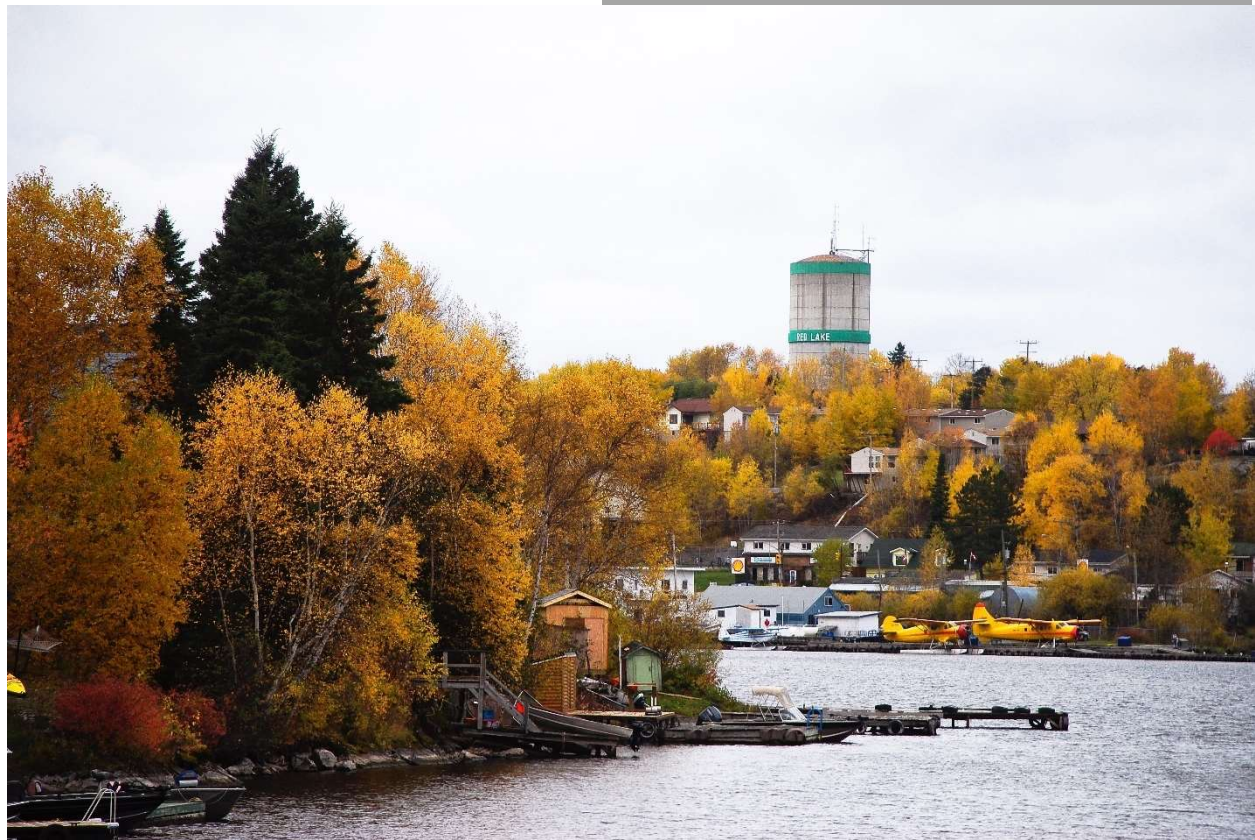


2022

Asset Management Plan



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Executive Summary

This asset management plan is intended to be a snapshot in time and is based on information currently available to the Municipality. As the Municipality continues to improve and integrate its data collection, better information will be available to allow for better analysis and long-term planning in future iterations.

The current plan provides information on the inventory, condition, and lifecycle activities and 10-year costs for the Municipality's core assets which include:

- Water and wastewater linear assets and buildings
- Stormwater management assets
- Bridges and structural culverts
- Paved and gravel roads

The total length and average condition for water and wastewater linear infrastructure and road infrastructure is provided below.

Category	Length	Average Condition
Water	43.16 KM	Fair
Wastewater	40.46 KM	Fair
Roads	66.89 KM	Fair

The plan outlines specific service levels for each asset type that fall under one of four categories including:

- Regulatory requirements
- Responsive service
- Reliable service
- Affordable service

These service levels provide the benchmark in which core asset performance can be measured against to ensure the Municipality is meeting the needs of residents in a responsible manner.

In order to meet the service level requirements, the Municipality looked at different scenarios on how to move forward with managing the lifecycle activities of assets and in order to achieve the lowest cost over the life of the asset, it is best to integrate road replacement with water and wastewater linear infrastructure work where possible. Other highlights include:

- Using aggressive preventative maintenance to prolong the life of the road to better align with water and wastewater pipe renewals
- Using a combination of heat trace and insulation to avoid having to blast rock when adding new water and wastewater linear infrastructure
- Where possible, pipe lining is preferable as the renewal method vs having to replace the entire pipe
- Using low-pressure sewer system vs a gravity system is preferable

The overall replacement cost of all core assets in this plan total \$333.7 million and in order to achieve or maintain expected service levels over the next 10 years, the Municipality would be required to spend almost \$80 million on capital projects and just over \$282,000 per year on operating costs. Based on existing funding sources including reserves and future NORDS, OCIF and Gas Tax funding, the Municipality will have a capital funding gap of about \$6.8 million per year or \$3,075 per dwelling.

In order to help address the funding gap, the Municipality has implemented a risk approach to asset management that incorporates the probability of asset failure (or the asset condition) in conjunction with the impacts of the asset failure on the Municipality and its residents. This approach will take into account the use of the asset in addition to the condition thus better highlighting priority areas for funding.

Moving forward, the Municipality will be incorporating all assets into this plan prior to July 1, 2024.

Introduction

Overview

Well-managed public infrastructure that is safe and reliable is vital to the prosperity and quality of life of communities as it helps maintain property viability across all sectors and industries and facilitates growth within the community. Given the range and scope of services provided, Ontario municipalities have a special responsibility in ensuring that infrastructure is planned, built, and maintained in a sustainable way. A detailed asset management plan is essential to meet this responsibility as it provides a framework for current year and long-term capital planning and operational decisions.

The Municipality of Red Lake's 2022 Asset Management Plan provides the Municipality with a framework for capital and operational decision making for core assets. The core assets include:

- Water and wastewater linear assets and buildings
- Stormwater management assets
- Bridges and structural culverts
- Paved and gravel roads

This plan builds on the 2018 Streetscan Roads Asset Management Plan and 2004 Keewatin Aski Water/Wastewater study and follows the format set out by the Ministry of Infrastructure in *Building Together: Guide for Municipal Asset Management Plans*. All dollar figures reported in this 2022 Plan are in constant 2022 dollars and should be adjusted annually to account for the effects of inflation.

The purpose of the Municipality's 2022 Asset Management Plan is to outline the most cost-effective mix of lifecycle activities for core infrastructure to minimize risk to the Municipality and users of the infrastructure. The plan will help direct municipal resources to assets in a strategic manner to ensure that assets with the most need are prioritized for funding.

This plan summarizes the current state of the core municipal infrastructure, the levels of service of each group of core assets, the lifecycle activities associated with each group of core assets, the lifecycle plan for each of the assets and the lifecycle costs broken down by operating, capital and development for the next 10 years. It was developed in partnership by the CAO, Infrastructure Development Coordinator, Information Technology Manager and Treasurer using the current TCA schedule, GIS information, and engineering studies.

Monitoring and Updating

The metrics outlined in the plan will be compared to actuals on an annual basis and will include:

- Compliance with legislative and regulatory requirements
- Compliance with service targets
- Capital projects delivered to schedule and on budget
- Operation and maintenance budgets met
- Events occurring outside the risk profile and how were they handled

The Asset Management Plan should be reviewed and updated at key intervals, but it is important that other asset management components such as capital budgeting exercises, risk assessments and updates to the TCA schedule and GIS information should occur at least annually. The table below outlines the key timelines for updates and reviews:

Asset Management Tool	Timeframe
Asset Management Plan	4 Years
Capital Budget	Annually
TCA Schedule	Annually
GIS System	Annually
Risk Assessment	Annually

State of the Local Infrastructure

This section provides a summary of the Municipality's core assets with reference to asset quantity and quality. The condition of the assets is mostly determined by staff or professional inspection and input, and interruptions/decreasing service levels. When a measurement of service levels or inspections were not available, condition assessments were based on the useful life of the asset relative to its age. There were also instances where the remaining useful life of an asset was used in conjunction with service level assessments and inspections. Useful life assumptions for the assets were derived from the Municipality's Tangible Capital Asset (TCA) schedule and are summarized in the table below.

