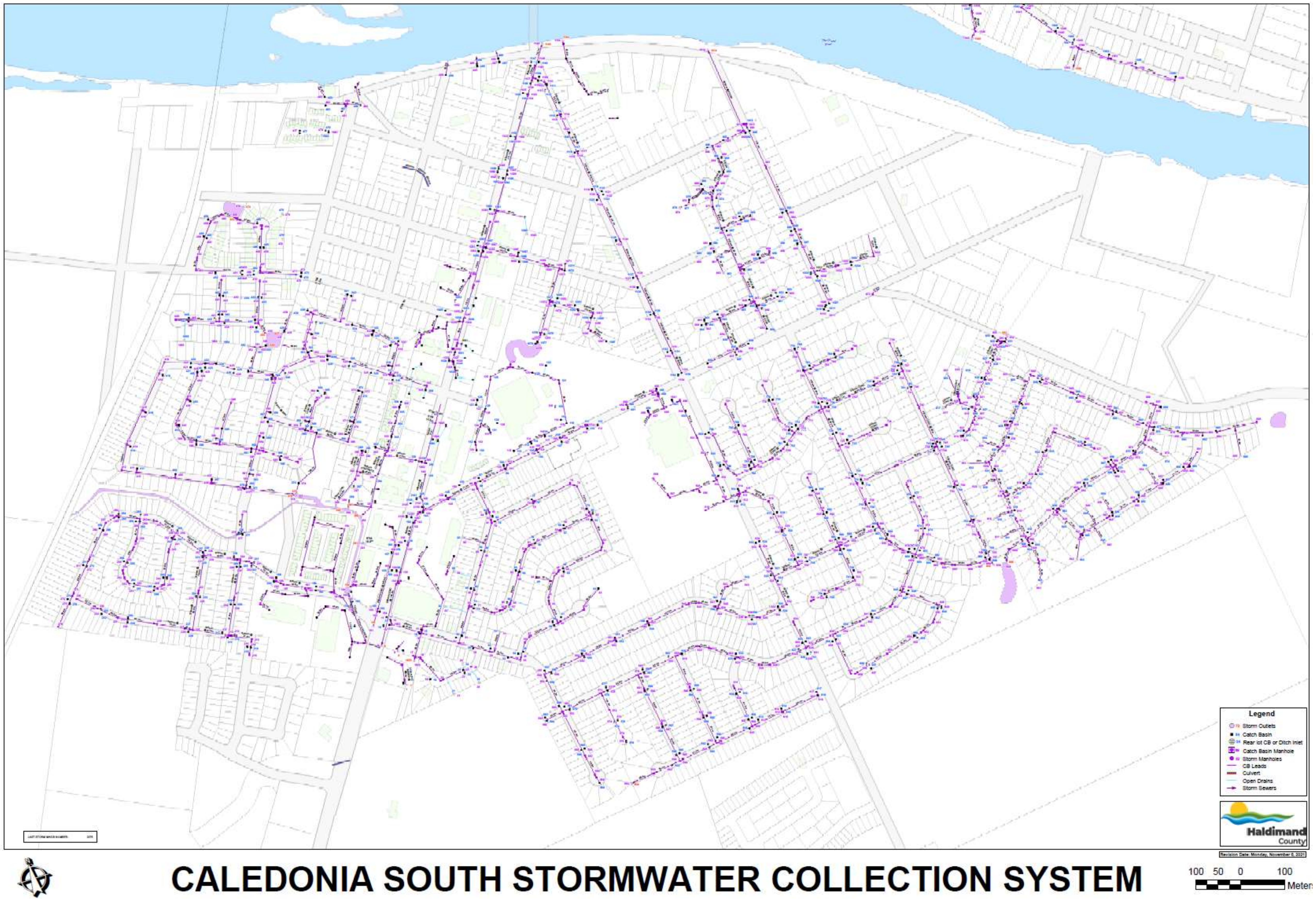


Appendix K: Level of Service Maps

Road Network Maps

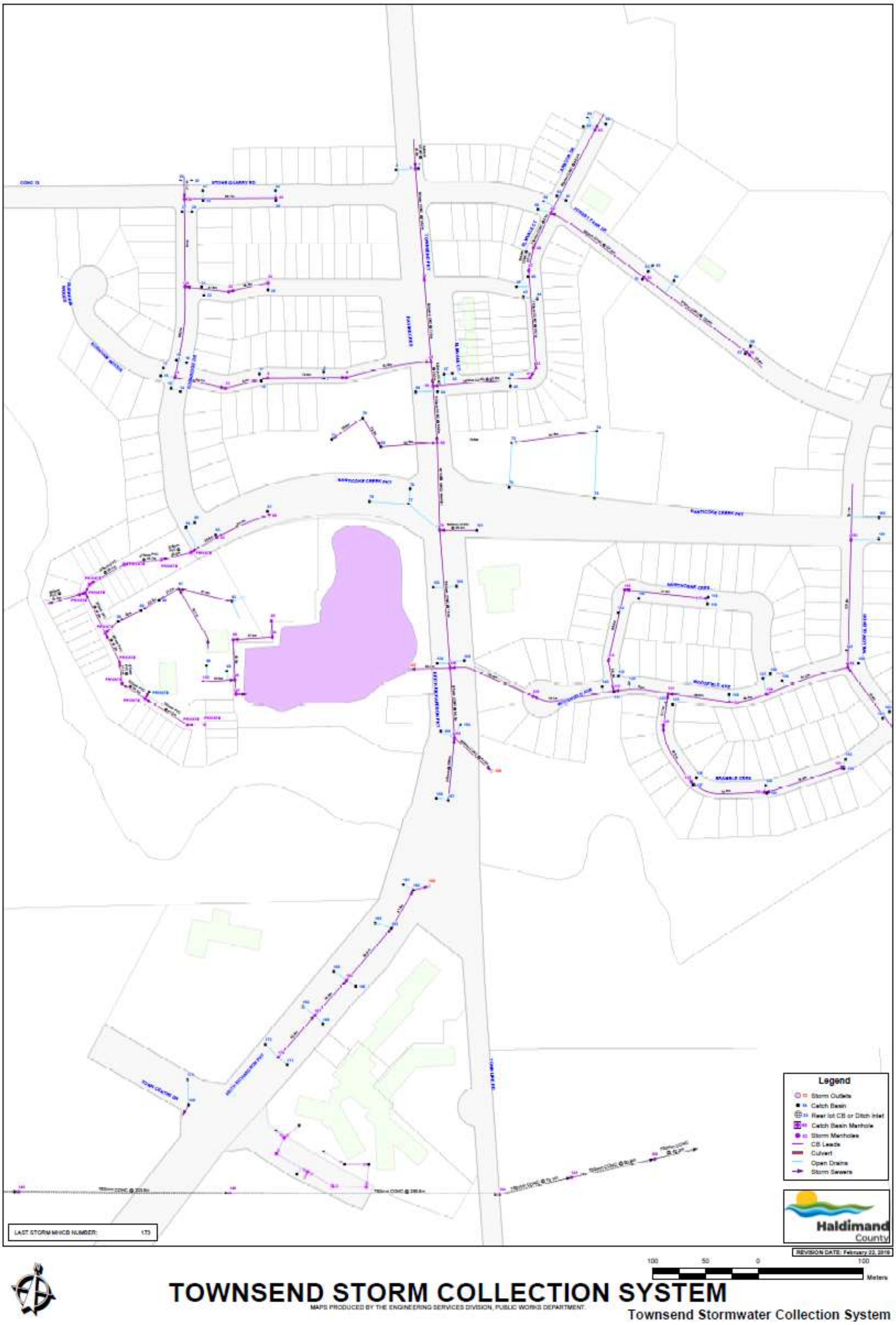
Storm Network Maps




Legend
Storm Outlets
Catch Basin
Rear lot CB or Ditch Inlet
Catch Basin Manhole
Storm Manholes
CB Leads
Culvert
Open Drains
Storm Sewers
Haldimand County
Revision Date: Monday, November 8, 2021
CALEDONIA SOUTH STORMWATER COLLECTION SYSTEM
100 50 0 100
Meters

NORTH EAST CALEDONIA
STORM COLLECTION SYSTEM

100 50 0 100
Meters


Legend
Storm Outlets
Catch Basin
Rear lot CB or Ditch Inlet
Catch Basin Manhole
Storm Manholes
CB Leads
Culvert
Open Drains
Storm Sewers
Haldimand County
REVISION DATE: February 22, 2019
100 50 0 100
Meters
LAST STORM MHCB NUMBER: 173
NANTICOKE CREEK PKY
TOWNSEND STORM COLLECTION SYSTEM
MAPS PRODUCED BY THE ENGINEERING SERVICES DIVISION, PUBLIC WORKS DEPARTMENT.
Townsend Stormwater Collection System

LEGEND

- Hydrant
- Fireline
- Diameter n/a
- 100mm Watermain
- 150mm Watermain
- 200mm Watermain
- 250mm Watermain
- 300mm Watermain
- 350mm and up