Asset Class	Useful Life
Bridges and Culverts	20 Years
Buildings	30 - 50 Years
Land Improvements	20 Years
Roads	10 - 20 Years
Underground Infrastructure	30 - 50 Years

Condition Assessments and Updates Overview

The Municipality's asset registry is documented in a tangible capital asset schedule that contains detailed information about the year the asset was acquired, historical cost of the asset, useful life of the asset and asset descriptions.

The Municipality used a five-point rating scale, consistent with the Canadian National Infrastructure Report Card, to assign a condition to all core assets. In instances where staff or professional inspection and service level assessments were not available, the percentage of remaining useful life was used. The table below summarizes the rating scale.

Condition Assessment	Rating Index	Definition
Very Good	80.01% - 100.00%	Well maintained, good condition, new or recently rehabilitated asset.
Good	60.01% - 80.00%	Good condition, few elements exhibit minor deficiencies
Fair	40.01% - 60.00%	Some elements exhibit significant deficiencies. Asset requires attention.
Poor	20.01% - 40.00%	A large portion of the system exhibits significant deficiencies. Asset mostly below standard and approaching end of service life.
Very Poor	<0.00% - 20.00%	Widespread signs of deterioration, service is affected.

Asset condition ratings based on staff or professional inspection and input as well as service interruptions or decreasing service levels took priority over the accounting based useful life. The inspection-based condition assessments were consolidated into the 5-tier condition system as shown above. In cases where it was not possible to visibly inspect the asset (for example water and wastewater

pipes), service interruptions and accounting useful life were weighted to create an overall condition assessment.

For all core assets (excluding bridges), updates to asset conditions are made throughout the year based on visual inspections or service interruptions. The Municipality currently reviews asset replacement costs on an annual basis as part of its budgeting process. This includes obtaining quotes and engaging engineers to provide cost estimates for asset replacement. Bridges are inspected every two years as required by provincial legislation and updates to conditions and replacement costs are based on bridge inspection reports.

Water and Wastewater Assets

The Municipality's water and wastewater assets include the water distribution network, wastewater collection system, lagoon and drying beds, and water and wastewater buildings.

Water Distribution Network

The Municipality's water distribution network is made up of 43.16 km of mains and 1,515 of service connections with an average age of 38.70 years (as of February 28, 2022) throughout the communities of Red Lake, Balmertown, Cochenour, McKenzie Island and Madsen as outlined in Appendix A. The net book value at December 31, 2021 of the water distribution network as indicated by the Municipality's TCA schedule is \$3,108,296 while the total replacement cost of the entire network is \$92,754,166 (in 2022 construction dollars), excluding any surface works. The Municipality's water distribution network is made from six different types of material consisting of:

Type	Useful Life	Length (km)
Asbestos-Cement	30 Years	1.04
Cast Iron	50 Years	13.24
Ductile Iron	50 Years	5.44
Hi-Dens Poly Ethel	50 Years	13.34
Poly Vinyl Chloride	50 Years	8.19
Steel	50 Years	1.93

Water distribution network asset condition is assigned using a weighted index of number of main breaks (as a measure of service interruptions) and asset age in comparison to useful life. A summary of the water distribution condition assessment is below:

Condition Assessment	Percentage	Length (km)
Very Good	9.73	4.20
Good	16.92	7.30
Fair	58.64	25.31
Poor	12.30	5.31
Very Poor	2.41	1.04

Wastewater Collection System

The Municipality's wastewater collection system is made up of 40.46 km of mains with an average age of 39.89 years (as of February 28, 2022) and 1,502 service connections throughout the communities of Red Lake, Balmertown, Cochenour, McKenzie Island and Madsen as outlined in Appendix B. The net book value at December 31, 2021, of the wastewater collection system as indicated by the Municipality's TCA schedule is \$3,257,862 while the total replacement cost of the entire network is \$53,040,249 (in 2022 construction dollars), excluding any surface works. The Municipality's wastewater collection system is made from six different types of material consisting of:

Type	Useful Life	Length (km)
Asbestos-Cement	30 Years	8.35
Concrete	50 Years	4.10
Ductile Iron	50 Years	0.72
Hi-Dens Poly Ethel	50 Years	12.98
Poly Vinyl Chloride	50 Years	12.51
Steel	50 Years	0.33
Vitrified Clay	30 Years	1.47

Wastewater collection system asset condition is assigned using a weighted index of number of main breaks (as a measure of service interruptions) and asset age in comparison to useful life. A summary of the wastewater collection system condition assessment is below:

Condition Assessment	Percentage	Length (km)
Very Good	6.76	2.74
Good	21.00	8.49
Fair	47.96	19.40
Poor	1.53	0.62
Very Poor	22.74	9.20

Water and Wastewater Buildings

The Municipality has water and wastewater buildings throughout the communities of Red Lake, Balmertown, Cochenour, McKenzie Island and Madsen. The table below outlines the type, location, average age, net book value, replacement cost (in 2022 construction dollars) and average condition assessment of each building.

Name	Location	Useful Life	Weighted Average Age	NBV	Replacement Cost	Average Condition Score
Water Buildings and Structures						
Red Lake WTP	Red Lake	50	61	387,908	22,261,300	1.44
Water Tower	Red Lake	50	31	444,573	3,250,500	2.25
Balmertown RPS	Balmertown	50	51	3,099,164	12,103,100	1.11
Cochenour WTP	Cochenour	50	17	7,322,215	23,351,150	1.22
Madsen WTP	Madsen	50	34	503,918	17,036,032	1.56
Wastewater Buildings and Structures						
Red Lake WPCP	Red Lake	50	30	659,900	12,735,000	2.33
Lift Station #1	Red Lake	50	27	130,185	2,607,000	2.44
Lift Station #2	Red Lake	50	25	143,931	1,452,000	1.89
Lift Station #3	Red Lake	50	18	81,880	1,230,000	1.89
Lift Station #4	Red Lake	50	41	38,389	1,140,000	1.89
Lift Station #5	Red Lake	50	41	34,685	1,120,000	1.89
Lift Station #6	Red Lake	50	31	70,331	1,452,000	1.89
Lift Station #7	Red Lake	50	31	71,512	1,140,000	1.89
Balmertown WPCP	Balmertown	50	44	114,502	10,225,000	2.44
Balmertown WPCP Lift Station	Balmertown	50	51	58,452	1,095,000	2.44
Balmertown Lift Station #2	Balmertown	50	51	4,160	1,452,000	2.00
Cochenour Lagoon	Cochenour	20	7	187,733	2,700,000	2.00
Cochenour Lift Station	Cochenour	50	30	29,469	2,025,000	2.22
Madsen Septic	Madsen	50	33	13,481	150,000	2.43
Balmertown Drying Beds	Balmertown				375,000	2.00
Sully Lake Drying Bed	Red Lake	20	11	61,050	715,000	2.17
				13,457,438	119,615,082	

The condition assessment of water and wastewater buildings is based on an average assessment of the various components within the building to provide an overall condition rating. The criteria applied and the individual rating for each component of the building is included in Appendix C. The overall condition is assigned based on:

Condition Assessment	Rating Index
Very Good	1.00 - 1.50
Good	1.51 - 2.50
Fair	2.51 - 3.50
Poor	3.51 - 4.50
Critical	4.50 +

On January 1, 2015, the Federal Wastewater Systems Effluent Regulation (WSER) came into effect and requires that wastewater treatment plants that have a capacity of less than 5,000 m³/day are required to meet the new effluent standards by January 1, 2021. Based on the current design of the Red Lake WPCP, the Municipality currently does not meet the WSER standards so that while the Red Lake WPCP has an overall condition assessment of 2.40 (which is considered “good”), there are issues that need to be addressed. The Municipality has completed a Feasibility Study and a Preliminary Design Report to upgrade the Red Lake WPCP which can be found on the Municipal website.

Stormwater Management Assets

The Municipality’s stormwater system is made up of retention ponds, pipes, culverts, ditches, manholes and storage chambers as outlined in Appendix D. The net book value at December 31, 2021, of the stormwater management assets as indicated by the Municipality’s TCA schedule is \$868,600 while the total replacement cost of the assets is \$2,423,271 (in 2022 construction dollars), excluding any surface works.

Underground Pipes

There are 4.89 km of underground pipes with an average age of 17.69 years (as of February 28, 2022) within the stormwater management asset network made of six different materials consisting of the following:

Type	Useful Life	Length (km)
Asbestos-Cement	30 Years	0.10
Corrugated Steel	30 Years	1.43
Concrete	50 Years	0.20
Hi-Dens Poly Ethel	50 Years	2.45
Poly Vinyl Chloride	50 Years	0.25
SDR	50 Years	0.46

Stormwater management underground pipe condition is assigned based on age in comparison to useful life and a summary of the condition assessment is below:

Condition Assessment	Percentage	Length (km)
Very Good	32.42	1.59
Good	13.98	0.68
Fair	6.75	0.33
Poor	17.96	0.88
Very Poor	28.89	1.41

Culverts

The culverts within the stormwater management asset network have an average age of 27.93 years (as of February 28, 2022) and consist of the following:

Size	Count	Length (km)
150 mm	1	0.04
300 mm	7	0.11
375 mm	66	0.89
400 mm	9	0.10
450 mm	13	0.17
475 mm	3	0.03
500 mm	3	0.02
525 mm	3	0.10
600 mm	10	0.17
700 mm	1	0.02
750 mm	7	0.10
1050 mm	1	0.08

Of the above, 16 (12.90%) are made from corrugated metal pipe with a 30-year useful life, 105 (84.68%) are made from corrugated steel pipe with a 30-year useful life and 3 (2.42%) are made from HDPE with a 50-year useful life.

The culvert condition assessment is based on remaining useful life, summary of which is provided below:

Condition Assessment	Percentage	Count
Very Good	9.38	12
Good	2.42	3
Fair	17.74	22
Poor	0.00	0
Very Poor	70.16	87

Other Stormwater Management Assets

The stormwater management asset network also includes the following and have an average age of 15.79 years (as of February 28, 2022):

Feature	Useful Life	Count
Manhole	50 Years	57
Catch Basin	50 Years	112
Catch Basin with Manhole	50 Years	17
Catch Basin in Ditch	50 Years	3
Gate Valve	15 Years	19
Grated Ditch Inlet	50 Years	5

Also included in other stormwater management assets are 109.39 km of ditches.

Other stormwater management asset conditions are assigned based on age in comparison to useful life and a summary of the condition assessment is below:

Condition Assessment	Percentage	Count
Very Good	38.52	94
Good	12.70	31
Fair	-	-
Poor	34.84	85
Very Poor	13.93	34

Note that ditches are not included in the above condition assessment as the useful life of ditches is the equivalent to land, which is to say, is indeterminate.

Bridges and Structural Culverts

The Municipality is responsible for one bridge, “Howey Bay Bridge” and one box culvert, “Forestry Road Culvert” and both are inspected every two years by an engineering firm. The last inspection was completed on December 14 & 15, 2021.

In accordance with the Ontario Ministry of Transportation Engineering Standards Branch, the Bridge Condition Index (BCI) was calculated for each structure. The range description for the BCI values is as follows:

Condition Assessment	BCI Rating
Excellent	100
Good	≥70 - 100
Fair	≥60 - <70
Poor	<60

The inspection indicates that the Howey Bay Bridge has a condition rating of 71.18 or is on the lower end of the good rating. The report also indicates that the bridge will likely need replacement in the next

one to five years. The structure is made of a steel girder with a total deck length of 6.4 meters and an overall width of 8.5 meters. The net book value of the Howey Bay Bridge at December 31, 2021, as indicated by the Municipality's TCA schedule is \$17,578 with a replacement cost of \$1,101,600 (in 2022 construction dollars). The age of the bridge is unknown.

The inspection indicates that the Forestry Road Culvert has a condition rating of 71.20 or is on the lower end of the good rating. The structure is a concrete box culvert with a total deck length of 20.1 meters and an overall width of 5.6 meters. The net book value of the Forestry Road Culvert at December 31, 2021, as indicated by the Municipality's TCA schedule is \$34,835 with a replacement cost of \$2,203,200 (in 2022 construction dollars). The age of the culvert is unknown however improvements were done to the culvert in 2016 with more improvements being anticipated in 2022.

Roads

The Municipality's road assets include paved roads and gravel roads.

Paved Roads

The Municipality's paved road network is made up of 22.96 lane km (11.07 linear km) of 37.5mm asphalt (overlay) roadways, 44.51 lane km (20.70 linear km) of 50mm asphalt and 37.55 lane km (18.51 linear km) of low compression base roadways (surface treatment) with an average age of 15.10 years (as of February 28, 2022) throughout the communities of Red Lake, Balmertown, Cochenour and Madsen as outlined in Appendix E. The paved road network consists of the following:

Type	Lane km	% of Land Area
Arterial	25.80	15.49
Local	55.46	33.30
Minor Collector	23.76	14.26

The net book value at December 31, 2021, of the paved road network as indicated by the Municipality's TCA schedule is \$6,302,846 while the total replacement cost of the entire network is \$56,654,665 (in 2022 construction dollars). Note that road base costs are only allocated to roads without underground infrastructure underneath them.

In 2018, the Municipality hired a third party to develop a road condition inventory based on the Pavement Condition Index (PCI) for all the paved roads in the municipality. These ratings have been updated by municipal staff for work completed between 2018 – 2021 and include the following classes:

Condition Assessment	PCI Rating
Excellent	86 - 100
Good	71 - 85
Fair	56 - 70
Poor	41 - 55
Very Poor	26 - 40
Failed	0 - 25

A summary of the Municipality's paved road condition assessment is below:

Condition Assessment	Percentage	Lane km
Excellent	31.12	32.67
Good	18.30	19.22
Fair	16.17	17.00
Poor	18.31	19.22
Very Poor	13.67	14.35
Failed	2.43	2.56

Gravel Roads

The Municipality's gravel road network consists of 24.69 lane km (16.45 linear km) of gravel roads with an average age of 35.5 years (as of February 28, 2022) throughout the communities of Red Lake, Balmertown, Cochenour and Madsen as outlined in Appendix F. All roads in the gravel road network are local and account for 14.82% of the land area of the municipality.

The net book value at December 31, 2021, of the gravel road network as indicated by the Municipality's TCA schedule is \$225,462 while the total replacement cost of the entire network is \$5,937,342 (in 2022 construction dollars).

The Municipality has rated the gravel roads based on visual inspection with the results below:

Condition Assessment	Percentage	Lane km
Very Good	21.67	5.35
Good	63.88	15.77
Fair	14.34	3.54
Poor	0.11	0.03
Very Poor	-	-

Level of Service

This section provides an overview on the current level of service for the Municipality's core assets. It also provides discussion on external factors that affect level of service.

Overview and Measures

The Municipality's current service levels support the intended purpose of the asset and its anticipated impact on the community and the municipality. They have been developed based on a combination of internal asset management practices, community expectations, statutory requirements and industry operating and safety standards and are guided by the following principles:

- **Reliable** – Services are predictable and continuous; services of sufficient capacity are convenient and accessible
- **Cost Effective** – Services are provided at the lowest possible cost for both current and future rate payers
- **Responsive** – Opportunities for community involvement in decision making are provided; and rate payers are treated fairly and consistently, within acceptable timeframes, demonstrating respect, empathy, and integrity
- **Safe** – Services are delivered so that they minimize health, safety, and security risks
- **Suitable** – Services are suitable for the intended function
- **Sustainable** – Services preserve and protect the natural and heritage environment

The level of service measures are described using two perspectives:

- **Community perspective** – includes the rate payer's expectation of the service provided by the asset
- **Technical perspective** – includes the Municipality's performance measurement of the service provided by the asset. Included in the technical perspective is the performance target.

The Municipality of Red Lake has created a response framework that provides guidance and standards on how quickly municipal staff are to respond to complaints or concerns with municipal infrastructure. The response framework standards outline if there is:

- **Significant or immanent risk to life or property** – respond within 30 minutes
- **Minimum or low-likelihood of impact or damage to life or property** – respond by next business day
- **No risk of impact or damage to life or property** – respond as available

These standards should be met, at a minimum, 95% of the time.

Water and Wastewater Assets

Water and wastewater services should provide a potable water supply, and collection, treatment, and disposal of sewage wastewater in a way that protects the natural environment and public health.

Water and wastewater services are available in the communities of Balmertown, Cochenour, Red Lake, McKenzie Island and Madsen but there are areas of the Municipality where water and wastewater

services from the Municipality are not available due to the prohibitive cost. Currently 52.49% of properties in the Municipality are connected to the municipal water system and 51.32% of properties are connected to the municipal wastewater system. Further, fire flow is available to 94.03% of properties within the Municipality. Maps indicating the location of the water distribution system, wastewater collection system and the fire flow areas are included in Appendices A, B, and G respectfully.