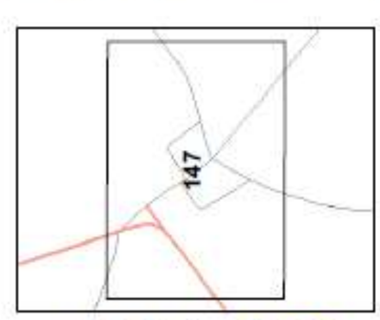
0 10 20 40 60 80 100 m

PRINT DATE: July 23, 2012

A GRAND EXPERIENCE HALDIMAND COUNTY

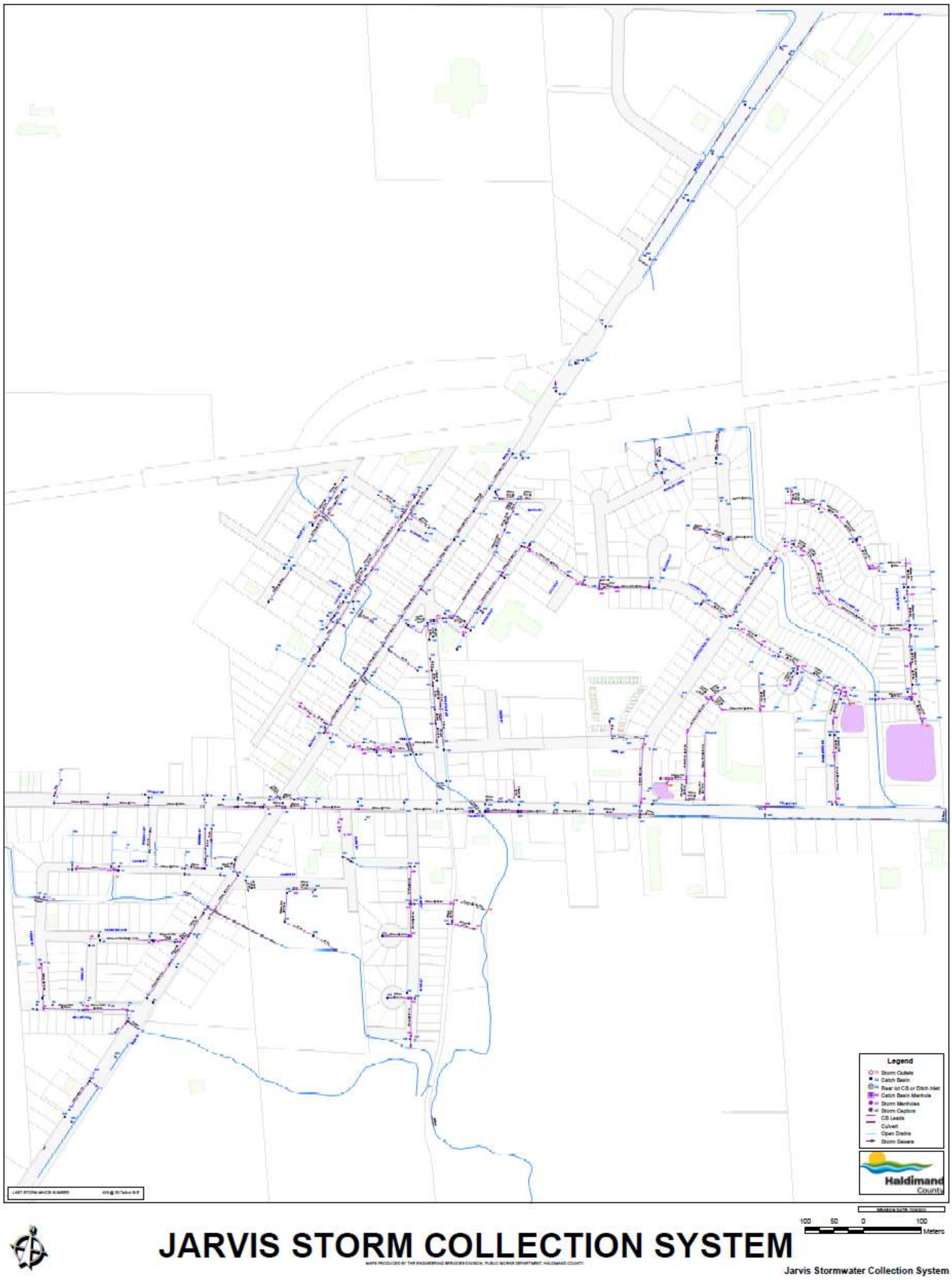
Stormwater Collection Map

CANBOROUGH

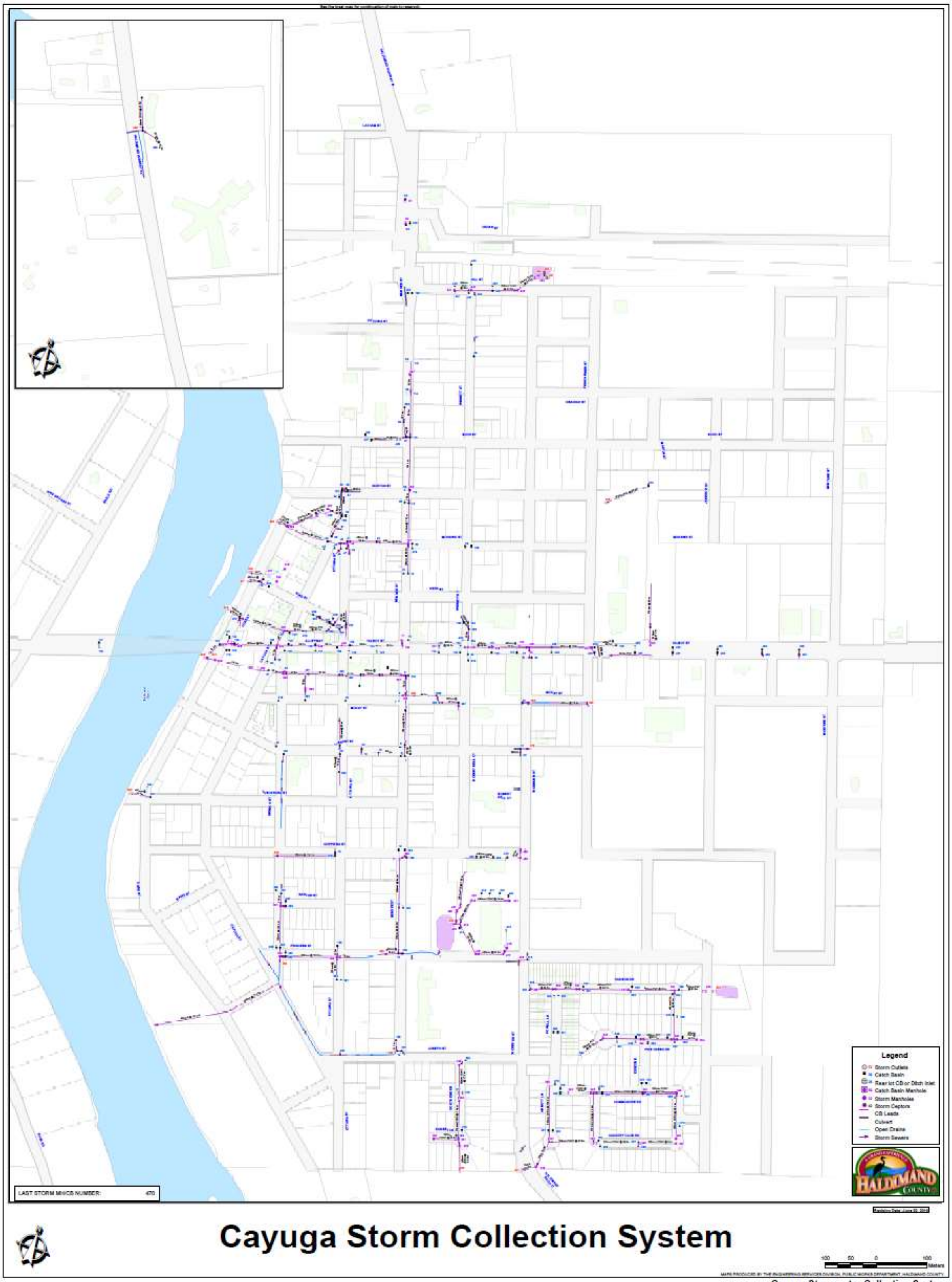


MAP 147

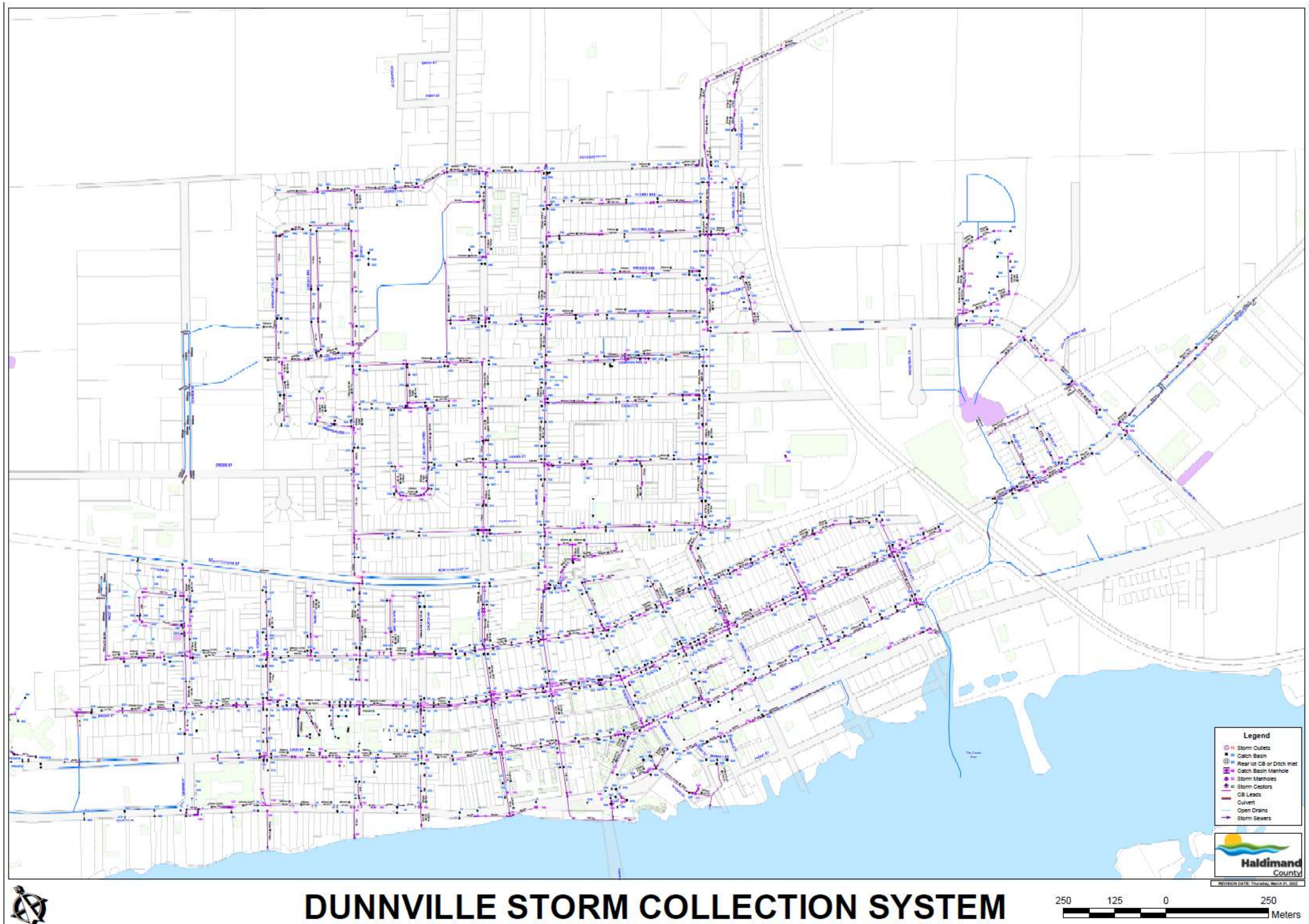
MAPS PRODUCED BY THE ENGINEERING SERVICES DIVISION, PUBLIC WORKS DEPARTMENT.



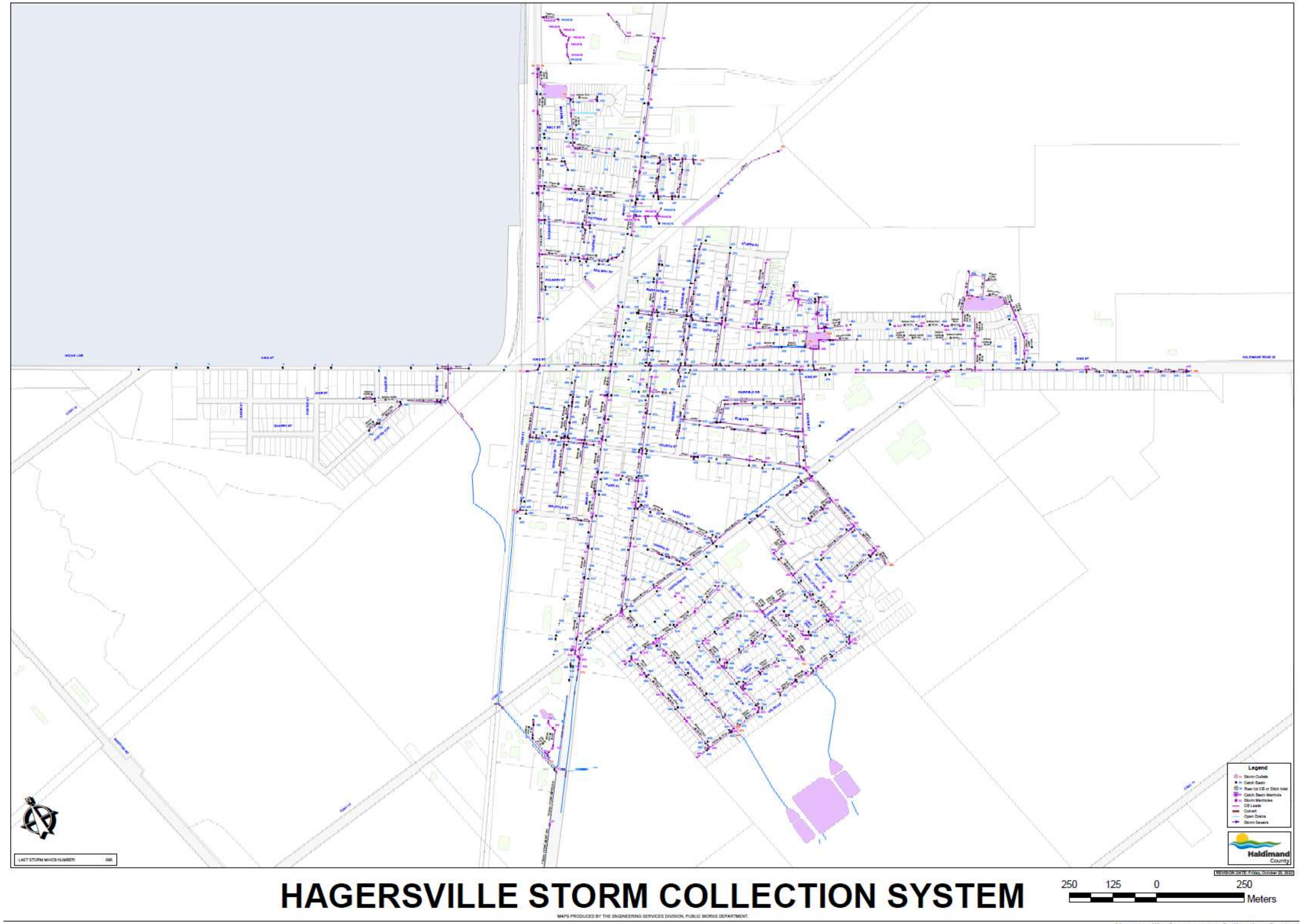
Legend
Storm Outlets
Catch Basin
Rear lot CB or Ditch Inlet
Catch Basin Manhole
Storm Manholes
Storm Ceptors
CB Leads
Culvert
Open Drains
Storm Sewers
Haldimand
County
100 50 0 100
Meters
JARVIS STORM COLLECTION SYSTEM
Jarvis Stormwater Collection System



Cayuga Stormwater Collection System



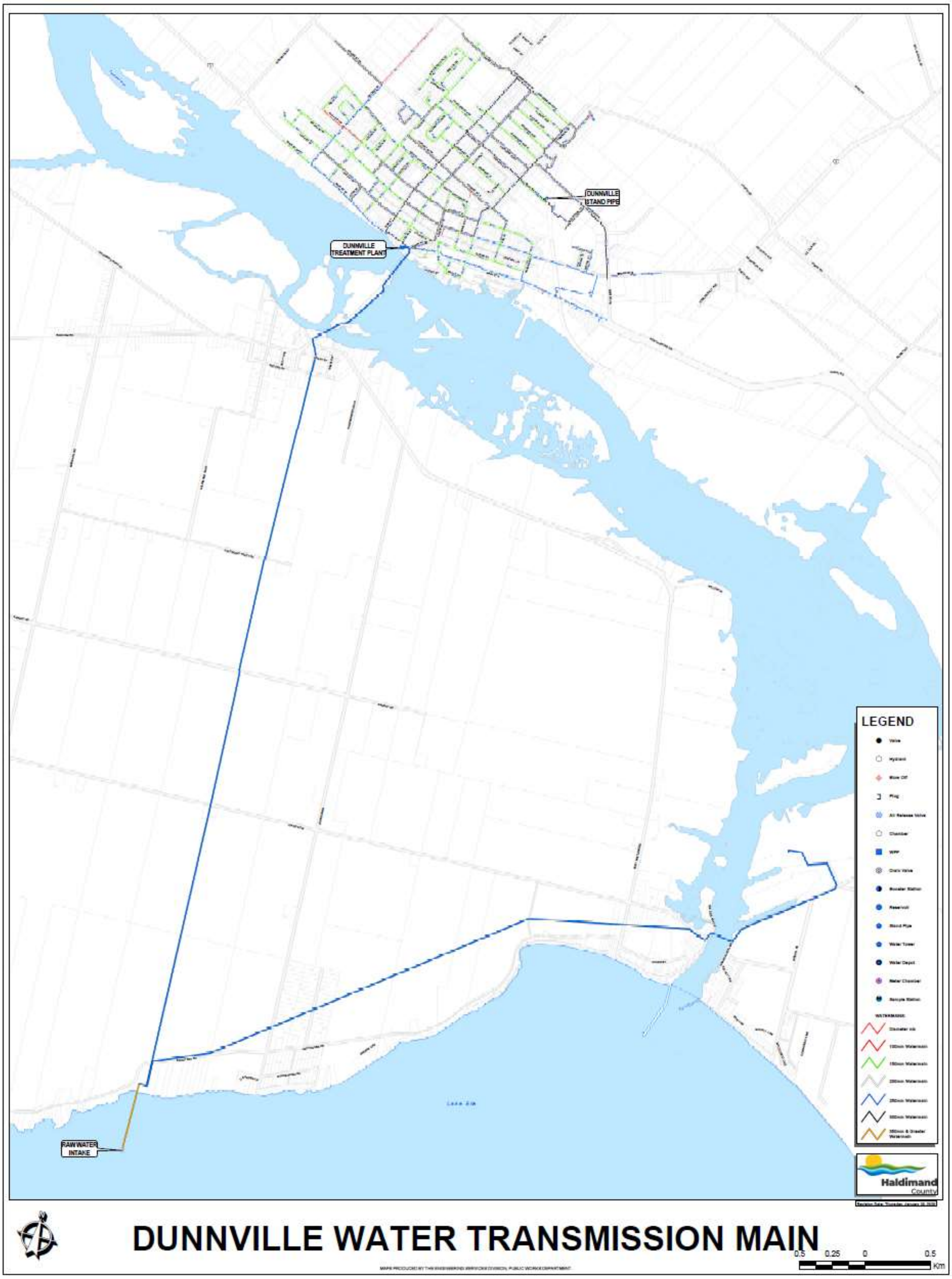
Dunnville Stormwater Collection System


Legend
Haldimand County
HAGERSVILLE STORM COLLECTION SYSTEM
250 125 0 250
Meters
MAPS PRODUCED BY THE ENGINEERING SERVICES DIVISION, PUBLIC WORKS DEPARTMENT
Hagersville Stormwater Collection System

LAKE ERIE INDUSTRIAL PARK STORM COLLECTION SYSTEM

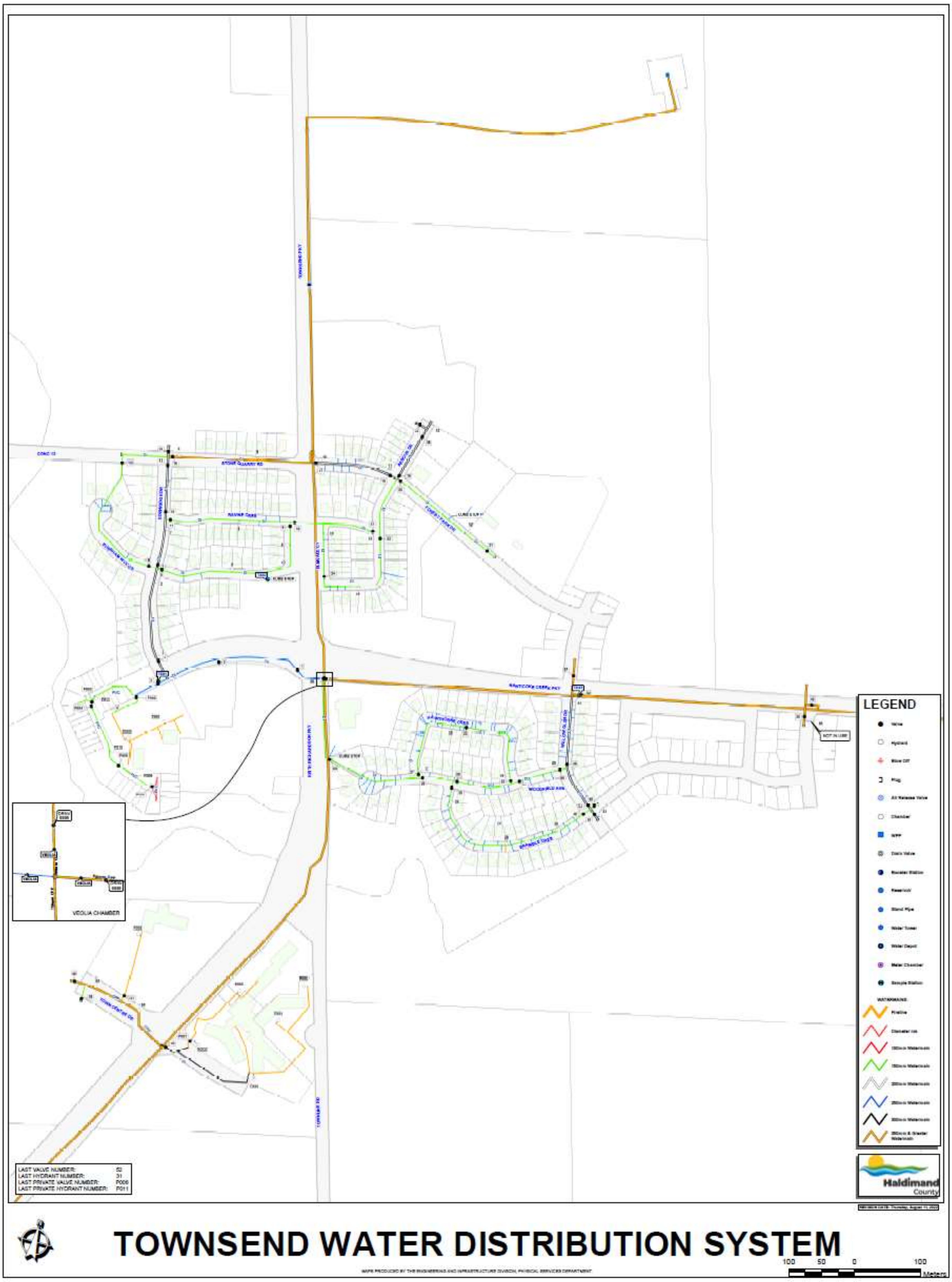

SHANNON ST
NELLES ST
FRONT ST
QUEEN ST
ALBION ST
RIVER RD
HALDIMAND ROAD
KING AVE
MERRITT ST
ALBION ST
JOHN ST
MILL ST
WATER ST
Legend
LAKE ERIE INDUSTRIAL PARK STORM COLLECTION SYSTEM
50 25 0 50
Meters
Lake Erie Industrial Park Stormwater Collection System

Water Network Maps

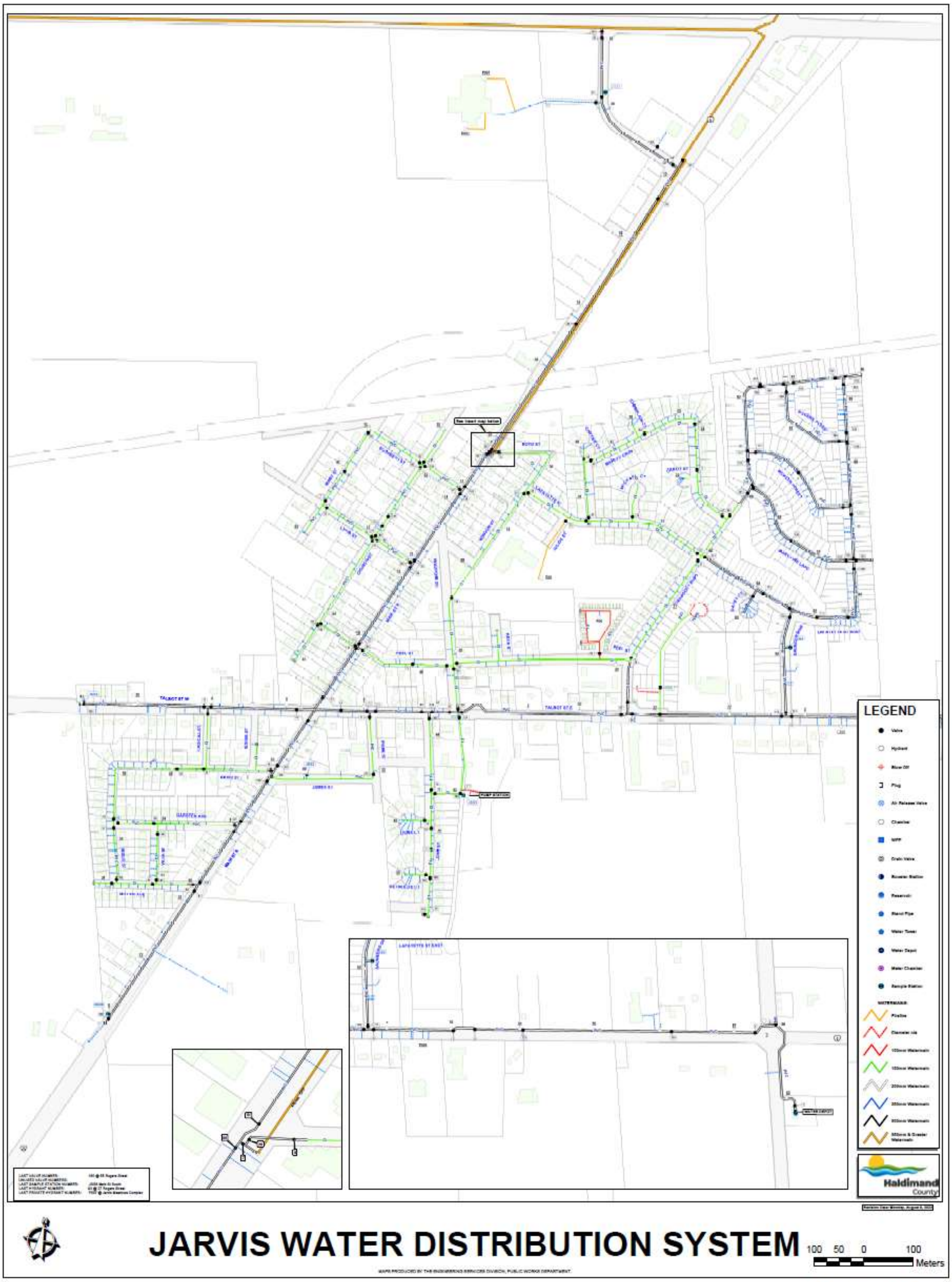


Caledonia N/E Water Distribution System

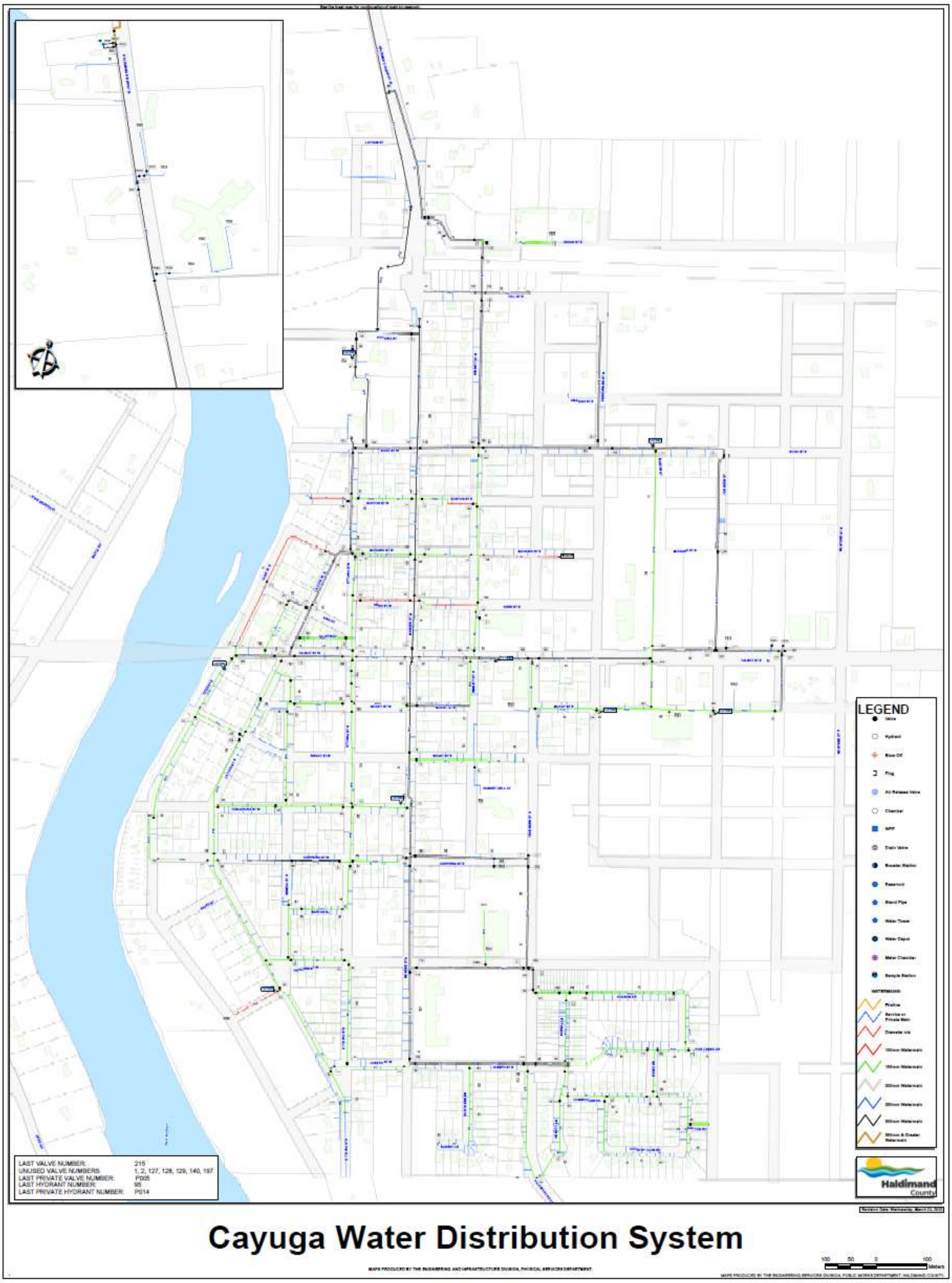
White Oaks Water System



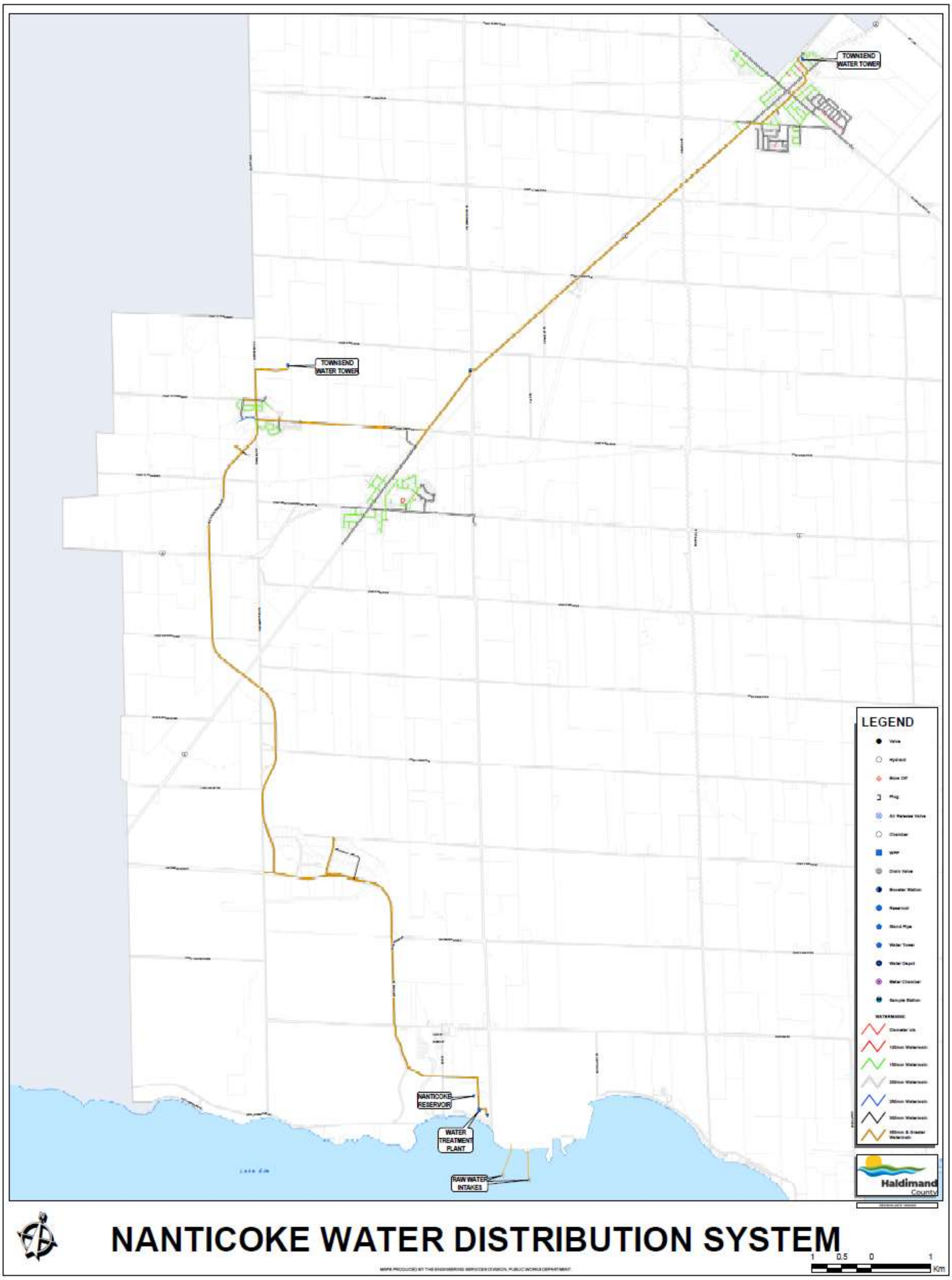
LEGEND
TOWNSEND WATER DISTRIBUTION SYSTEM
VEOLIA CHAMBER
LAST VALVE NUMBER: 52
LAST HYDRANT NUMBER: 31
LAST PRIVATE VALVE NUMBER: P000
LAST PRIVATE HYDRANT NUMBER: P011
Haldimand County
100 50 0 100
Meters