For those connected to the water and wastewater system, the expectation is that they have clean water when they need it, that tastes good, with adequate pressure, at a reasonable cost and that the wastewater system takes away their waste and treats it with no harm to the environment. From the community perspective, this means a quality, efficient water supply with adequate capacity and a quality wastewater collection with adequate capacity and no environmental impacts. The table below illustrates the technical perspective, performance target and current performance by target.

WATER SERVICES		
Technical Perspective	Performance Target	Current Performance
Meet all regulatory requirements	No incidents of non-compliance	2021 - 12 incidents 2020 - 4 incidents
	No boil water advisories, other than due to water breaks	All BWA average connection days – 0.38 days (2021) 3.87 (2020) BWA due to water breaks average connection days – 0.01 (2021) 3.83 (2020)
Provide responsive service	Respond as required by Municipality of Red Lake's response framework	No known responses outside of framework standards in the past 2 years
	Repair main breaks within twenty-four hours of initiation in the winter and sixteen hours of initiation in the summer, 95% of the time	No known repairs outside the timeframes in the past 2 years
Provide reliable service	One water break per 5 km of water mains per year	.95 water breaks per 5 km of mains
Provide affordable service	Hold rate increases to inflation or lower	2.0% increase in 2022 vs 5.1% inflation

Boil water advisories in 2021 consisted of:

- McKenzie Island – 15 properties affected for 10 connection days due to a water main break on October 28, 2021
- Madsen – 71 properties affected for 6 connection days due to a failure at the water treatment plant on June 2, 2021

Boil water advisories in 2020 consisted of:

- Red Lake - 19 properties affected for 6 connection days due to a water main break on August 12, 2020
- Red Lake - 5 properties affected for 14 connection days due to a water main break on August 11, 2020
- Red Lake - 34 properties affected for 8 connection days due to a water main break on June 22, 2020
- Red Lake - 744 properties affected for 7 connections days due to a water main break on June 3, 2020
- Red Lake - 37 properties affected for 2 connection days due to a water main break on February 19, 2020
- Red Lake - 7 properties affected for 8 connection days due to the installation of a new water service on February 11, 2020
- Cochenour – 29 properties affected for 1 connection day due to a water main repair on February 6, 2020
- Red Lake – 7 properties affected for 5 connection days due to a water main break on January 9, 2020

WASTEWATER SERVICES		
Technical Perspective	Performance Target	Current Performance
Meet all regulatory requirements	No incidents of non-compliance	2021 - 4 incidents 2020 - 1 incidents
Provide responsive service	Respond as required by Municipality of Red Lake's response framework	No known responses outside of framework standards in the past 2 years
	Repair collapsed/frozen pipes within twenty-four hours of initiation in the winter and sixteen hours of initiation in the summer, 95% of the time	No known repairs outside the timeframes in the past 2 years
Provide reliable service	No sewer backups	0 average connection days due to sewer backups
Provide affordable service	Hold rate increases to inflation or lower	2.0% increase in 2022 vs 5.1% inflation

When looking at improving/maintaining the level of service for water and sewer infrastructure, cost is a significant obstacle. In recent years there have been technological advances that have made underground water and sewer renewals more cost effective however, they are not ideal for the Municipality. Specifically, as the Municipality is situated predominately on bedrock, direction drilling becomes more costly and/or not feasible, negating any savings from not using the traditional cut and cover method. In addition, when some water and sewer lines were originally installed in the mid-1900s,

they were placed on waste rock from the nearby mines which is very sharp and jagged. Pushing new pipes through the exiting waste rock could cause the pipes to shred and create additional issues.

Another alternative method is lining existing pipes with structural liners. The use of waste rock as fill for some of the trenches has caused some pipes to become punctured and not structurally able to hold the liner. In these instances, the lining would only be a temporary solution that would like be destroyed by the waste rock as well. In addition, there are some water mains that need an increased diameter. In these cases, the traditional cut and cover method is preferred.

An area of concern for the wastewater system is stormwater entering sanitary sewers causing sewage to overflow into streets or backup into homes. As the Municipality does not have combined sewers in the wastewater system, this happens by infiltration of the sanitary sewer's components. This would include low lying access lids where stormwater collects, failed parging and/or majestic seals of concrete structures as well as failed pipe joints. In the past, weeping tile and eavestroughs have been tied into the sanitary sewer. As these ties in are discovered, they are eliminated. To avoid overflows or backups of the sanitary sewer should stormwater infiltrate the sanitary sewer, lift stations are designed to overflow if they do not have the capacity to deal with a high flow event.

Effluent discharged from the sewage treatment plants is outlined in Appendix H. In 2021, there were four effluent violations at the Red Lake Water Pollution Control Plant where the effluent parameter E. coli exceeded the compliance limit of 200 MPN/100mL in:

- January (261 MPN/100mL)
- August (389 MPN/100mL)
- November (469 MPN/100mL)
- December (675 MPN/100mL)

In 2020 there were no effluent violations.

Stormwater Management Assets

A stormwater management system protects our environment and reduces flooding to protect people and property.

For residents, the expectation is that there is no flooding on their streets or properties. From a community perspective, this means a stormwater system with adequate capacity. The table below illustrates the technical perspective, performance target and current performance by target.

STORMWATER MANAGEMENT		
Technical Perspective	Performance Target	Current Performance
Provide responsive service	Respond as required by Municipality of Red Lake's response framework	No known responses outside of framework standards in the past 2 years
	Remove blockage within four hours of initiation, 95% of the time	All blockages removed within four hours of initiation in the last 2 years
Provide reliable service	No flooding incidents due to blockages	No flooding incidents due to blockages in the last 2 years

Appendix D provides a map of areas protected by stormwater management assets. As of February 28, 2022, 100% of the stormwater management system is resilient to a 5-year storm. As of February 28, 2022, 2,466 out of 2,866 properties or 86.04% of properties within the Municipality are resilient to a 100-year storm. A map outlining properties not resilient to a 100-year storm is included in Appendix F.

Bridges and Structural Culverts

Bridges and structural culverts should allow people or cargo easy passage over an obstacle by providing a route that would otherwise be uneven or impossible.

For users of the infrastructure, the expectation is that there are sturdy bridges that take them where they want to go without too much congestion. From a community perspective, this means safe reliable bridges and structural culverts with adequate capacity. The table below illustrates the technical perspective, performance target and current performance by target.

BRIDGES AND STRUCTURAL CULVERTS		
Technical Perspective	Performance Target	Current Performance
Meet all regulatory requirements	No incidents of non-compliance with minimum maintenance standards	0 incidents of non-compliance with minimum maintenance standards
	Inspection every two years	Last completed December 2021
Provide responsive service	Respond as required by Municipality of Red Lake's response framework	No known responses outside of framework standards in the past 2 years
Provide reliable service	All bridges have adequate load limits	Load limit on Howey Bay Road bridge is not adequate. To be reviewed once the bridge is replaced.

The Howey Bay Road bridge currently has a 5-tonne load limit and supports all vehicles up to 5 tonnes, pedestrians, and cyclists. The Municipality should look at replacing the bridge in the next one to five years as indicated in the 2021 inspection report which can be found on the Municipal website.

In the next one to five years, the Forestry Road culvert will require work to rehabilitate the concrete footing as it has extensive erosion and exposed rebar under the waterline as indicated in the 2021 inspection report which can be found on the Municipal website.

Roads

Roads should exist for two key purposes: to provide access to and from origins and destinations and facilitate movement. For residents, the expectation is that there are smooth roads that take them where they need to go safely and without too much congestion. From a community perspective, this means safe, reliable roads with adequate capacity. The table below illustrates the technical perspective, performance target and current performance by target.

ROADS		
Technical Perspective	Performance Target	Current Performance
Meet all regulatory requirements	No incidents of non-compliance with minimum maintenance standards	0 incidents of non-compliance with minimum maintenance standards
Provide responsive service	Respond as required by Municipality of Red Lake's response framework	No known responses outside of framework standards in the past 2 years
Provide reliable service	No roads with "failed" PCI rating	2.43% or 2.56 lane km of road with failed rating
	Less than 10% of roads with PCI rating of very poor	13.67% or 14.35 lane km of road with very poor rating

Integration of road repair/renewal/replacement with the underground infrastructure repair/renewal/replacement is a challenge. Roads requiring work to maintain the level of service may not be addressed right away as there may be roads with underground infrastructure that have a higher priority to be replaced even though the road itself is in better condition. There may be instances of roads in poor condition where the underground infrastructure is also in poor condition resulting in the road not being repaired until the underground infrastructure is also repaired. The 2.56 lane km of road with a failed rating indicated above falls into this scenario. There are plans to address the underground infrastructure and the failed road in 2022/2023.

Lifecycle Management Strategy

This section provides discussion on policies and practices that, in conjunction with the level of service requirements, dictate the lifecycle management requirements for the Municipality's core assets. It will also set out the action plan that will assist the Municipality in maintaining assets so that the desired levels of service are achieved efficiently and effectively.

External Influences on Lifecycle Activities

Municipality of Red Lake's main economic activity is mining which is historically unstable and can affect assessment values impacting taxation revenues. In years of assessment write downs, planned expenditures (both short and long term) may no longer be feasible, impacting all activities of lifecycle management. In years of assessment increases or growth, there are unbudgeted increases in taxation revenues. The volatility requires the Municipality to be adaptable, and any long-term plan must be flexible.

The mining industry draws skilled and talented workers and the wages/salaries paid to those in the Municipality of Red Lake are competitive within the industry making attracting and retaining employees difficult as the Municipality is not able to compete on a dollar basis, specifically in our Public Works department. The inability to hire fully qualified public works employees requires additional training time for new employees and a skill gap when employees leave, affecting the ability of the Municipality to complete lifecycle activities.

In recent years, gold markets have been strong creating an environment for growth in the Municipality. Over the next ten years, it is anticipated that a new mine with the potential to create an addition 1,500 jobs will be developed approximately 25 kms south of the community of Red Lake. Further, within the next two to ten years, it is likely that a bridge north of the Municipality will be constructed providing a year-round access road for Indigenous communities, creating additional demand on businesses and services within the Municipality.

Rising costs, especially fuel, steel, and lumber, as well as delays in the supply chain restrict the Municipality's ability to obtain goods and services. Interest rates have been at a historic low and low borrowing costs have offset some of the increased commodity costs meaning capital projects are still feasible. Interest rates are rising, and rapidly increasing commodity costs will begin to restrict the ability of the Municipality to complete capital projects. Proper planning of lifecycle activities coupled with no large assessment decreases will help the Municipality move forward without significant tax rate increases.

Procurement Policy

The Procurement of Goods, Services or Construction & Disposal of Assets By-Law No. 1574-12 sets out the policies and procedures for procurement at the Municipality of Red Lake and can be found on the Municipal website. The objective of the by-law is to obtain the best value when purchasing goods, construction, and services for the Municipality while treating all suppliers equitably and to also ensure that the competitive process is open, transparent, and fair to all suppliers.

The by-law requires that for purchasing goods, services, and construction:

- Up to \$2,500 plus taxes, no quote, tender or RFP required
- Between \$2,500 - \$15,000 plus taxes, two written quotations are required
- Between \$15,000 - \$75,000 plus taxes, three written quotations are required
- Over \$75,000 plus taxes, sealed tenders, sealed RFP or three sealed written quotes are required

The by-law also allows that in an emergency situation the requirements above can be waived by the CAO or designate.

The by-law also requires that when disposing of an asset, it must first be declared surplus by Council and that no asset that can be utilized by any other department, board or commission of the Corporation shall be declared surplus. Any surplus asset are to be disposed of at near fair market value, as is possible and any assets with monetary value over \$200 is required to be disposed of through sealed public tender.

Potential issues with this approach to procurement is that there may be pressure to accept the lowest upfront bid possibly resulting in higher operating costs or inadequate goods, services, or construction. To mitigate, the Municipality includes “the lowest or any bid not necessarily accepted” when issuing the tender or RFP documents to help ensure that the Municipality is able to procure the best value (lowest life costs with the specs required) and not just the lowest upfront cost.

The global supply chain issues and increasing commodity costs have made procurement difficult. There are significant delays for materials and when they do come, they are at a significantly higher cost than they were a few years ago. The Municipality has had to place greater emphasis on some lifecycle activities (such as maintenance) than others (such as replacement or renewal) until materials and/or labour is available which, potentially, increases the lifecycle costs of the asset. In some instances, the Municipality has had to push off renewal/rehabilitation/replacement activities as they have become cost prohibitive in the short term. It is predicted that the rising interest rates will help to curb the rapid inflation making activities that do not require borrowing less costly.

Alternative Solutions

The Municipality regularly reviews alternative service delivery options on both a formal and informal basis. Shared services have the potential to allow the Municipality to share costs associated with acquiring and maintaining assets through joint agreements with either neighbouring municipalities or private organizations in an effort to share risks and minimize costs.

The Municipality currently utilizes Northern Waterworks Inc. as the operating authority to look after the municipal water and wastewater facilities. This allows the Municipality to leverage the knowledge and resources of NWI to achieve efficiencies in a much more cost-effective manner including:

- Compliance monitoring
- Operator training
- Process optimization
- Bulk procurement of materials, supplies and services

Given the geographical location of Red Lake, shared service agreements with neighbouring municipalities for other core assets are not cost-effective.

Lifecycle Activities

The lifecycle activities of the Municipality's core assets fall into five categories:

- Non-infrastructure solutions
- Maintenance activities
- Replacement/renewal/rehabilitation activities
- Expansion activities
- Disposal activities

All of these activities were assessed when looking at the long-term plan for municipal core assets. A discussion on each activity and how they impacted the plan is outlined below.

Non-Infrastructure Solutions

Non-infrastructure solutions are policies, processes or strategies that reduce asset related costs (operating, maintaining, rehabilitation, replacement, expansion) and/or improve asset performance resulting in either lower costs and/or extended life.

The Municipality of Red Lake currently utilizes the following solutions, in varying degrees:

- Integrated Infrastructure Planning - layering road, water, wastewater, and stormwater capital forecasts together to minimize costs
- Insurance – minimizes the cost of unforeseen and uncontrollable asset losses
- Land Use Planning – managing the development of land within the Municipality, ensuring the efficient use of land and the efficient construction of assets
- Managed Failures – use of asset conditions, risk assessments and levels of service to manage and plan for where assets are “allowed” to fail, allowing funds to be used in more critical areas

The Municipality plans to implement demand management which helps to manage and forecast the demand for services within the municipality. This will be critical to help maintain levels of service as the need for municipal services grows.

Maintenance Activities

The Municipality's maintenance activities includes regularly scheduled costs to inspect or maintain assets and one-time repair costs that are not considered rehabilitation, renewal, or replacement costs. More specifically, for all core assets, maintenance activities are those activities that do not increase service capacity from the original design.

The following table outlines the maintenance activities for each asset category covered under this plan as well as the spending in 2021 and 2020 for those activities.

Asset Type	Activities
Water Distribution System	<ul style="list-style-type: none"> • Annual hydrant flushing, winterizing, and cleaning • Leak detection • Break repairs • Annual frost protection including utilization of heat trace • Thawing frozen assets • Exercising valves • Corrosion control measures
Wastewater Collection System	<ul style="list-style-type: none"> • Flushing of low-pressure sewers (Madsen, Cochenour Crescent, and McKenzie Island) • Blockage and collapse repairs including thawing frozen assets • Jetting, cleaning, and inspection of gravity sewers • Hydrovac of sanitary manholes • Repair of grates and manhole covers
Water and Wastewater Buildings	<ul style="list-style-type: none"> • See Municipal website for detailed description of all maintenance activities performed
Stormwater Pipes	<ul style="list-style-type: none"> • Blockage removal including thawing frozen assets • Hydrovac of stormwater catch basins and manholes • Repair of frame, grates, and access lids
Stormwater Culverts and Other Assets	<ul style="list-style-type: none"> • Blockage removal including thawing frozen assets • Debris removal and excavation • Ditch brushing and mowing • Tree harvesting from ditches • Minor culvert replacement
Bridges and Structural Culverts	<ul style="list-style-type: none"> • Snow removal and sediment collection • Activities as outlined in bi-annual bridge inspection • Erosion protection (slope stabilization) • Concrete and asphalt sealing • Expansion joint repairs • Guard rail repair
Paved Roads	<ul style="list-style-type: none"> • Street sweeping • Pothole filling • Crack sealing • Line painting • Subgrade repairs • Asphalt patching
Gravel Roads	<ul style="list-style-type: none"> • Snow removal and grading • Gravel replacement • Dust control • Subgrade repairs

When looking at the long-term plan, specific assets having consistently high maintenance costs were flagged for special consideration.

Replacement and Renewal/Rehabilitation Activities

The Municipality's renewal and rehabilitation activities include significant repairs that extend asset life and enhances service capacity from the original design whereas the Municipality's replacement activities include replacing one asset with another. When looking whether renewal/rehabilitation or replacement is necessary the Municipality uses a bottom-up approach which includes weighing the cost and new useful life with the potential costs of additional maintenance or repairs, remaining useful life and the risk of asset failure.