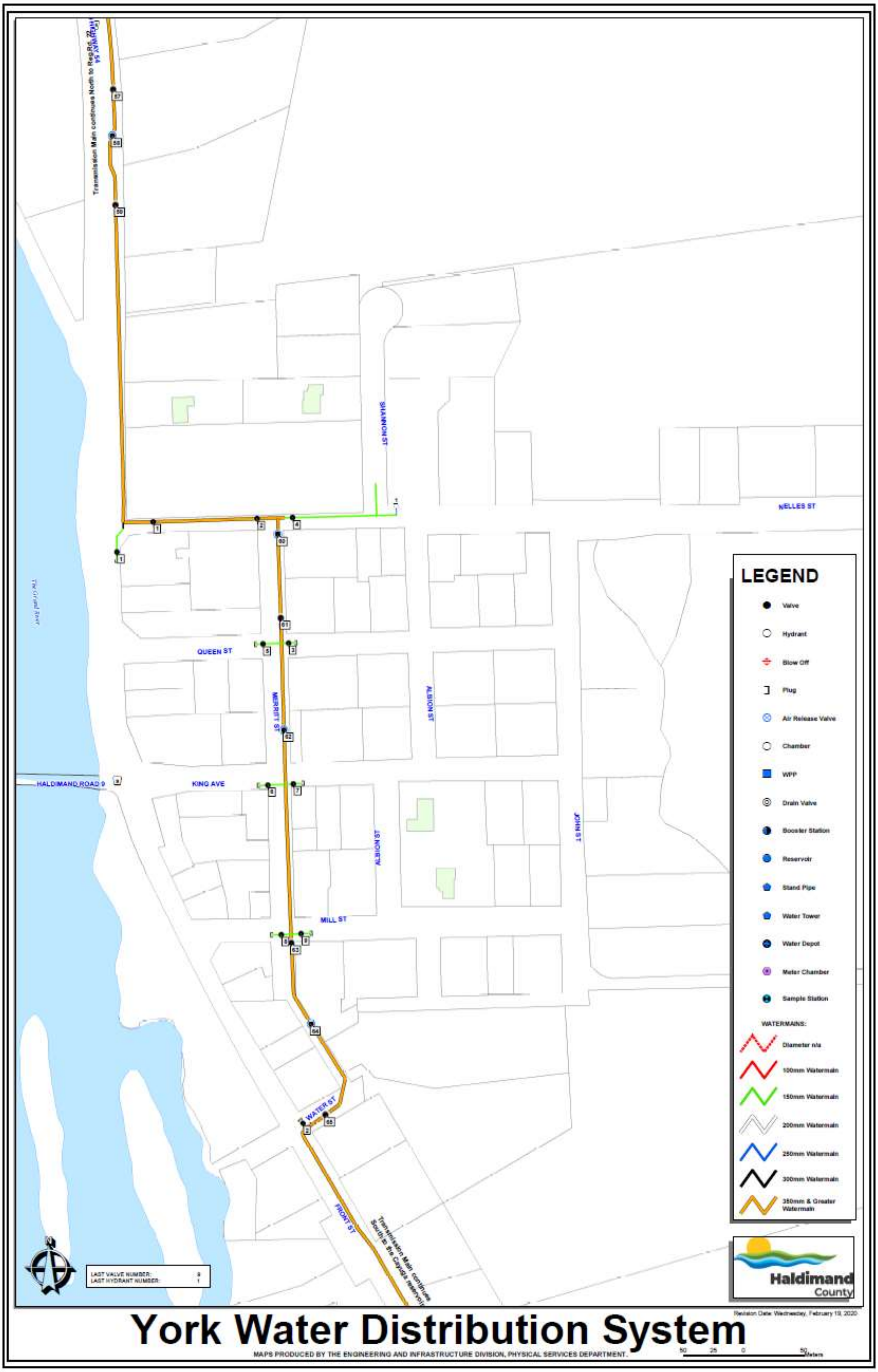


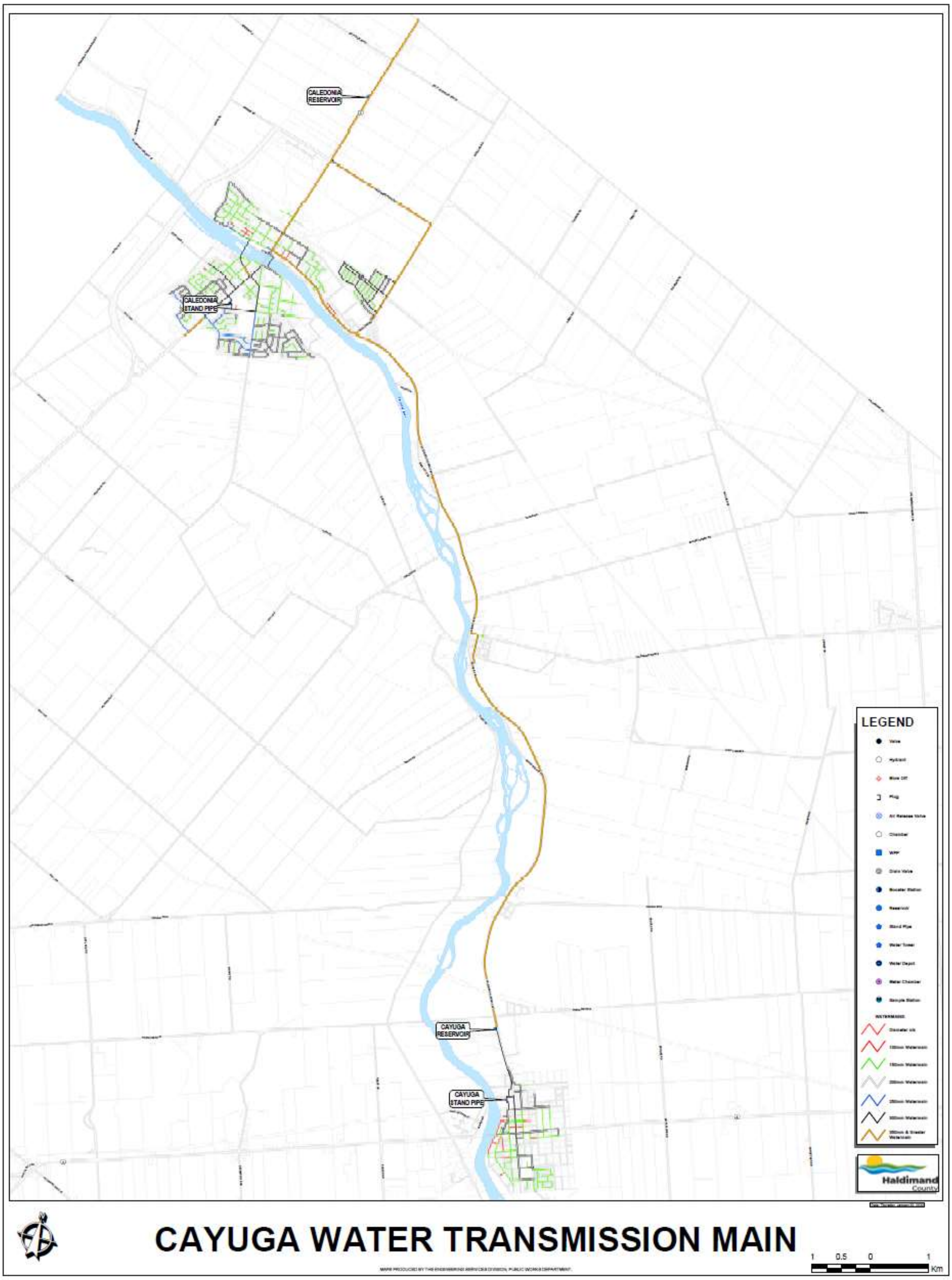
Jarvis Water Distribution System

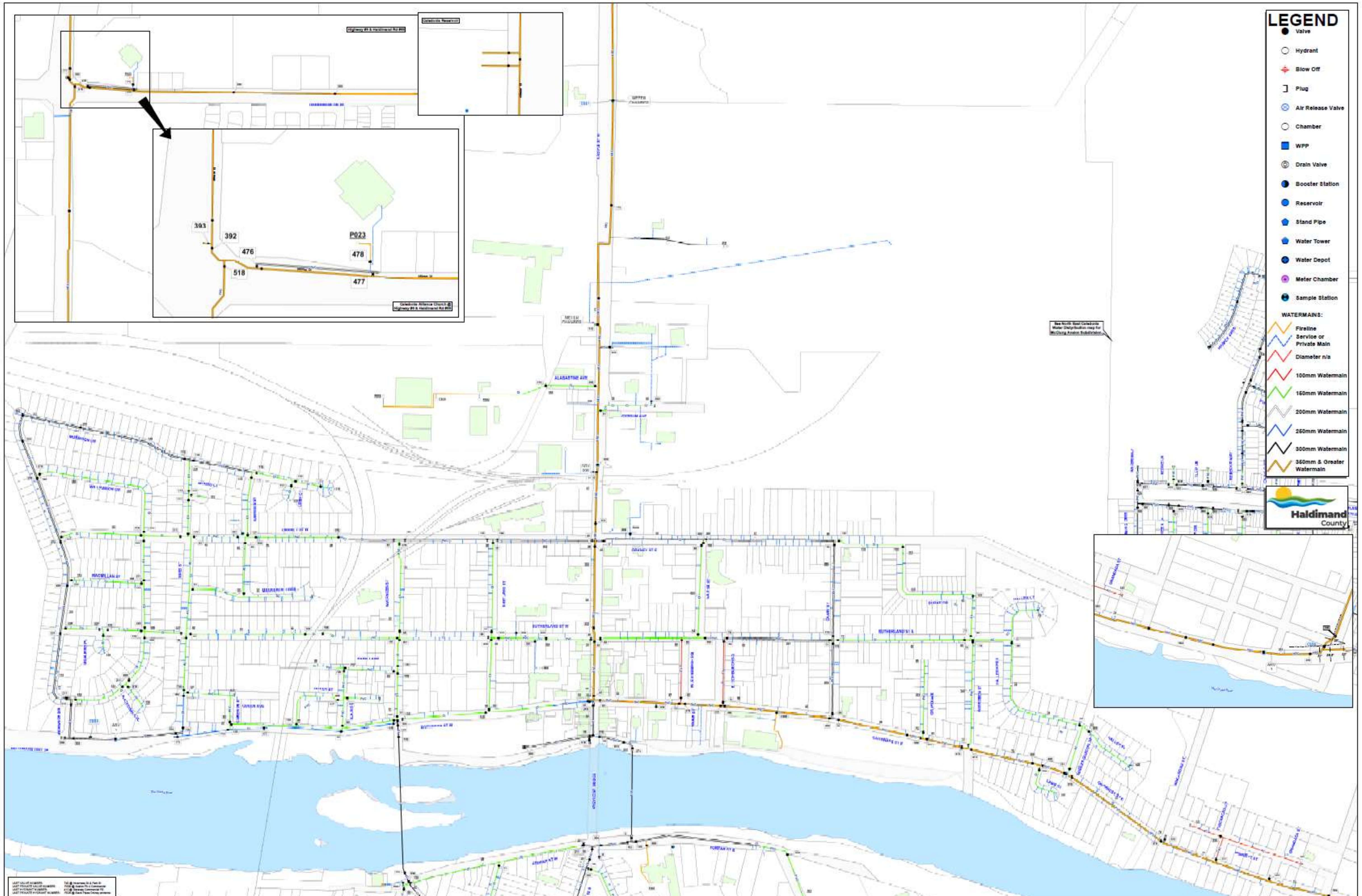


Cayuga Water Distribution System


TOWNSEND WATER TOWER
TOWNSEND WATER TOWER
NANTICOKE RESERVOIR
WATER TREATMENT PLANT
RAW WATER INTAKES
LEGEND
Haldimand County
NANTICOKE WATER DISTRIBUTION SYSTEM
1 0.5 0 1
Km


York Water Distribution System
MAPS PRODUCED BY THE ENGINEERING AND INFRASTRUCTURE DIVISION, PHYSICAL SERVICES DEPARTMENT.
LEGEND
Valve
Hydrant
Blow Off
Plug
Air Release Valve
Chamber
WPP
Drain Valve
Booster Station
Reservoir
Stand Pipe
Water Tower
Water Depot
Meter Chamber
Sample Station
WATERMAINS:
Diameter n/a
100mm Watermain
150mm Watermain
200mm Watermain
250mm Watermain
300mm Watermain
350mm & Greater Watermain
Haldimand County
Revision Date: Wednesday, February 19, 2020
LAST VALVE NUMBER:
LAST HYDRANT NUMBER:
HIGHWAY 54
Transmission Main continues North to Reg.Rd. 20
SHANNON ST
NELLES ST
QUEEN ST
MERRITT ST
ALBION ST
KING AVE
HALDIMAND ROAD 9
JOHN ST
MILL ST
WATER ST
FRONT ST
Transmission Main continues South to the Cayuga reservoir


CALEDONIA RESERVOIR
CALEDONIA STAND PIPE
CAYUGA RESERVOIR
CAYUGA STAND PIPE
LEGEND
Haldimand County
CAYUGA WATER TRANSMISSION MAIN
1 0.5 0 1
Km

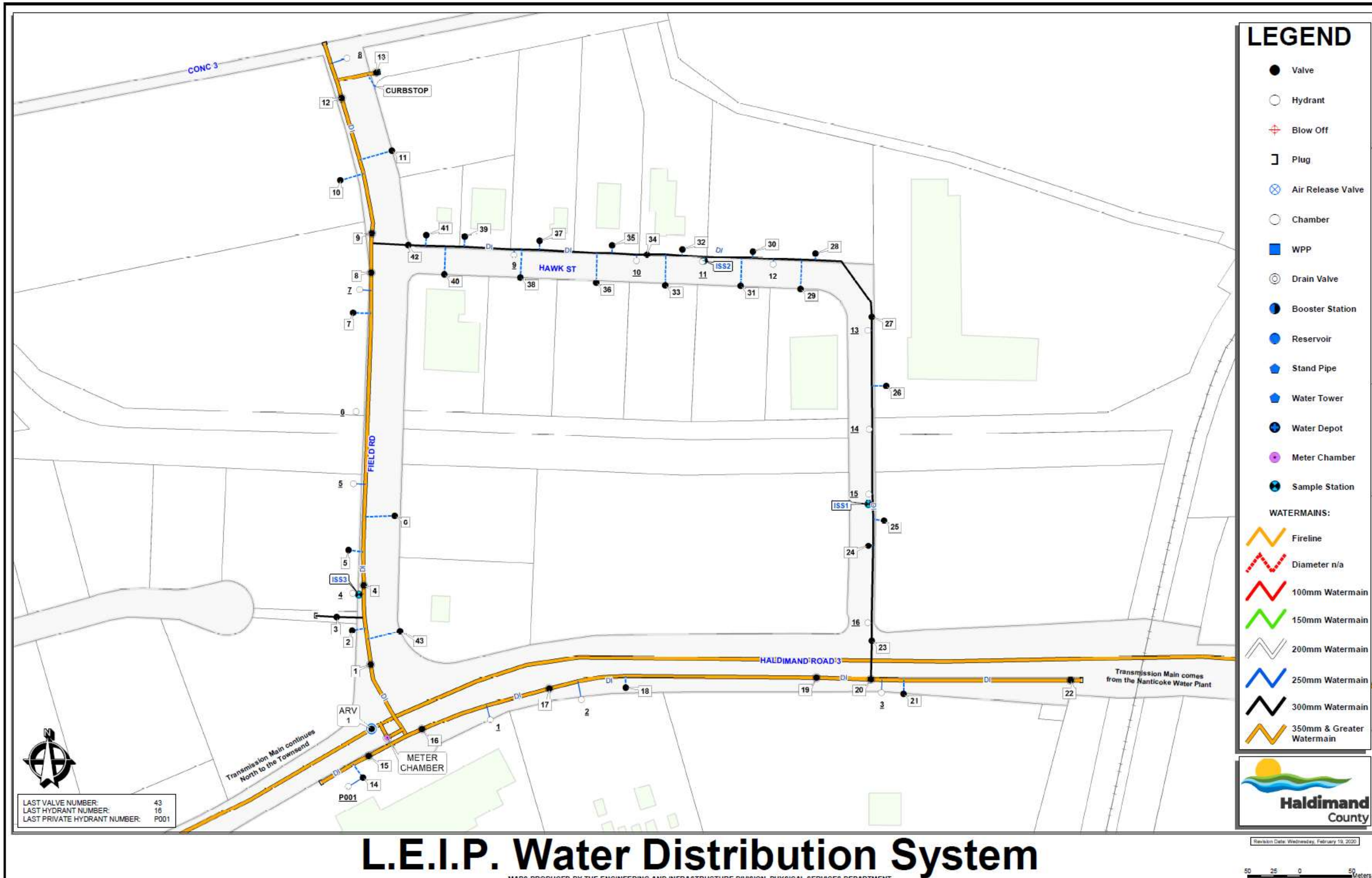


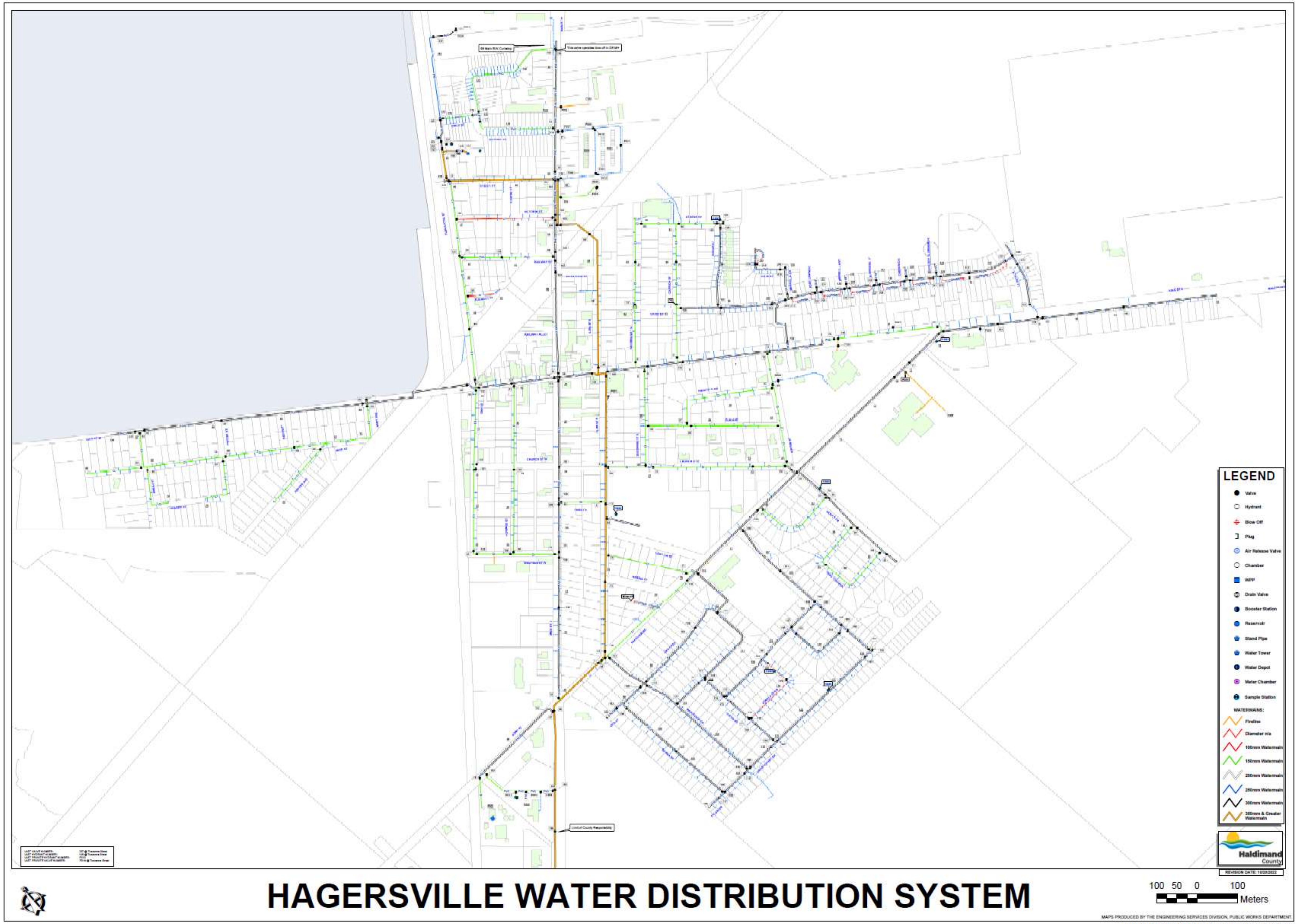
NORTH CALEDONIA WATER DISTRIBUTION SYSTEM