The Municipality has in the past struggled with replacing or renewing/rehabilitating core assets due to uncertainty with its assessment base and the ability to continue to fund the associated debt. In recent years, the Municipality has been successful in obtaining Federal and Provincial capital funding allowing the Municipality to rehabilitate priority roadways within the community of Red Lake in 2020 and 2021. This included rehabilitating and/or expanding the stormwater management assets, rehabilitating 500 meters of existing sidewalks, construct 2.3 kilometers of new sidewalks and rehabilitating the pavement and curbs for 4.4 kilometers of paved roads for a total cost of \$5,655,169. This was funded through the Investing in Canada Infrastructure Program, Ontario Community Infrastructure Fund, and municipal reserves.

There are also plans to replace failing water mains in the community of Cochenour in 2022.

Expansion Activities

The Municipality undertakes expansion activities as required. With the predicted increased economic activity and potential for new residents to be moving to the Municipality, it is anticipated that over the next two to ten years, there will be additional need for municipal infrastructure. With respect to core infrastructure, this may require expanded water and wastewater services, new roads, and new stormwater management assets.

Considerations for Plan Priorities

To create the long-term plan, there were a number of factors that were taken into account to determine priorities including:

- Risk
- Growth requirements
- Public value

Risk

To assign a risk factor to assets the Municipality looked at:

- Probability of failure – what is the chance the asset will fail?
- Consequences of failure – what is the impact to the Municipality if the asset fails?
- Mitigation/redundancy – are their risk mitigation processes or procedures in place to reduce the overall risk?

The probability of failure is generally related to the condition of the asset. If an asset is in very good condition, the likelihood of failure is likely to be rare or very unlikely. If an asset is in poor or failing condition, the likelihood of failure should be likely or almost certain. Other factors that affect the probability of failure include asset capacity and function as if the asset does not function correctly or does not meet the needed capacity, it is considered to be failing.

The table below illustrates the overall methodology used by the Municipality to assign the probability of failure.

Score	Likelihood of Failure	Failure Descriptor	Probability of Occurrence
1	Rare	May occur only in exceptional circumstances	More than 20 years
2	Unlikely	Could occur at some time	Within 10 - 20 years
3	Possible	Might occur at some time	Within 3 - 5 years
4	Likely	Will probably occur in most circumstances	Within 2 years
5	Almost Certain	Expected to occur in most circumstances	Within 1 year

Consequences of failure are determined using a combination of qualitative and quantitative metrics including. For each core asset category, different metrics were used to ensure appropriate impacts were measured.

Buildings

Metrics used to establish the consequence of failure for buildings included:

- Cost impacts – the cost to replace the asset
- Social impacts – the potential harm or disruption to residents or municipal staff
- Environmental impacts – the impact of asset failure on the environment
- Service delivery impacts – the impact of asset failure on the municipality's ability to provide service at the desired levels or potential service delivery interruptions
- Location impacts – the impact of asset failure based on proximity to essential services

The table below outlines the scoring methodology for each of the metrics.

Score	Consequence	Impacts				
		Cost	Social	Environmental	Service Delivery	Location
1	Insignificant	Less than \$5,000	No disruption or harm	No impact	No interruptions	No impact on essential services
2	Minor	\$5,000 - \$50,000	Minor disruption and no harm	Short-term/minor impact - fixable	Minor interruptions	Minor impact on essential services
3	Moderate	\$50,001 - \$500,000	Moderate disruption or minor harm	Medium term impact - fixable	Moderate interruptions	Moderate impact on essential services
4	Major	\$500,001 - \$5,000,000	Major disruption or moderate harm	Long-term impact - fixable	Major interruptions	Major impact on essential services
5	Significant	More than \$5,000,000	Significant disruption or major/significant harm	Long-term impact - permanent	Significant interruptions	Significant impact on essential services

When assigning a factor to the consequence of failure, the Municipality averages the score from all five impact areas to determine an overall consequence rating.

Roads

Metrics used to establish the consequence of failure for paved roads and gravel roads included:

- Cost impacts – the cost to replace the asset
- Road type – the function of the road
- Surface type – the surface material
- Traffic count– average number of vehicles per day
- Location impacts – the impact of asset failure based on proximity to essential services

The table below outlines the scoring methodology for each of the metrics.

Score	Consequence	Impacts				
		Cost	Road Type	Surface Type	Traffic Count	Location
1	Insignificant	Less than \$10,000		Gravel	Nominal	No impact on essential services
2	Minor	\$10,001 - \$50,000	Local	LCB	Up to 49	Minor impact on essential services
3	Moderate	\$50,001 - \$200,000	Minor Collector	Asphalt Overlay	50 - 199	Moderate impact on essential services
4	Major	\$200,001 - \$1,000,000	Arterial	HCB	200 - 399	Major impact on essential services
5	Significant	More than \$1,000,000			400 - 999	Significant impact on essential services

When assigning a factor to the consequence of failure, the Municipality averages the score from all five impact areas to determine an overall consequence rating.

Water Distribution Network

Metrics used to establish the consequence of failure for the water distribution network include the following:

- Main size – the diameter of the main
- Cost impacts – the cost to replace the asset
- Location impacts – the impact of asset failure based on proximity to essential services

The table below outlines the scoring methodology for each of the metrics.

		Impacts		
Score	Consequence	Cost	Main Size	Location
1	Insignificant	Less than \$10,000	1 mm – 50 mm	No impact on essential services
2	Minor	\$10,001 - \$50,000	51 mm – 100 mm	Minor impact on essential services
3	Moderate	\$50,001 - \$200,000	101 mm – 150 mm	Moderate impact on essential services
4	Major	\$200,001 - \$1,000,000	151 mm – 200 mm	Major impact on essential services
5	Significant	More than \$1,000,000	Greater than 200 mm	Significant impact on essential services

When assigning a factor to the consequence of failure, the Municipality averages the score from all three impact areas to determine an overall consequence rating.

Wastewater Collection System

Metrics used to establish the consequence of failure for the water distribution network include the following:

- Main size – the diameter of the main
- Main type – the function of the main
- Cost impacts – the cost to replace the asset
- Location impacts – the impact of asset failure based on proximity to essential services

The table below outlines the scoring methodology for each of the metrics.

Score	Consequence	Impacts			
		Cost	Main Size	Main Type	Location
1	Insignificant	Less than \$5,000	1 mm – 75 mm		No impact on essential services
2	Minor	\$5,000 - \$50,000	76 mm – 150 mm	Gravity	Minor impact on essential services
3	Moderate	\$50,001 - \$500,000	151 mm – 225 mm		Moderate impact on essential services
4	Major	\$500,001 - \$5,000,000	226 mm – 300 mm	Low Pressure System	Major impact on essential services
5	Significant	More than \$5,000,000	Greater than 300 mm	Force Main	Significant impact on essential services

When assigning a factor to the consequence of failure, the Municipality averages the score from all four impact areas to determine an overall consequence rating.

Stormwater Management Assets

Metrics used to establish the consequence of failure for the stormwater management assets include the following:

- Cost impacts – the cost to replace the asset
- Location impacts – the impact of asset failure based on proximity to essential services

The table below outlines the scoring methodology for each of the metrics.

		Impacts	
Score	Consequence	Cost	Location
1	Insignificant	Less than \$10,000	No impact on essential services
2	Minor	\$10,001 - \$50,000	Minor impact on essential services
3	Moderate	\$50,001 - \$200,000	Moderate impact on essential services
4	Major	\$200,001 - \$1,000,000	Major impact on essential services
5	Significant	More than \$1,000,000	Significant impact on essential services

When assigning a factor to the consequence of failure, the Municipality averages the score from both impact areas to determine an overall consequence rating.

Overall Risk

To determine the overall risk factor, the Municipality uses a weight of 60% to probability and 40% to consequence for each asset. Some individual assets have been grouped together to create segments in cases where there is underground infrastructure under a road or where there is water and wastewater infrastructure in the same area. In these cases, weight as been assigned to each individual asset as follows:

- If there is only a paved road – 40% to road asset, 30% to water asset, 15% to wastewater asset and 15% to stormwater management assets
- If it is only a gravel road – 30% to road asset, 40% to water asset, 15% to wastewater asset and 15% to stormwater management assets
- If there is a paved road and a gravel road – 36% to paved road, 4% to gravel road, 30% to water asset, 15% to wastewater asset and 15% to stormwater management assets

In instances where one asset type does not make up part of the segment, that component is excluded from the calculation creating a lower overall risk asset for the Municipality.

When the overall risk factor has been determined, it is classified under the following categories:

- Extreme Risk (Score > 4) – Risk well beyond acceptable levels and is shown below in red
- High Risk (Score > 3 or =/ < 4) – Risk is beyond acceptable levels and is shown below in orange
- Medium Risk (Score > 2 or =/ < 3) – Risk at acceptable level but monitoring is required to ensure risk does not become high and is shown below in yellow
- Low Risk (Score <= 2) – Risk is at or below acceptable levels and is shown below in green

Risk Matrix					
Probability of Failure	Consequence of Failure				
	Insignificant	Minor	Moderate	Major	Significant
Rare	1.0	1.6	2.2	2.8	3.4
Unlikely	1.4	2.0	2.6	3.2	3.8
Possible	1.8	2.4	3.0	3.6	4.2
Likely	2.2	2.8	3.4	4.0	4.6
Almost Certain	2.6	3.2	3.8	4.4	5.0

If a risk falls under the extreme risk or high-risk category, the Municipality must look for ways to mitigate the risk by implementing redundancy measures or increasing emphasis on one of the lifecycle activities.

When looking at the long-term plan, assets without redundancies or without the ability to mitigate with cost effective efforts were assigned a higher probability of failure score.

Growth Requirements

With the anticipated influx of people utilizing the services within the Municipality over the next two to ten years, having development ready land available is a priority for the Municipality. This will involve upgrading or expanding existing infrastructure and adding new infrastructure including roads, water mains and service connections, sewer mains and service connections and stormwater management assets.

Assets that do not currently meet future growth needs were assigned a higher probability of failure score.

Public Benefit

The mandate of the Municipality is to provide the greatest benefit to the greatest number of people. When all other things equal, the highest public value (calculated as the lowest cost per affected resident) were given a higher priority.

Lifecycle Management Strategy Scenarios

The following section outlines the different lifecycle management activity timing scenarios for each group of core assets.

Roads

The lifecycle management strategy scenarios for paved roads are based off of the lifecycle costs for 100 m of paved roads and include the following scenarios:

- Scenario 1 - An annual allocation for potholes based on anticipated PCI rating, aggressive preventative maintenance in years 3 and 10, replacing the surface in year 30 with preventative maintenance in years 33 and 40 and replacing the road in year 50.
- Scenario 2 - An annual allocation for potholes based on anticipated PCI rating, moderate preventative maintenance in year 10, surface replacement in year 25, preventative maintenance in year 35 and replacing the road in year 45.
- Scenario 3 - An annual allocation for potholes based on anticipated PCI rating, no preventative maintenance, surface replacement in year 20 and replacing the road in year 40.

When assessing the financial impacts of the lifecycle activities the following assumptions were made:

- Aggressive preventative maintenance would maintain the PCI of a new road to, at minimum, 80 in the first 10 years
- Moderate preventative maintenance would maintain the PCI of a new road to, at a minimum, 70 in the first 10 years
- Average annual PCI decrease in the first 10 years of a new road is 3-4 points per year depending on preventative maintenance and approximately 2-3 points per year in subsequent years
- Average annual PCI decrease for a new overlaid surface is approximately 5 points per year for the first 5 years and approximately 3 points per year in subsequent years

These assumptions are based on the historical information of the Municipality of Red Lake and other surrounding municipalities and are subject to fluctuations based on climate conditions.

The inflated lifetime costs and the net present value of each scenario is provided below:

	Inflated Costs	Net Present Value
Option 1	849,293.66	\$377,607.02
Option 2	818,437.93	\$393,516.98
Option 3	790,517.95	\$410,766.96

The inflated costs were calculated using 2% inflation per year over 50 years. The net present value calculation is based off of a discount rate of 3.20%, which is the Municipality's current cost of borrowing. The detailed calculation of the costs can be found in Appendix J.

Scenario 1 provides the lowest cost in today's dollars coupled with the highest level of service as the aggressive preventative maintenance prolongs the life of the road long enough for the Municipality to realize savings. By maintaining the roads to a higher standard, it reduces the likelihood of failure resulting in a lower occurrence of accidents, property damage and potential injuries. As current underground infrastructure materials have a useful life of 50 years, scenario 1 better aligns the useful life of the road with the useful life of the underground assets allowing the municipality to integrate replacement of underground assets with road replacement.

Water Distribution Network

The lifecycle management strategies for the water distribution network are based off of the lifecycle costs for 100 m of water mains and include the following scenarios:

- Scenario 1 - Blasting rock to ensure adequate line depth to prevent freezing lines and using a lining method to renew the pipe at the end of its useful life (50 years)
- Scenario 2 - Blasting rock to ensure adequate line depth to prevent freezing lines and completely replacing the old pipe at the end of its useful life (50 years)
- Scenario 3 - Laying pipe at the adequate depth to prevent freezing lines where ground type permits, using heat trace and insulation where desired depth is not achievable and using a lining method to renew the pipe at the end of its useful life (50 years)
- Scenario 4 - Laying pipe at the adequate depth to prevent freezing lines where ground type permits, using heat trace and insulation where desired depth is not achievable and completely replacing the old pipe at the end of its useful life (50 years)

When assessing the financial impacts of the lifecycle activities the following assumptions were made:

- There were no limitations on the ability to use a lining method to renew the pipe such as undersized mains, improper fill material, and inadequate capacity
- Heat trace would last for approximately 35 years after which a bleeder line or aqua flow unit would be required
- The cost to line the pipe is 70% of the material costs and 20% of the earthworks cost of replacing the pipe and is required to be completed 5 years earlier
- Anticipated water breaks at 25 years and 40 years for scenario 1 and 2 and at year 33 for scenario 3 and 4 based on historical water break data

The inflated lifetime costs and the net present value of each scenario is provided below:

	Inflated Costs	Net Present Value
Option 1	428,432.06	\$278,924.31
Option 2	598,669.80	\$307,818.36
Option 3	349,850.42	\$209,891.59
Option 4	514,797.84	\$237,657.02

The inflated costs were calculated using 2% inflation per year over 50 years. The net present value calculation is based off of a discount rate of 3.20%, which is the Municipality's current cost of borrowing. The detailed calculation of the costs can be found in Appendix J.

In instances where pipe lining is a viable option (water mains are properly sized, fill material provides the proper foundation for the pipe and existing size meets the current and future capacity needs) scenario 3 provides the lowest cost in today's dollars. In instances where pipe lining is not a viable option, scenario 4 is the next best option. It should also be noted that in areas with high usage, the likelihood of freezing is low and may not require heat trace for scenarios 3 and 4. Heat trace should be assessed on an individual basis during the engineering phase of a project and the NPV of the project should be reassessed.

While scenario 1 and 2 would provide the highest level of service due to the lower likelihood of lines freezing, the infrastructure costs are higher than the corresponding scenario without blasting. In addition, blasting rock creates additional potential liability in regard to damage to nearby structures. As Ontario has joint and several liability, the nearby structures become an even greater risk to the Municipality of Red Lake and is not recommended where avoidable.

Wastewater Collection System

The lifecycle management strategies for the wastewater collection system are based off of the lifecycle costs for 100 m of sewer mains and include the following scenarios:

- Scenario 1 - Blasting rock to ensure adequate line depth to allow for a gravity sewer and using a lining method to renew the pipe at the end of its useful life (50 years)
- Scenario 2 - Blasting rock to ensure adequate line depth to allow for a gravity sewer and completely replacing the old pipe at the end of its useful life (50 years)
- Scenario 3 – Using a low-pressure system with heat trace in low use areas and using a lining method to renew the pipe at the end of its useful life (50 years)
- Scenario 4 - Using a low-pressure system with heat trace in low use areas and completely replacing the old pipe at the end of its useful life (50 years)

When assessing the financial impacts of the lifecycle activities the following assumptions were made:

- There were no limitations on the ability to use a lining method to renew the pipe such as undersized mains, improper fill material, and inadequate capacity
- Heat trace would last for approximately 35 years
- The cost to line the pipe is 70% of the material costs and 20% of the earthworks cost of replacing the pipe and is required to be completed 5 years earlier
- Anticipated main breaks at year 33 for scenario 1 and 2 and at year 39 for scenario 3 and 4 based on historical break data
- Low pressure system has an allocation of \$1,000 per year for additional repairs due to the decentralized mechanisms and potential airlocks

The inflated lifetime costs and the net present value of each scenario is provided below:

	Inflated Costs	Net Present Value
Scenario 1	354,965.78	\$209,450.75
Scenario 2	385,440.28	\$210,971.17
Scenario 3	320,635.50	\$160,286.51
Scenario 4	351,110.00	\$161,806.92

The inflated costs were calculated using 2% inflation per year over 50 years. The net present value calculation is based off of a discount rate of 3.20%, which is the Municipality's current cost of borrowing. The detailed calculation of the costs can be found in Appendix J.