MAPS PRODUCED BY THE ENGINEERING AND INFRASTRUCTURE DIVISION, PHYSICAL SERVICES DEPARTMENT

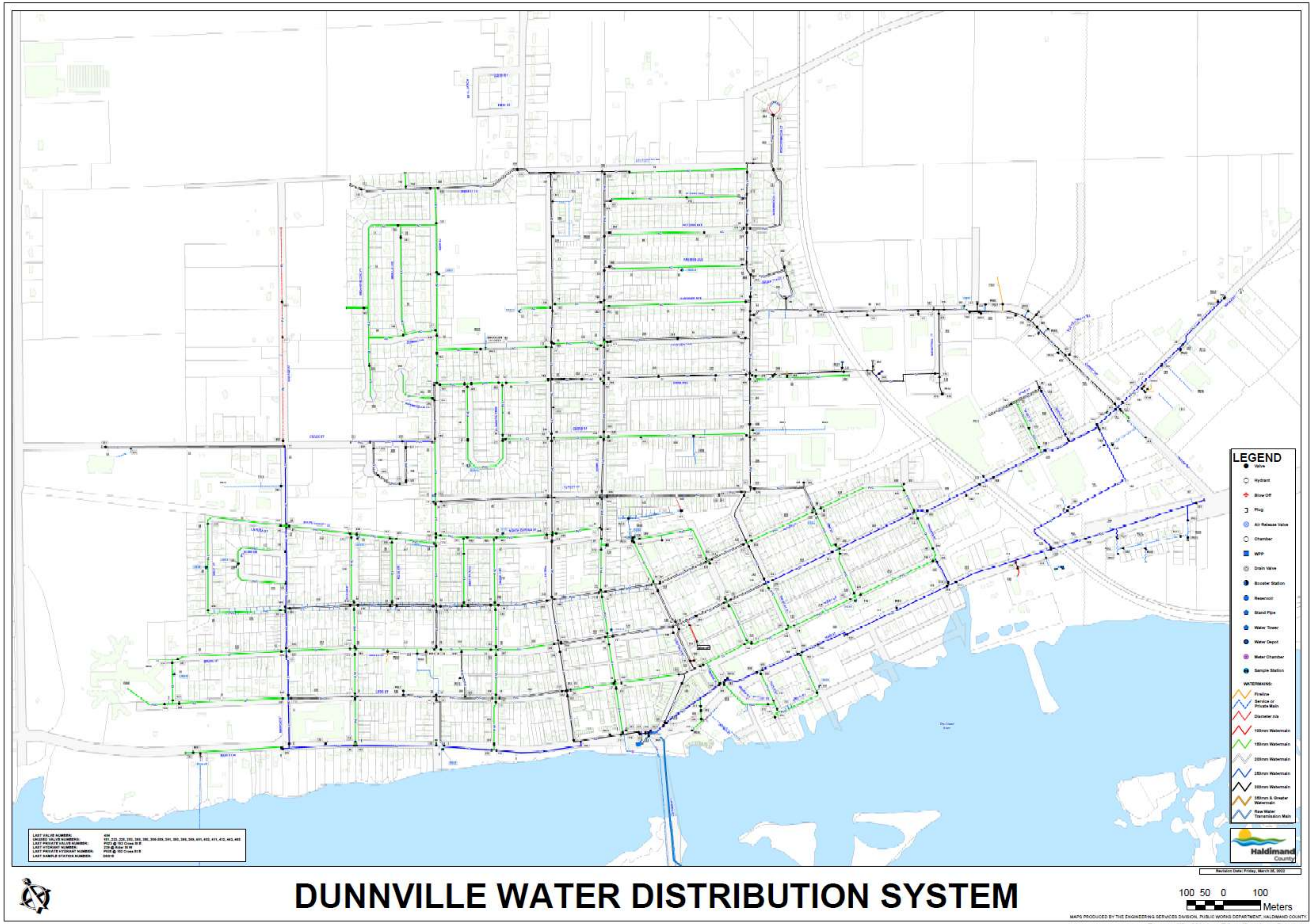
100 50 0 100
Meters

Caledonia N Water Distribution System

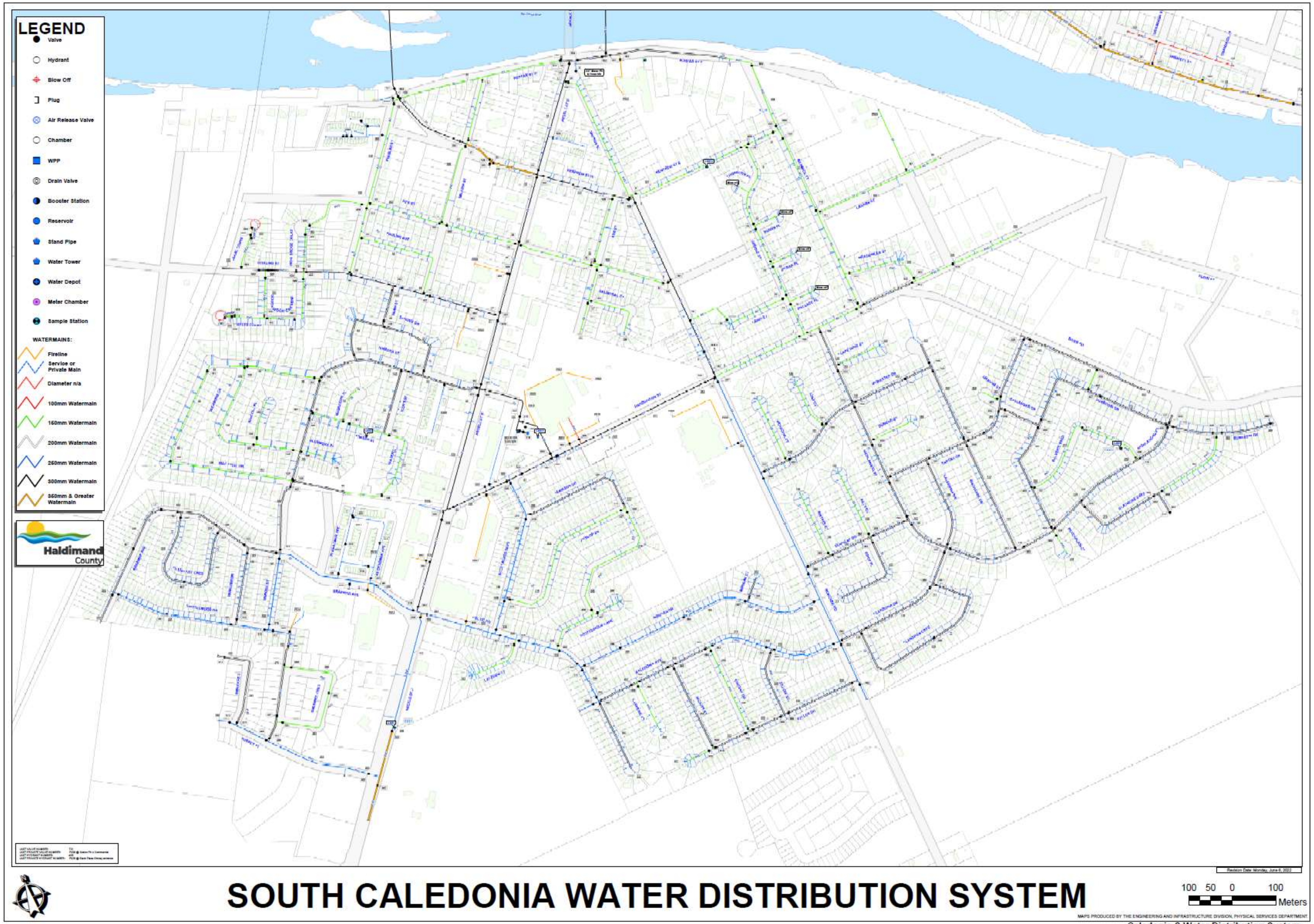

LEGEND
Valve
Hydrant
Blow Off
Plug
Air Release Valve
Chamber
WPP
Drain Valve
Booster Station
Reservoir
Stand Pipe
Water Tower
Water Depot
Meter Chamber
Sample Station
WATERMAINS:
Fireline
Diameter n/a
100mm Watermain
150mm Watermain
200mm Watermain
250mm Watermain
300mm Watermain
350mm & Greater Watermain
Haldimand County
CONC 3
CURBSTOP
HAWK ST
FIELD RD
HALDIMAND ROAD 3
Transmission Main comes from the Nanticoke Water Plant
Transmission Main continues North to the Townsend
METER CHAMBER
ARV 1
P001
LAST VALVE NUMBER: 43
LAST HYDRANT NUMBER: 16
LAST PRIVATE HYDRANT NUMBER: P001
L.E.I.P. Water Distribution System
MAPS PRODUCED BY THE ENGINEERING AND INFRASTRUCTURE DIVISION, PHYSICAL SERVICES DEPARTMENT.
Revision Date: Wednesday, February 19, 2020
50 25 0 50 Meters



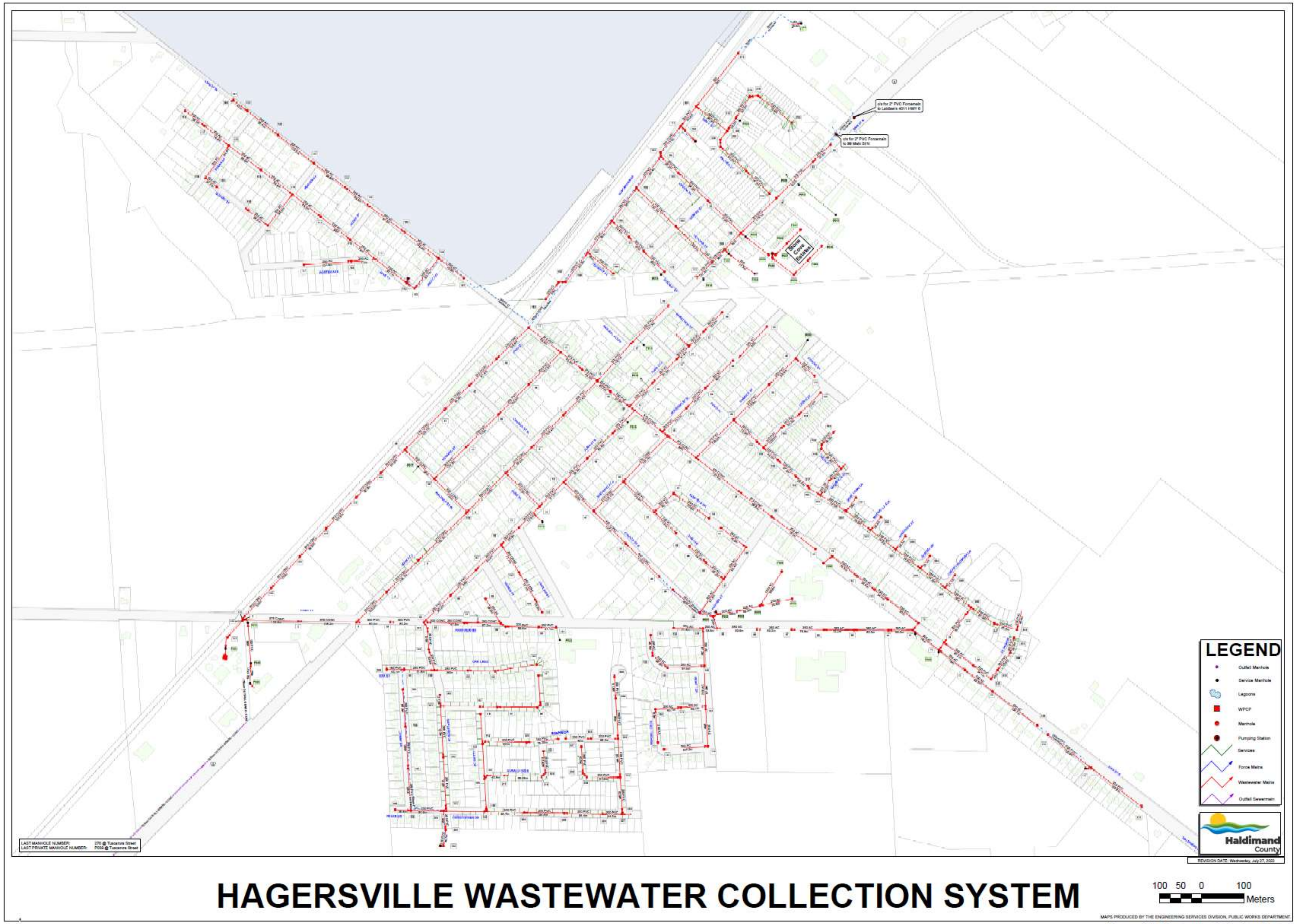
Hagersville Water Distribution System



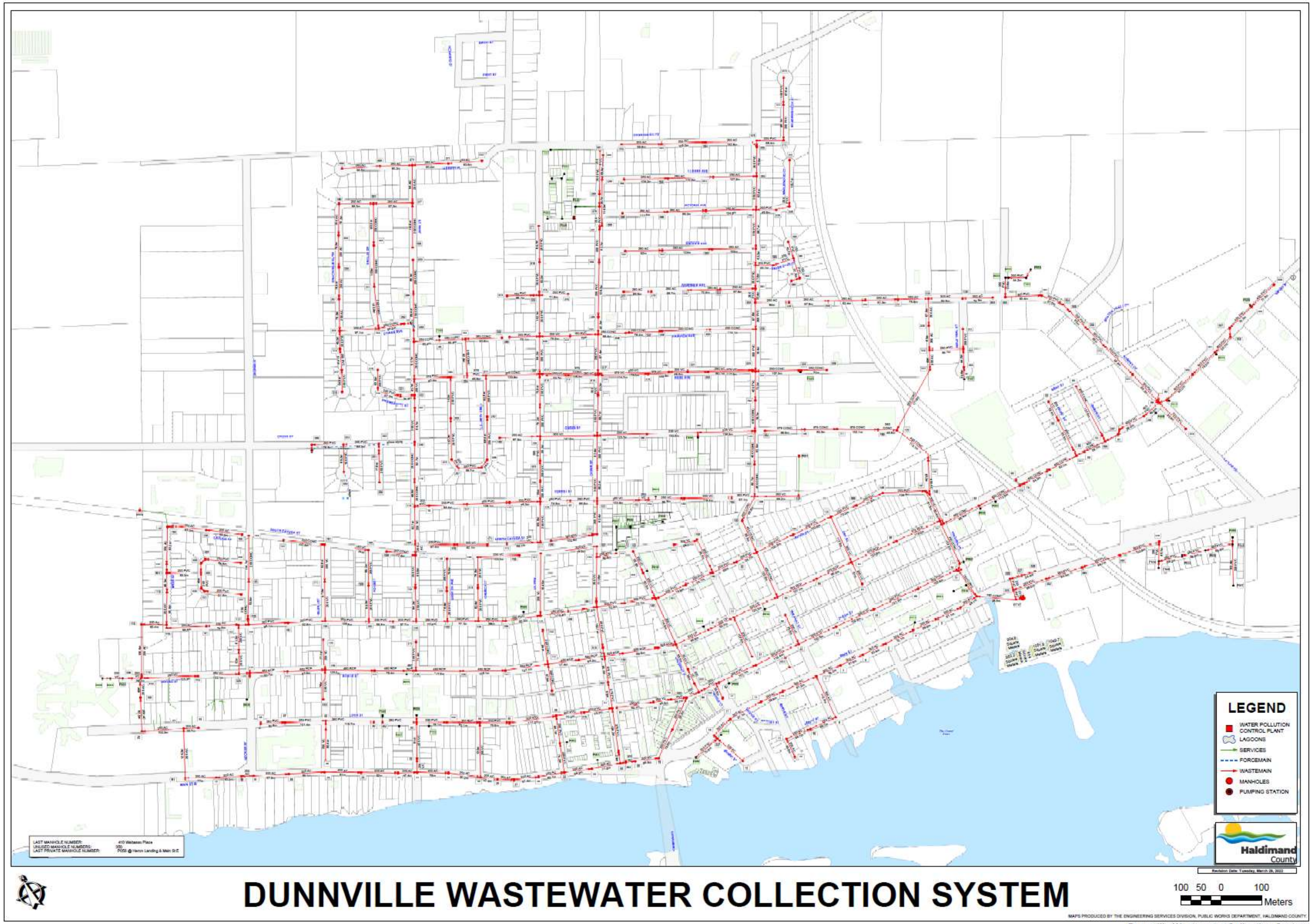
Dunnville Water Distribution System

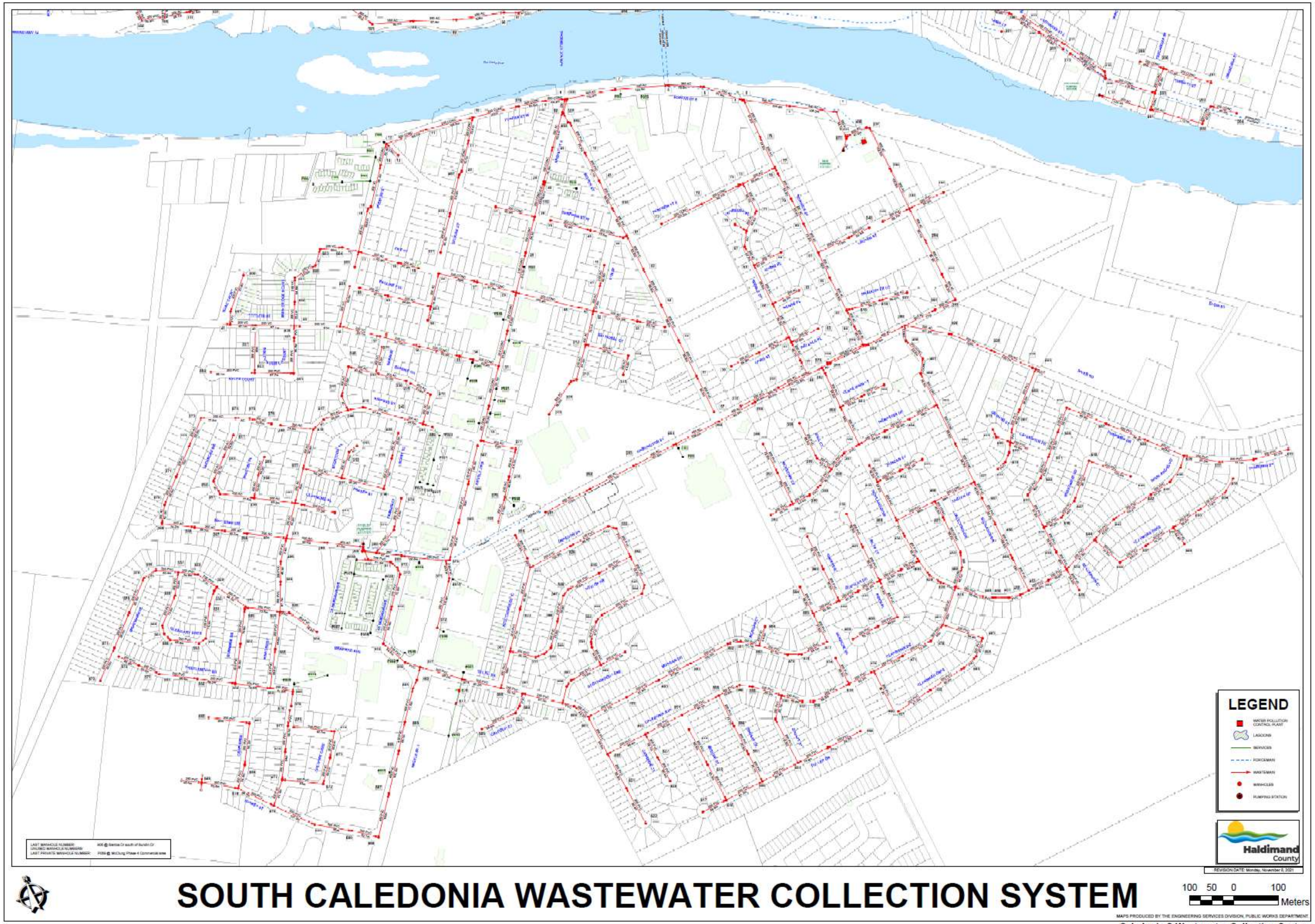

LEGEND
Valve
Hydrant
Blow Off
Plug
Air Release Valve
Chamber
WPP
Drain Valve
Booster Station
Reservoir
Stand Pipe
Water Tower
Water Depot
Meter Chamber
Sample Station
WATERMAINS:
Fireline
Service or Private Main
Diameter n/a
100mm Watermain
150mm Watermain
200mm Watermain
250mm Watermain
300mm Watermain
350mm & Greater Watermain
Haldimand County
SOUTH CALEDONIA WATER DISTRIBUTION SYSTEM
100 50 0 100
Meters
Caledonia S Water Distribution System

Sanitary Network Maps

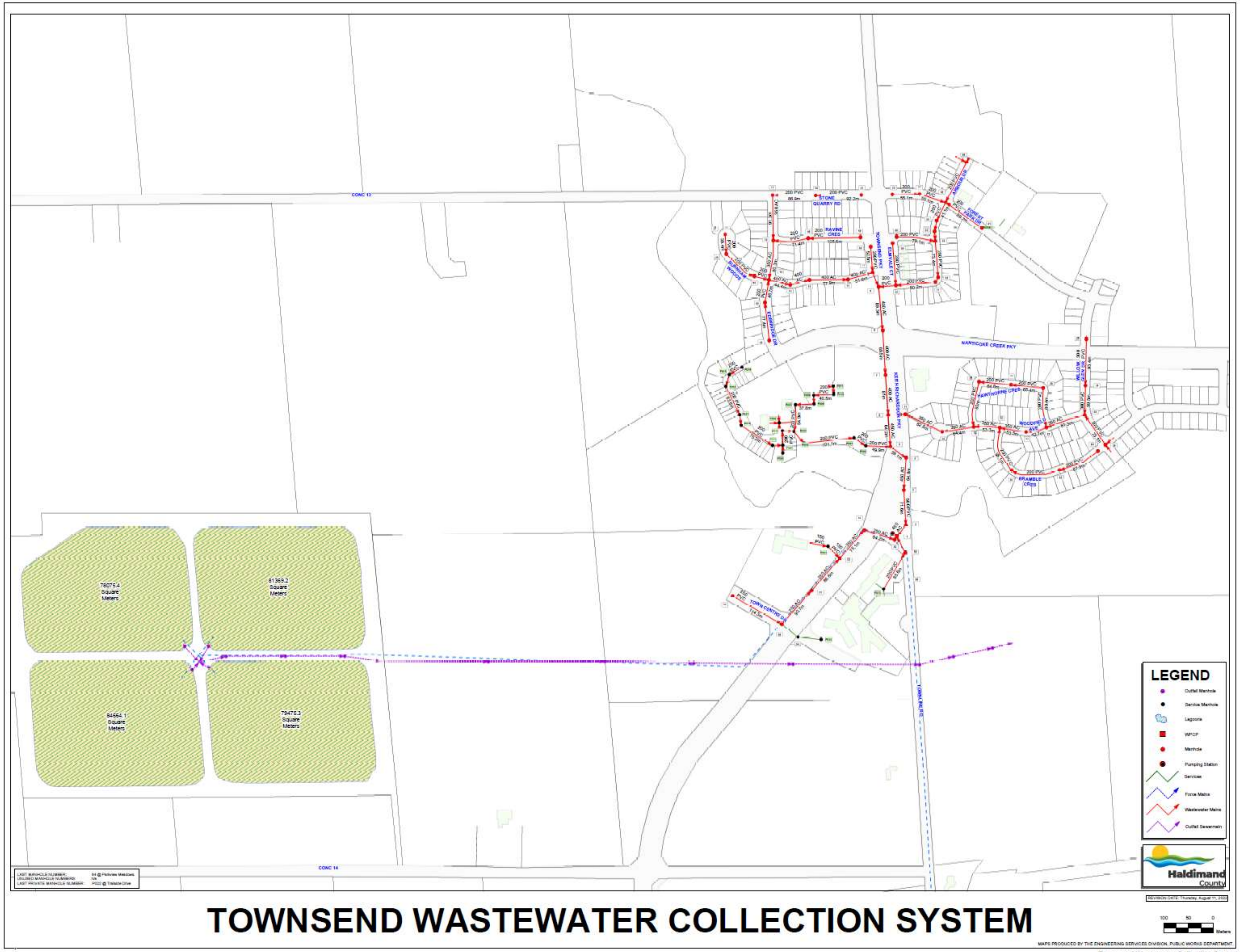


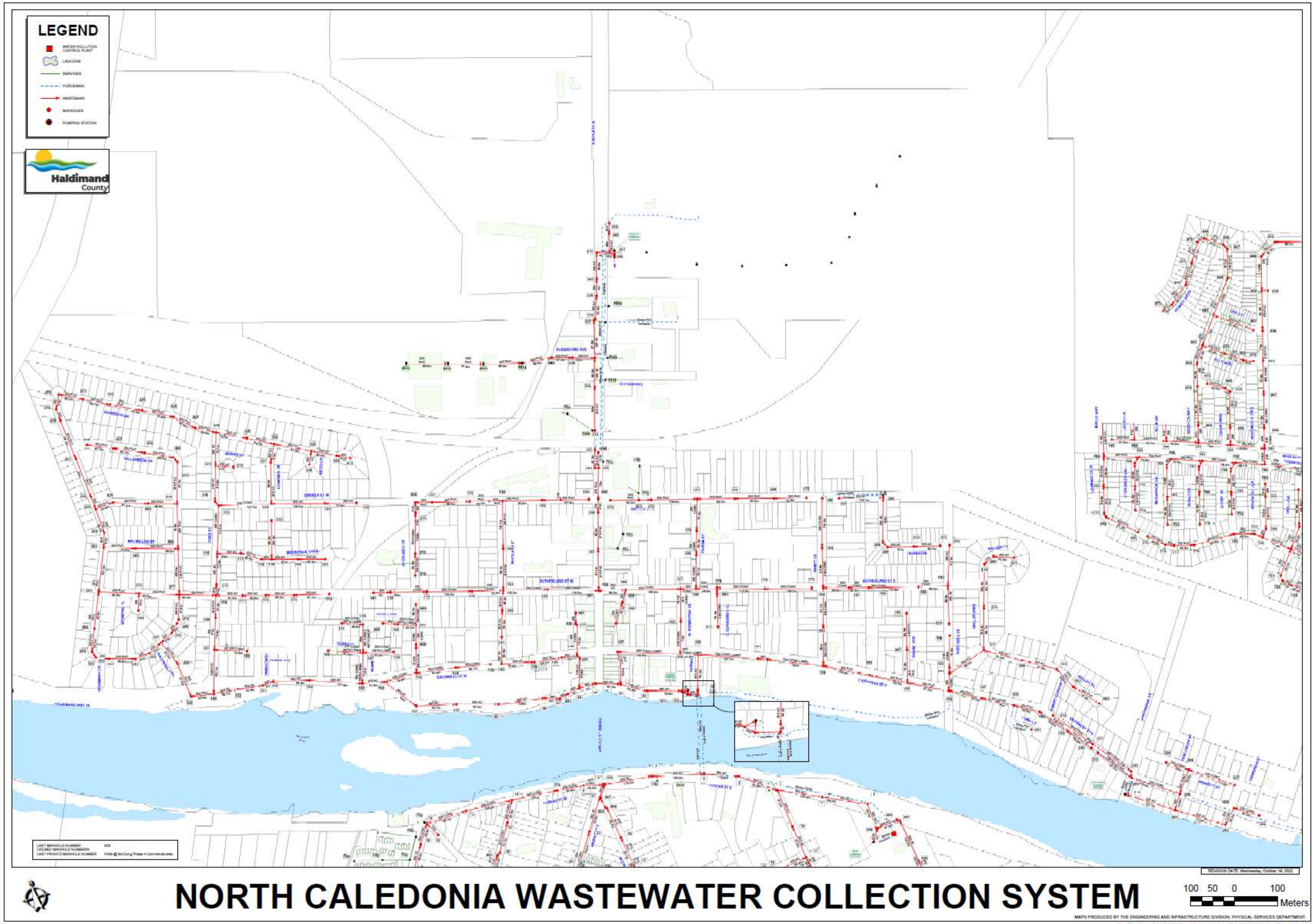
Hagersville Wastewater Collection System


LEGEND
WATER POLLUTION CONTROL PLANT
LAGOONS
SERVICES
FORCEMAIN
WASTEMAIN
MANHOLES
PUMPING STATION
Haldimand County
DUNNVILLE WASTEWATER COLLECTION SYSTEM
100 50 0 100
Meters
MAPS PRODUCED BY THE ENGINEERING SERVICES DIVISION, PUBLIC WORKS DEPARTMENT, HALDIMAND COUNTY
Dunnville Wastewater Collection System

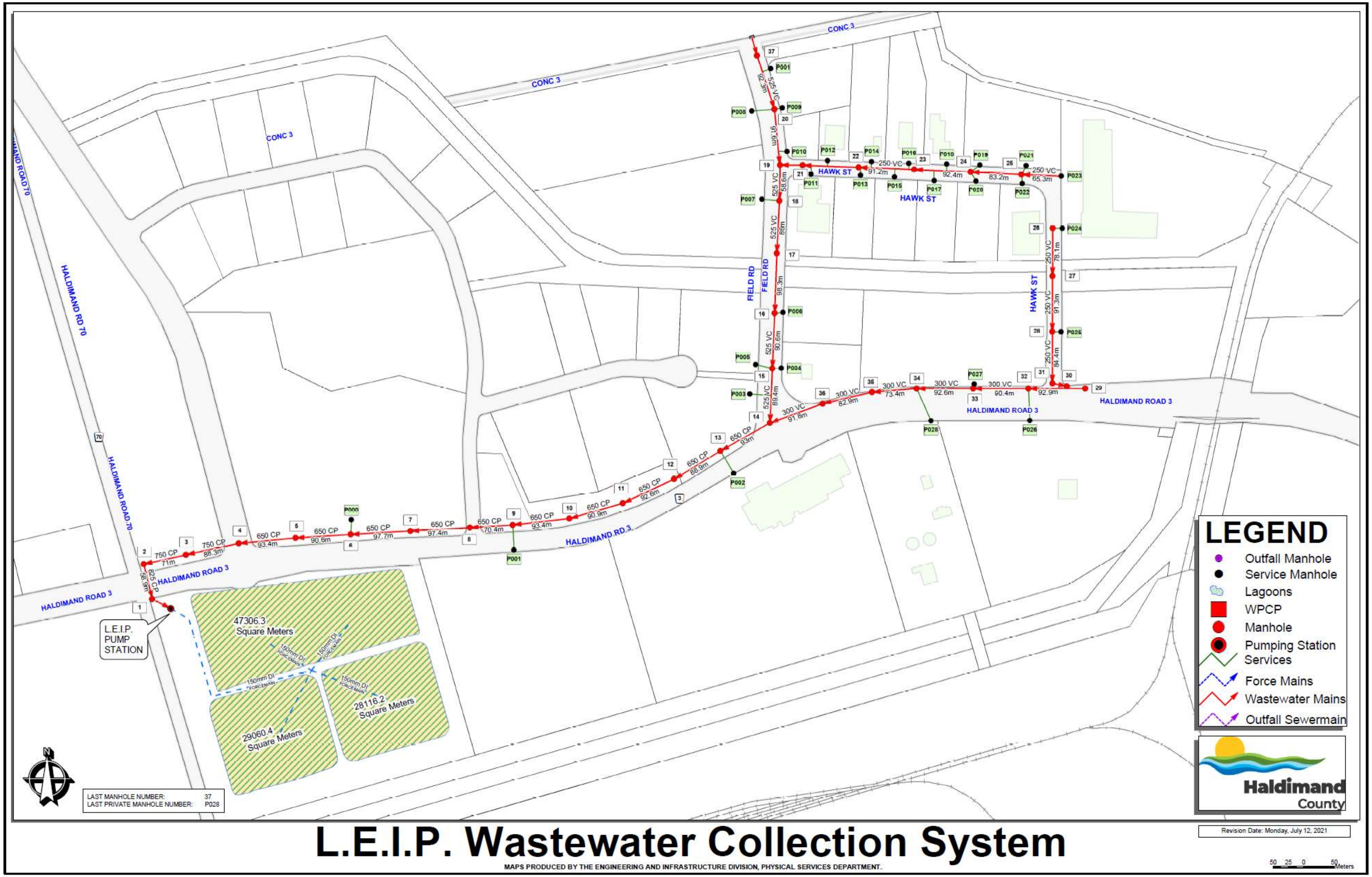


Caledonia S Wastewater Collection System

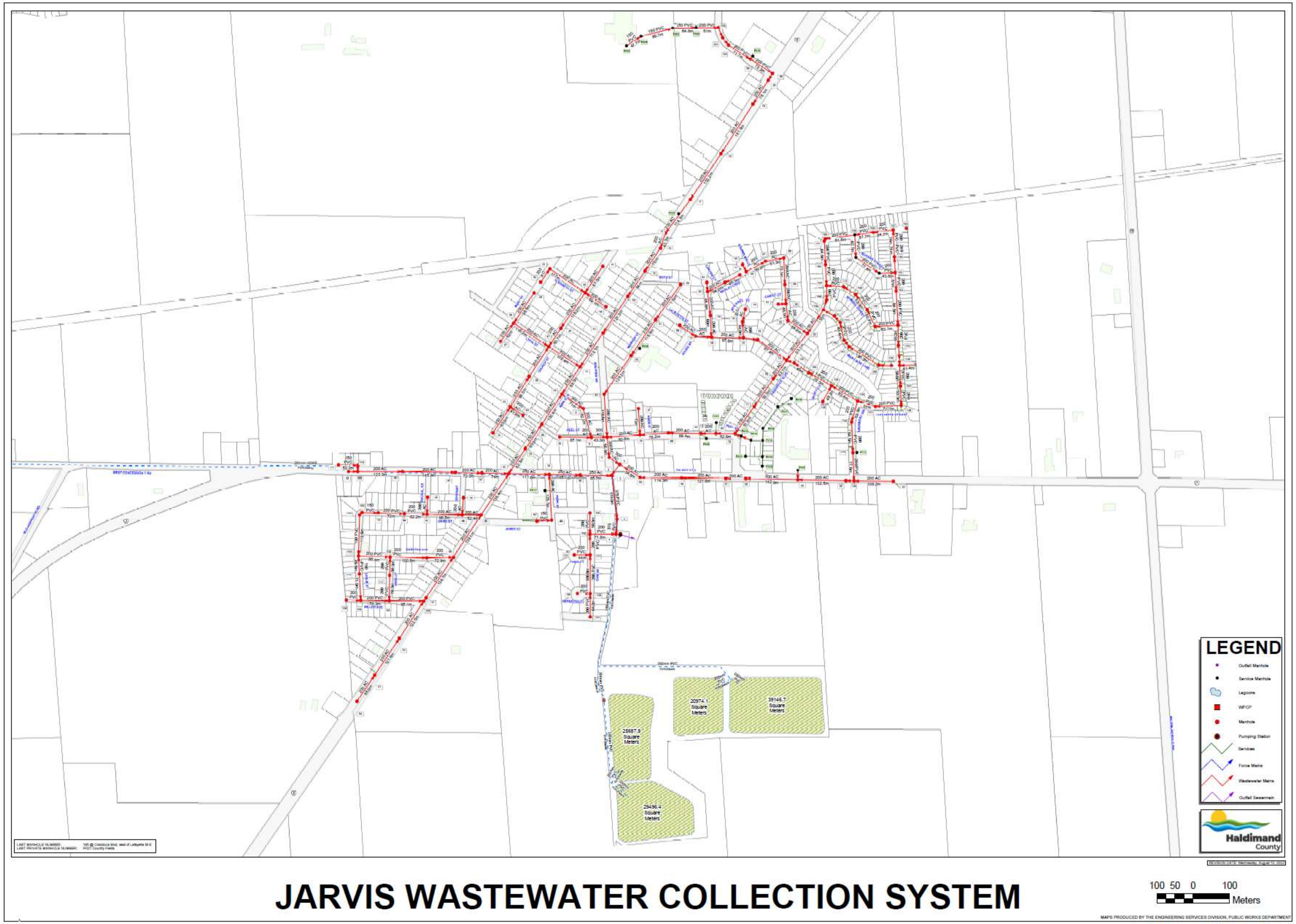

CONC 13
CONC 14
NANTICOKE CREEK PKY
LEGEND
Outfall Manhole
Service Manhole
Lagoons
WPCP
Manhole
Pumping Station
Services
Force Mains
Wastewater Mains
Outfall Sewermain
Haldimand County
REVISION DATE: Thursday, August 11, 2022
100 50 0
Meters
TOWNSEND WASTEWATER COLLECTION SYSTEM
MAPS PRODUCED BY THE ENGINEERING SERVICES DIVISION, PUBLIC WORKS DEPARTMENT
Townsend Wastewater Collection System



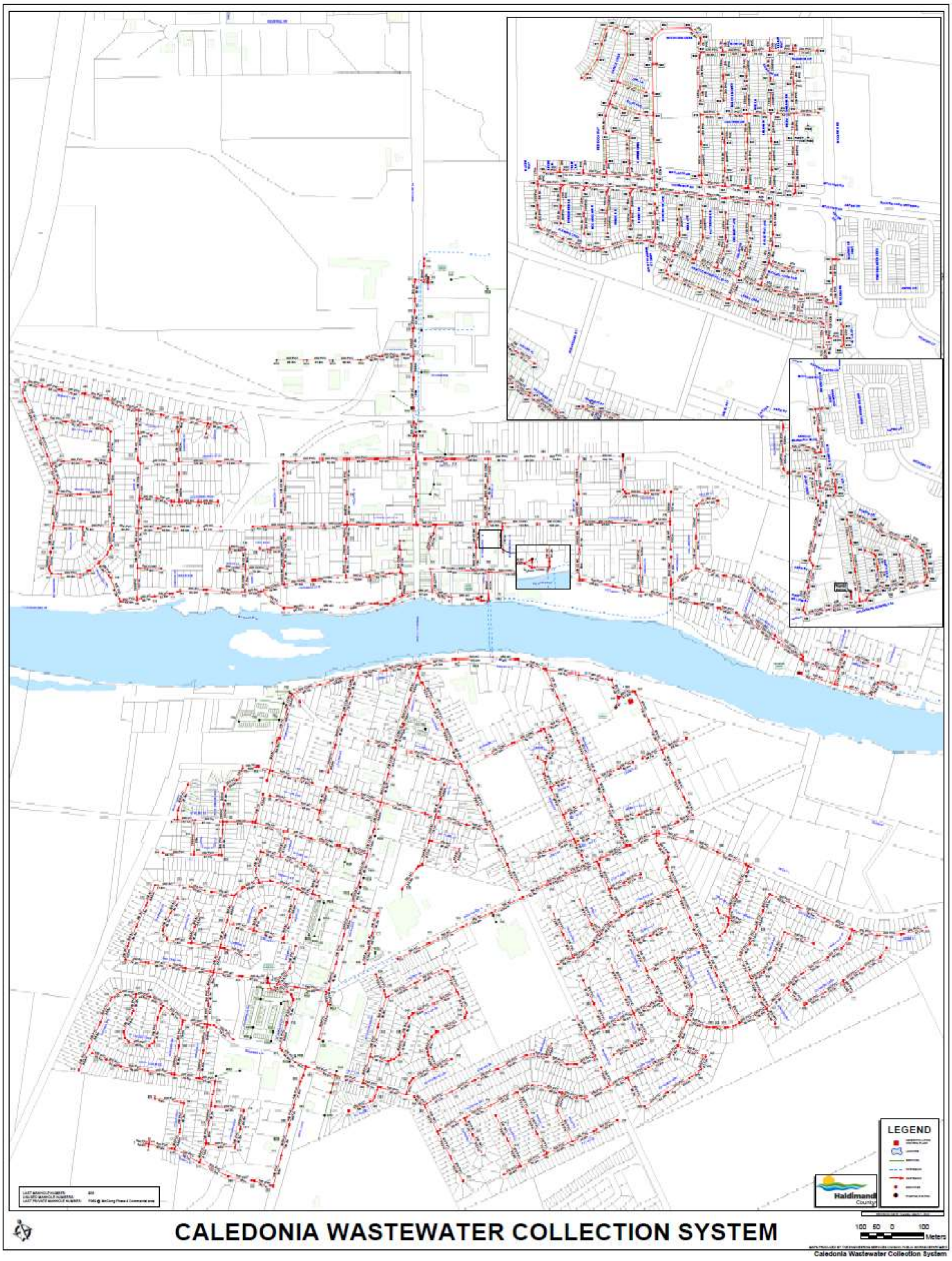
Caledonia N Wastewater Collection System

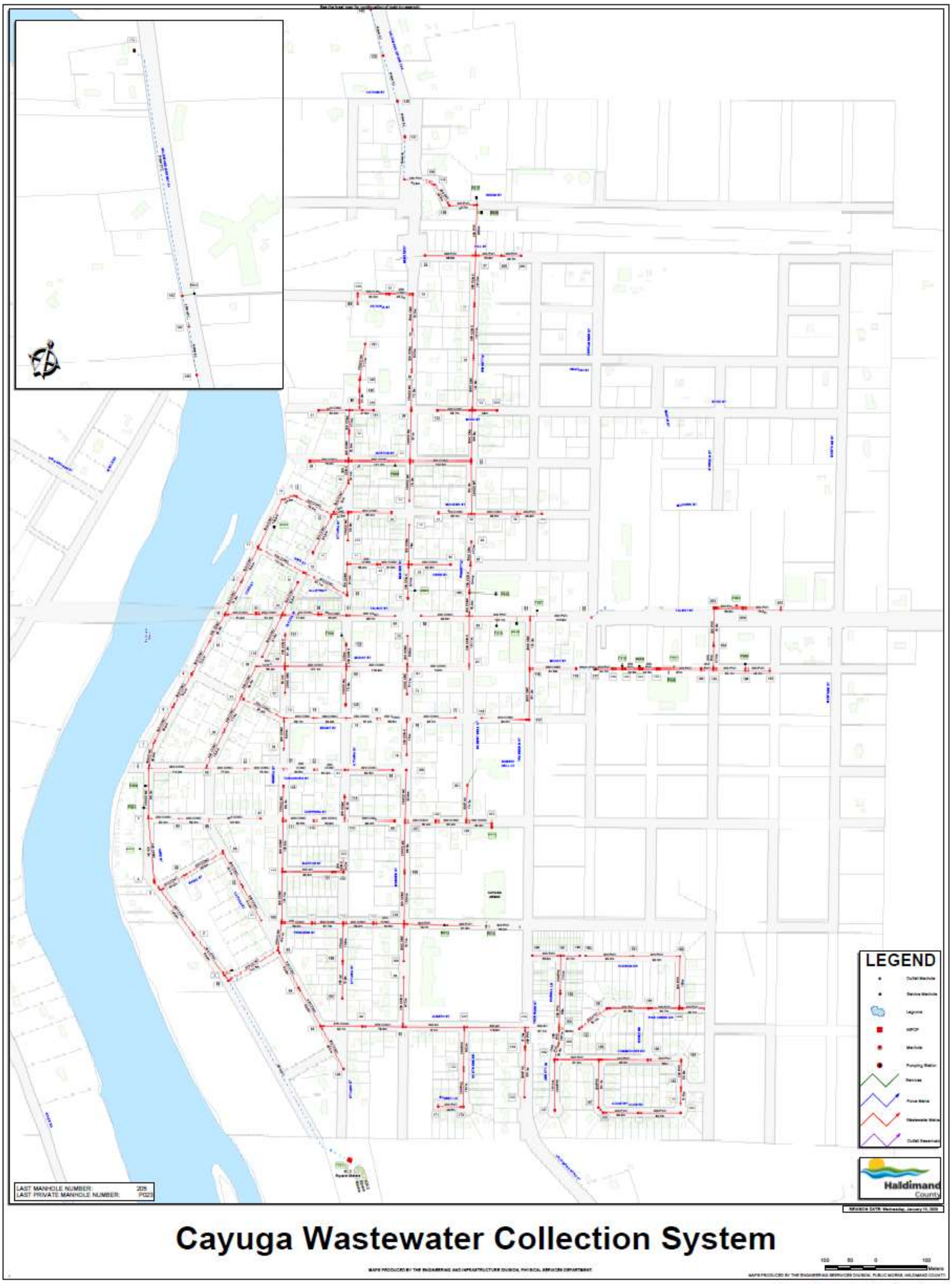


CONC 3
HALDIMAND ROAD 70
HALDIMAND RD 70
HALDIMAND ROAD 3
HALDIMAND RD 3
FIELD RD
HAWK ST
L.E.I.P. PUMP STATION
47306.3 Square Meters
29060.4 Square Meters
28116.2 Square Meters
150mm DI FORCEMAIN
LEGEND
Outfall Manhole
Service Manhole
Lagoons
WPCP
Manhole
Pumping Station
Services
Force Mains
Wastewater Mains
Outfall Sewermain
Haldimand County
LAST MANHOLE NUMBER: 37
LAST PRIVATE MANHOLE NUMBER: P028
Revision Date: Monday, July 12, 2021
L.E.I.P. Wastewater Collection System
MAPS PRODUCED BY THE ENGINEERING AND INFRASTRUCTURE DIVISION, PHYSICAL SERVICES DEPARTMENT.
50 25 0 50 Meters

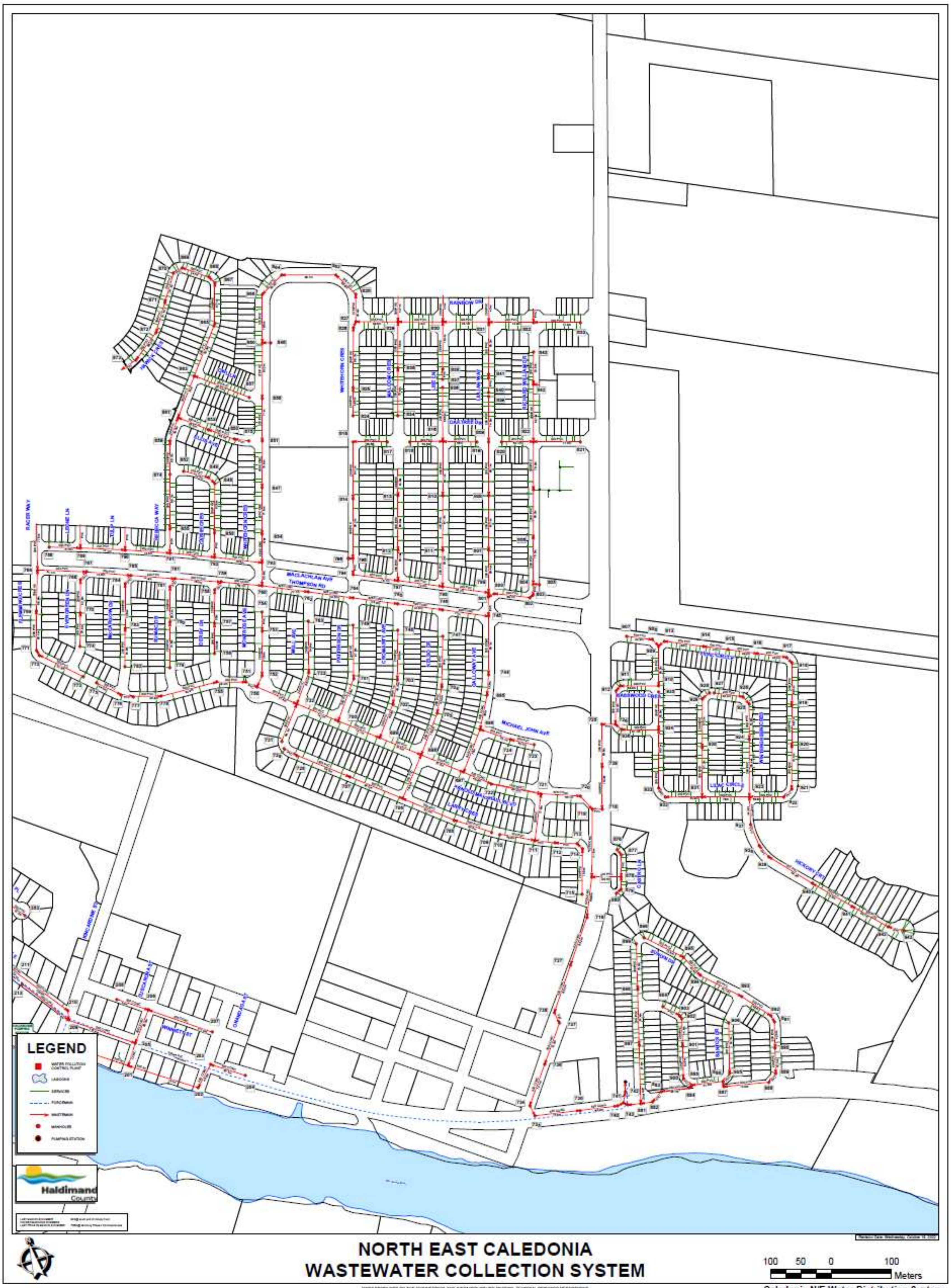


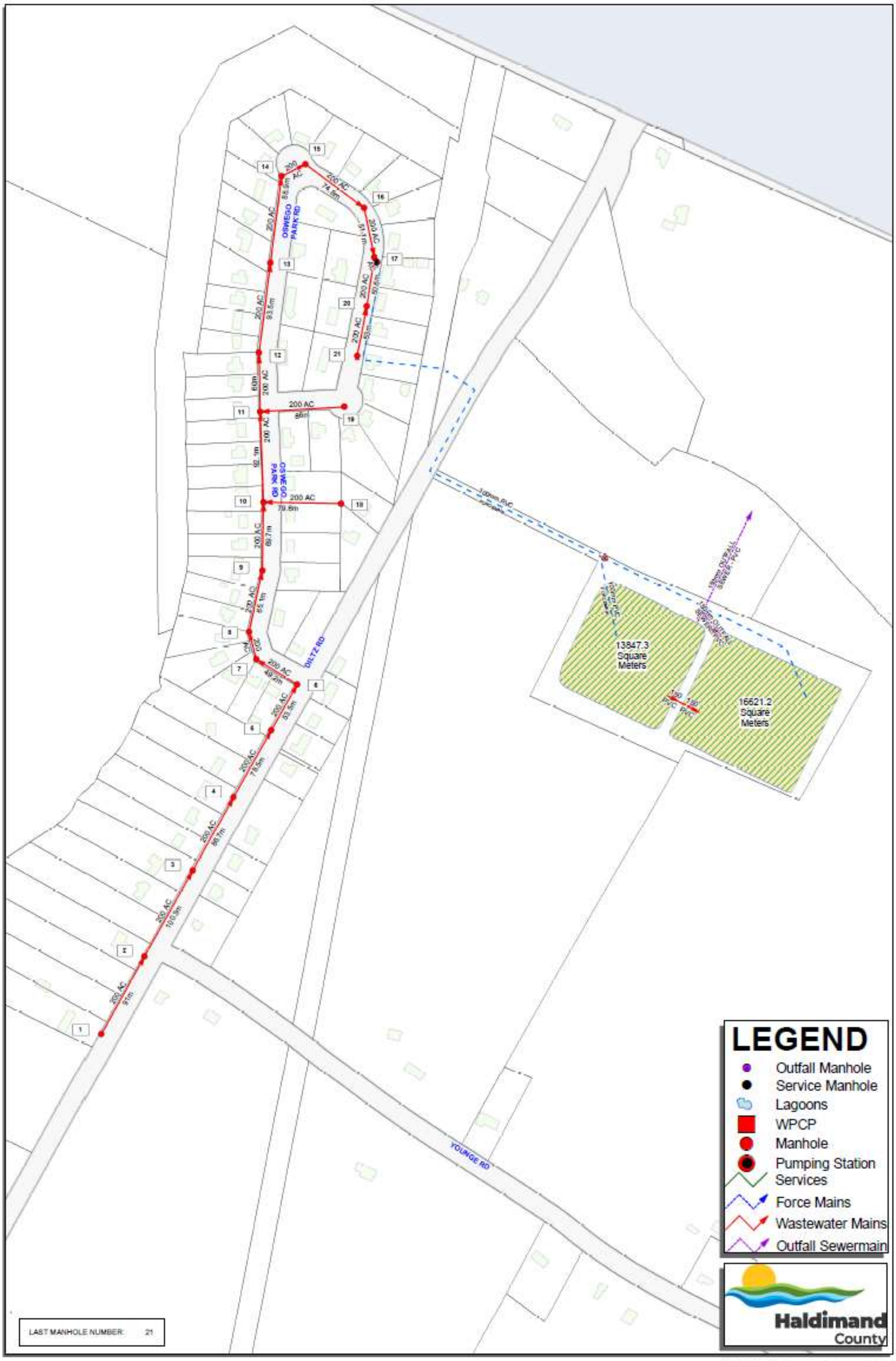
Jarvis Wastewater Collection System


LEGEND
Haldimand County
CALEDONIA WASTEWATER COLLECTION SYSTEM
100 50 0 100
Meters
Caledonia Wastewater Collection System



Cayuga Wastwater Collection System


LEGEND
Haldimand County
NORTH EAST CALEDONIA
WASTEWATER COLLECTION SYSTEM
100 50 0 100
Meters
Caledonia N/E Water Distribution System
MACLACHLAN AVE
THOMPSON RD
MICHAEL JOHN AVE
HICKORY CRT



Oswego Wastewater Collection System

MAPS PRODUCED BY THE ENGINEERING AND INFRASTRUCTURE DIVISION, PHYSICAL SERVICES DEPARTMENT.

Appendix L: Risk Rating Criteria

Risk Definitions

Risk	Integrating a risk management framework into your asset management program requires the translation of risk potential into a quantifiable format. This will allow you to compare and analyze individual assets across your entire asset portfolio. Asset risk is typically defined using the following formula: **Risk = Probability of Failure (POF) x Consequence of Failure (COF)**

Probability of Failure (POF)	The probability of failure relates to the likelihood that an asset will fail at a given time. The current physical condition and service life remaining are two commonly used risk parameters in determining this likelihood.
POF - Structural	The likelihood of asset failure due to aspects of an asset such as load carrying capacity, condition or breaks
POF - Functional	The likelihood of asset failure due to its performance
POF - Range	1 - Rare 2 - Unlikely 3 - Possible 4 - Likely 5 - Almost Certain

Consequences of Failure (COF)	The consequence of failure describes the overall effect that an asset's failure will have on an organization's asset management goals. Consequences of failure can range from non-eventful to impactful: a small diameter water main break in a subdivision may cause several rate payers to be without water service for a short time. However, a larger trunk water main may break outside a hospital, leading to significantly higher consequences.
COF - Economic	The monetary consequences of asset failure for the organization and its customers
COF - Social	The consequences of asset failure on the social dimensions of the community
COF - Environmental	The consequence of asset failure on an asset's surrounding environment
COF - Operational	The consequence of asset failure on the Town's day-to-day operations
COF - Health & safety	The consequence of asset failure on the health and well-being of the community
COF - Strategic	The consequence of asset failure on strategic planning
COF - Range	1 - Insignificant 2 - Minor 3 - Moderate 4 - Major 5 - Severe

Risk Frameworks

Asset Category	Asset Segment	Risk Criteria	Criteria	Weighting (%)	Sub-Criteria	Weighting (%)	Value/Range	Score
General / Corporate		COF	Economic	100%	Replacement Cost	100%	0 - 2,000 2,000 - 20,000 20,000 - 200,000 200,000 – 2,000,000 >2,000,000	1 - Insignificant 2 - Minor 3 - Moderate 4 - Major 5 - Severe
		POF	Structural	60%	Age Based Condition	100%	80 - 100 60 - 79 40 - 59 20 - 39 0 - 19	1 - Rare 2 - Unlikely 3 - Possible 4 - Likely 5 - Almost Certain
			Functional	40%	Service Life Remaining	100%	> 40 30 - 40 20 - 30 10 - 20 < 10	1 - Rare 2 - Unlikely 3 - Possible 4 - Likely 5 - Almost Certain

Asset Category	Risk Criteria	Criteria	Weighting (%)	Sub-Criteria	Weighting (%)	Value/Range	Score
Bridges & Culverts	COF	Economic	50%	Replacement Cost	70%	0 - 2,000 2,000 - 20,000 20,000 - 200,000 200,000 - 2,000,000 >2,000,000	1 - Insignificant 2 - Minor 3 - Moderate 4 - Major 5 - Severe
				Structure Type (AM Segment)	30%	Non-OSIM Bridges Structural Culverts OSIM Bridges	2 - Minor 3 - Moderate 4 - Major
		Social	50%	MMS Class	25%	6 5 4 3 2	1 - Insignificant 2 - Minor 3 - Moderate 4 - Major 5 - Severe
				Speed	25%	=<40km/h =<50km/h =<60km/h =<70km/h =<80km/h	1 - Insignificant 2 - Minor 3 - Moderate 4 - Major 5 - Severe
				Structure Width	25%	<5 5m - 10m 10m - 15m 15m - 20m >20m	1 - Insignificant 2 - Minor 3 - Moderate 4 - Major 5 - Severe
				School Route	25%	Yes No	4 - Major 2 - Minor
	POF	Structural	60%	Assessed Condition	100%	80 - 100 60 - 79 40 - 59 20 - 39 0 - 19	1 - Rare 2 - Unlikely 3 - Possible 4 - Likely 5 - Almost Certain
		Functional	40%	Service Life Remaining	100%	> 40 20 - 30 10 - 20 1 - 10 < 1	1 - Rare 2 - Unlikely 3 - Possible 4 - Likely 5 - Almost Certain

Asset Category	Risk Criteria	Criteria	Weighting (%)	Sub-Criteria	Weighting (%)	Value/Range	Score
Road Network	COF	Economic	50%	Replacement Cost	70%	0 - 2,000 2,000 - 20,000 20,000 - 200,000 200,000 - 2,000,000 >2,000,000	1 - Insignificant 2 - Minor 3 - Moderate 4 - Major 5 - Severe
				Surface Type (AM Segment)	30%	Earth Gravel Surface Treated Asphalt	1 - Insignificant 2 - Minor 3 - Moderate 4 - Major
		Social	50%	Speed	33%	=<40km/h =<50km/h =<60km/h =<70km/h =<80km/h	1 - Insignificant 2 - Minor 3 - Moderate 4 - Major 5 - Severe
				Road Type (Level 1)	34%	Local Collector Arterial	2 - Minor 3 - Moderate 4 - Major
				AADT	33%	AADT =<50 >50 AADT =<140 >140 AADT =<360 >360 AADT =<1405 >1405 AADT =<9225	1 - Insignificant 2 - Minor 3 - Moderate 4 - Major 5 - Severe
	POF	Structural	60%	Assessed Condition (PCI)	100%	80 - 100 60 - 79 40 - 59 20 - 39 0 - 19	1 - Rare 2 - Unlikely 3 - Possible 4 - Likely 5 - Almost Certain
		Functional	40%	Service Life Remaining	100%	> 40 20 - 30 10 - 20 1 - 10 < 1	1 - Rare 2 - Unlikely 3 - Possible 4 - Likely 5 - Almost Certain

<table>
<tr><th>Asset Category</th><th>Asset Segment</th><th>Risk Criteria</th><th>Criteria</th><th>Weighting (%)</th><th>Sub-Criteria</th><th>Weighting (%)</th><th>Value/Range</th><th>Score</th></tr>
<tr><td rowspan="9">Storm System</td><td rowspan="4">Rest of System</td><td rowspan="2">COF</td><td>Economic</td><td>70%</td><td>Replacement Cost</td><td>100%</td><td>0 - 2,000
2,000 - 20,000
20,000 - 200,000
200,000 - 2,000,000
>2,000,000</td><td>1 - Insignificant
2 - Minor
3 - Moderate
4 - Major
5 - Severe</td></tr>
<tr><td>Social</td><td>30%</td><td>System Segments</td><td>100%</td><td>municipal drains
Storm Structures
Storm Ponds</td><td>2 - Minor
3 - Moderate
4 - Major</td></tr>
<tr><td rowspan="2">POF</td><td>Structural</td><td>60%</td><td>Assessed Condition</td><td>100%</td><td>80 - 100
60 - 79
40 - 59
20 - 39
0 - 19</td><td>1 - Rare
2 - Unlikely
3 - Possible
4 - Likely
5 - Almost Certain</td></tr>
<tr><td>Functional</td><td>40%</td><td>Service Life Remaining</td><td>100%</td><td>> 40
30 - 40
20 - 30
10 - 20
< 10</td><td>1 - Rare
2 - Unlikely
3 - Possible
4 - Likely
5 - Almost Certain</td></tr>
<tr><td rowspan="5">Storm Mains</td><td rowspan="3">COF</td><td rowspan="2">Economic</td><td rowspan="2">70%</td><td>Replacement Cost</td><td>50%</td><td>0 - 2,000
2,000 - 20,000
20,000 - 200,000
200,000 - 2,000,000
>2,000,000</td><td>1 - Insignificant
2 - Minor
3 - Moderate
4 - Major
5 - Severe</td></tr>
<tr><td>Diameter</td><td>50%</td><td>200
250
375 & 400
>450 & < 700
>700</td><td>1 - Insignificant
2 - Minor
3 - Moderate
4 - Major
5 - Severe</td></tr>
<tr><td>Social</td><td>30%</td><td>Surface Type (Attribute)</td><td>100%</td><td>UNK
River
Surface Treated
Asphalt</td><td>2 - Minor
5 - Severe
3 - Moderate
4 - Major</td></tr>
<tr><td rowspan="2">POF</td><td>Structural</td><td>60%</td><td>Assessed Condition</td><td>100%</td><td>80 - 100
60 - 79
40 - 59
20 - 39
0 - 19</td><td>1 - Rare
2 - Unlikely
3 - Possible
4 - Likely
5 - Almost Certain</td></tr>
<tr><td>Functional</td><td>40%</td><td>Service Life Remaining</td><td>100%</td><td>> 40
30 - 40
20 - 30
10 - 20
< 10</td><td>1 - Rare
2 - Unlikely
3 - Possible
4 - Likely
5 - Almost Certain</td></tr>
</table>

Asset Category	Asset Segment	Risk Criteria	Criteria	Weighting (%)	Sub-Criteria	Weighting (%)	Value/Range	Score
Water System	Watermains	COF	Economic	70%	Replacement Cost	50%	0 - 2,000 2,000 - 20,000 20,000 - 200,000 200,000 - 2,000,000 >2,000,000	1 - Insignificant 2 - Minor 3 - Moderate 4 - Major 5 - Severe
					Diameter	50%	> 100 100 - 150 150 - 300 300 - 400 > 400	1 - Insignificant 2 - Minor 3 - Moderate 4 - Major 5 - Severe
			Social	30%	Surface Type (Attribute)	100%	UNK River Surface Treated Asphalt	2 - Minor 5 - Severe 3 - Moderate 4 - Major
		POF	Structural	60%	Assessed Condition	100%	80 - 100 60 - 79 40 - 59 20 - 39 0 - 19	1 - Rare 2 - Unlikely 3 - Possible 4 - Likely 5 - Almost Certain
			Functional	40%	Service Life Remaining	100%	> 40 30 - 40 20 - 30 10 - 20 < 10	1 - Rare 2 - Unlikely 3 - Possible 4 - Likely 5 - Almost Certain
	Rest of System	COF	Economic	70%	Replacement Cost	100%	0 - 2,000 2,000 - 20,000 20,000 - 200,000 200,000 - 2,000,000 >2,000,000	1 - Insignificant 2 - Minor 3 - Moderate 4 - Major 5 - Severe
			Social	30%	System Segments	100%	Hydrant & General Equipment & Meters Valves General Buildings Storage & Water Depot Booster Station Treatment Plant	1 - Insignificant 2 - Minor 3 - Moderate 4 - Major 4 - Major 5 - Severe
		POF	Structural	60%	Assessed Condition	100%	80 - 100 60 - 79 40 - 59 20 - 39 0 - 19	1 - Rare 2 - Unlikely 3 - Possible 4 - Likely 5 - Almost Certain
			Functional	40%	Service Life Remaining	100%	> 40 30 - 40 20 - 30 10 - 20 < 10	1 - Rare 2 - Unlikely 3 - Possible 4 - Likely 5 - Almost Certain

Asset Category	Asset Segment	Risk Criteria	Criteria	Weighting (%)	Sub-Criteria	Weighting (%)	Value/Range	Score
Sanitary System	Sanitary Mains	COF	Economic	70%	Replacement Cost	50%	0 - 2,000 2,000 - 20,000 20,000 - 200,000 200,000 - 2,000,000 >2,000,000	1 - Insignificant 2 - Minor 3 - Moderate 4 - Major 5 - Severe
					Diameter	50%	200 250 375 & 400 >450 & < 700 >700	1 - Insignificant 2 - Minor 3 - Moderate 4 - Major 5 - Severe
			Social	30%	Surface Type (Attribute)	100%	UNK River Surface Treated Asphalt	2 - Minor 5 - Severe 3 - Moderate 4 - Major
		POF	Structural	60%	Assessed Condition	100%	80 - 100 60 - 79 40 - 59 20 - 39 0 - 19	1 - Rare 2 - Unlikely 3 - Possible 4 - Likely 5 - Almost Certain
			Functional	40%	Service Life Remaining	100%	> 40 30 - 40 20 - 30 10 - 20 < 10	1 - Rare 2 - Unlikely 3 - Possible 4 - Likely 5 - Almost Certain
	Rest of System	COF	Economic	70%	Replacement Cost	100%	0 - 2,000 2,000 - 20,000 20,000 - 200,000 200,000 - 2,000,000 >2,000,000	1 - Insignificant 2 - Minor 3 - Moderate 4 - Major 5 - Severe
			Social	30%	System Segments	100%	General Equipment Manholes General Building Lagoon & PS Treatment Plant	1 - Insignificant 2 - Minor 3 - Moderate 4 - Major 5 - Severe
		POF	Structural	60%	Assessed Condition	100%	80 - 100 60 - 79 40 - 59 20 - 39 0 - 19	1 - Rare 2 - Unlikely 3 - Possible 4 - Likely 5 - Almost Certain
			Functional	40%	Service Life Remaining	100%	> 40 30 - 40 20 - 30 10 - 20 < 10	1 - Rare 2 - Unlikely 3 - Possible 4 - Likely 5 - Almost Certain

Appendix M: Condition Assessment Guidelines

The foundation of good asset management practice is accurate and reliable data on the current condition of infrastructure. Assessing the condition of an asset at a single point in time allows staff to have a better understanding of the probability of asset failure due to deteriorating condition.

Condition data is vital to the development of data-driven asset management strategies. Without accurate and reliable asset data, there may be little confidence in asset management decision-making which can lead to premature asset failure, service disruption and suboptimal investment strategies. To prevent these outcomes, the County's condition assessment strategy should outline several key considerations, including:

- The role of asset condition data in decision-making
- Guidelines for the collection of asset condition data
- A schedule for how regularly asset condition data should be collected

Role of Asset Condition Data

The goal of collecting asset condition data is to ensure that data is available to inform maintenance and renewal programs required to meet the desired level of service. Accurate and reliable condition data allows municipal staff to determine the remaining service life of assets, and identify the most cost-effective approach to deterioration, whether it involves extending the life of the asset through remedial efforts or determining that replacement is required to avoid asset failure.

In addition to the optimization of lifecycle management strategies, asset condition data also impacts the County's risk management and financial strategies. Assessed condition is a key variable in the determination of an asset's probability of failure. With a strong understanding of the probability of failure across the entire asset portfolio, the County can develop strategies to mitigate both the probability and consequences of asset failure and service disruption. Furthermore, with condition-based determinations of future capital expenditures, the County can develop long-term financial strategies with higher accuracy and reliability.

Guidelines for Condition Assessment

Whether completed by external consultants or internal staff, condition assessments should be completed in a structured and repeatable fashion, according to consistent and objective assessment criteria. Without proper guidelines for the completion of condition assessments there can be little confidence in the validity of condition data and asset management strategies based on this data.

Condition assessments must include a quantitative or qualitative assessment of the current condition of the asset, collected according to specified condition rating criteria, in a format that can be used for asset management decision-making. As a result, it is important that staff adequately define the condition rating criteria that should be used and the assets that require a discrete condition rating. When engaging with external consultants to complete condition assessments, it is critical that these details are communicated as part of the contractual terms of the project.

There are many options available to the County to complete condition assessments. In some cases, external consultants may need to be engaged to complete detailed technical assessments of infrastructure. In other cases, internal staff may have sufficient expertise or training to complete condition assessments.

Developing a Condition Assessment Schedule

Condition assessments and general data collection can be both time-consuming and resource intensive. It is not necessarily an effective strategy to collect assessed condition data across the entire asset inventory. Instead, the County should prioritize the collection of assessed condition data based on the anticipated value of this data in decision-making. The International Infrastructure Management Manual (IIMM) identifies four key criteria to consider when making this determination:

1. **Relevance**: every data item must have a direct influence on the output that is required
2. **Appropriateness**: the volume of data and the frequency of updating should align with the stage in the assets life and the service being provided
3. **Reliability**: the data should be sufficiently accurate, have sufficient spatial coverage and be appropriately complete and current
4. **Affordability**: the data should be affordable to collect and maintain