In instances where pipe lining is a viable option (sewer mains are properly sized, fill material provides the proper foundation for the pipe and existing size meets the current and future capacity needs) scenario 3 provides the lowest cost in today's dollars. In instances where pipe lining is not a viable

option, scenario 4 is the next best option. Although gravity sewers are more commonplace, low pressure sewer systems are more cost effective for planned expenditures. Significant unplanned expenditures can result in the NPV lifetime costs of the asset being higher than the traditional gravity sewers. In order to mitigate some of this risk, it may be advisable to have the property owner responsible for the grinder pumps feeding into a low-pressure system.

Further, to install a gravity sewer in most cases would require blasting rock to ensure the proper depth and slope of the mains. Blasting rock creates additional liability risk in regard to damage to nearby structures. As Ontario has joint and several liability, the nearby structures become an even greater risk to the Municipality of Red Lake and is not recommended where avoidable.

Other Assets

Stormwater Management Assets

Stormwater management assets exist to prevent flooding to protect municipal and private infrastructure. The Municipality currently does not have adequate historical data on service levels to provide a meaningful assessment for the Stormwater Management Assets. The management plan will consist of best practice utilization including street sweeping, hydro-vacing catch basins, and annual ditch maintenance until reliable data can be captured. Further, there is no evidence that a change in maintenance plans increases the useful life of the asset but rather the maintenance levels affect the failure rate of the asset.

Stormwater management assets do not provide a direct service but rather a service to other assets, it makes the most sense to renew, rehabilitate and replace in tandem with the road and linear water/wastewater assets the stormwater assets are protecting.

Water and Wastewater Buildings

The Municipality's water and wastewater buildings require strict adherence to provincial regulations and standards which does not allow for deviation from the environmental compliance approval (or certificate of approval) which the specific facility is operating under.

Furthermore, Northern Waterworks Inc., a subsidiary of PUC Services Inc., is the operating authority that develops the preventative maintenance strategy and maintains all Municipality of Red Lake water and wastewater structures.

Bridges and Culverts

Bridges and structural culverts due their nature provide little opportunity of preventative maintenance. Bi-annual engineering reports provide recommendations, and those deficiencies are corrected when identified.

Capital Priorities

By using an integrated approach to new capital projects, the Municipality can realize further savings:

Pipe Lining is Viable		
	Inflated Costs	Net Present Value
Individually	1,677,519.58	819,830.05
Integrated	1,561,218.82	744,799.15
Savings	116,300.76	75,030.90

Pipe Lining is Not Viable		
	Inflated Costs	Net Present Value
Individually	1,872,941.50	849,115.89
Integrated	1,675,840.70	759,631.70
Savings	197,100.80	89,484.19

Appendix K provides a list of integrated capital projects where the overall risk to the Municipality is equal to or greater than 3.0. Note that the list does not include priority rankings as the ability of the Municipality to complete the projects is funding dependent. When applying for funding opportunities, the Municipality will assess which project best meets the funding requirements.

Appendix K provides a list of paving priorities for the Municipality (excluding roads included in the capital projects). Note that the list does not include priority rankings as the list is based on information available as of the writing of the plan and is subject to change. This list will be updated on an annual basis once changes to the road condition due to climatic conditions (ex. winter weather) or other factors can be assessed.

Lifecycle Costs

The lifecycle costs include operating and capital costs over the next 10 years.

Operating Costs

Operating costs consist of regular maintenance activities but exclude emergency repair activities and include:

- Water and Wastewater
 - Heat trace costs based on an average cost per year of the last five years
 - Sewer jetting/flushing costs based on an average cost per year of the last five years
 - Building and component maintenance costs as performed by Northern Waterworks
- Stormwater Management
 - No allocation made as maintenance performed on assets is generally emergency in nature
- Bridges
 - Maintenance as outlined in the bridge inspection report and an allocation based on an average cost per year over the last five years
- Roads
 - Potholing costs based on the anticipated PCI of road surfaces
 - Crack sealing based on the age of the road
 - Grading costs based on an average of the last five years

The average annual requirement for operating costs is about \$282,000 and break down is provided in Appendix I.

Capital Costs

Capital costs consist of renewal, rehabilitation, or replacement costs in order for existing core assets to meet service levels.

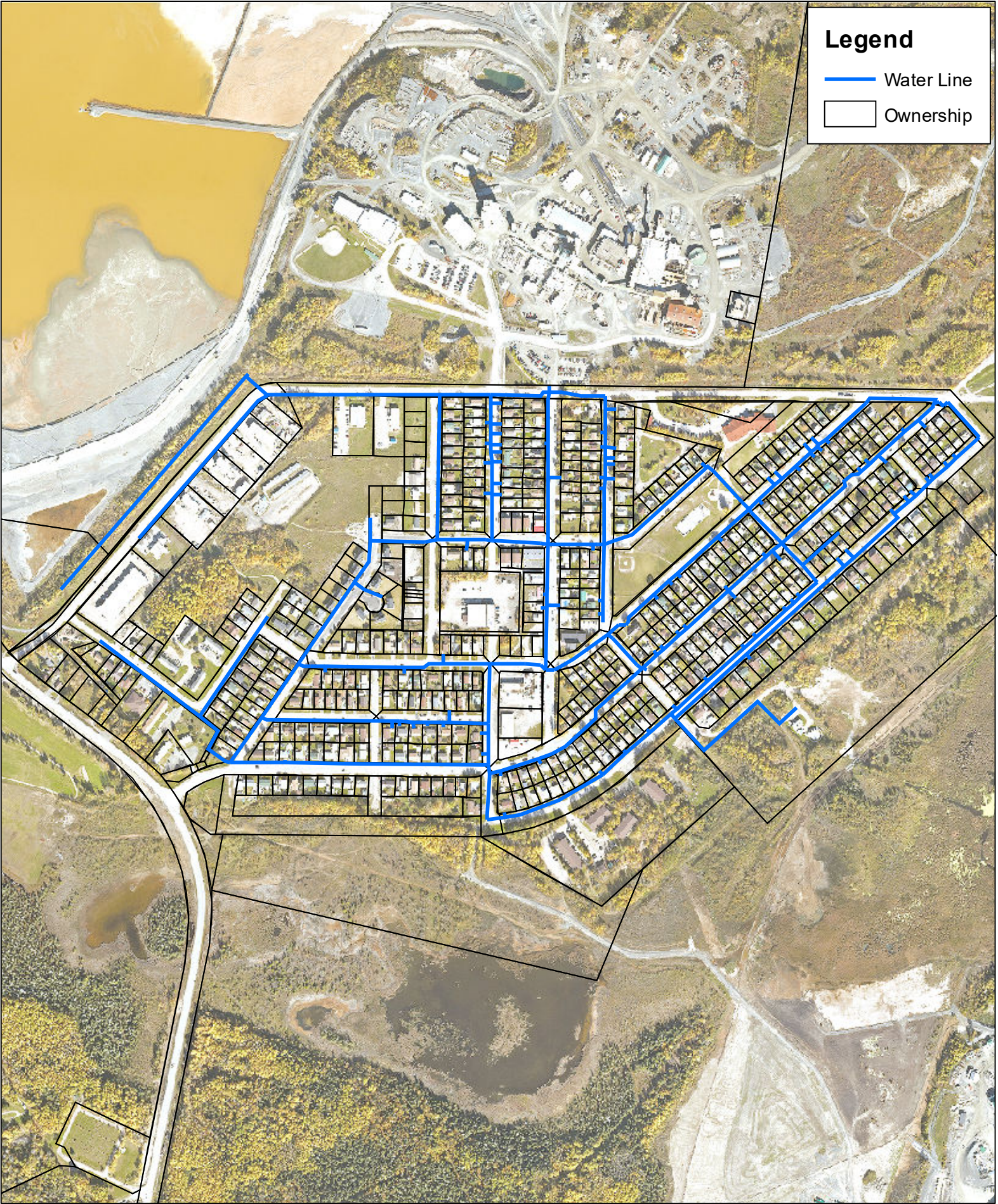
A full break down of the capital costs per year is provided in Appendix I which illustrates the following:

- To address the existing backlog, over \$23 million would be required in year 1
- Average annual capital requirement for existing infrastructure is approximately \$8 million or \$80 million over the 10-year period
- Existing funding (NORDS, OCIF and Gas Tax) and specific reserves provide approximately \$12 million in funding, resulting in an infrastructure deficit of almost \$68 million

Development Costs

Development costs consist of expansion activities to allow for growth within the Municipality. Over the next 5 to 10 years, it is expected to see significant growth due to the Road South and start-up of a new gold mine 25 kms south of the Municipality.

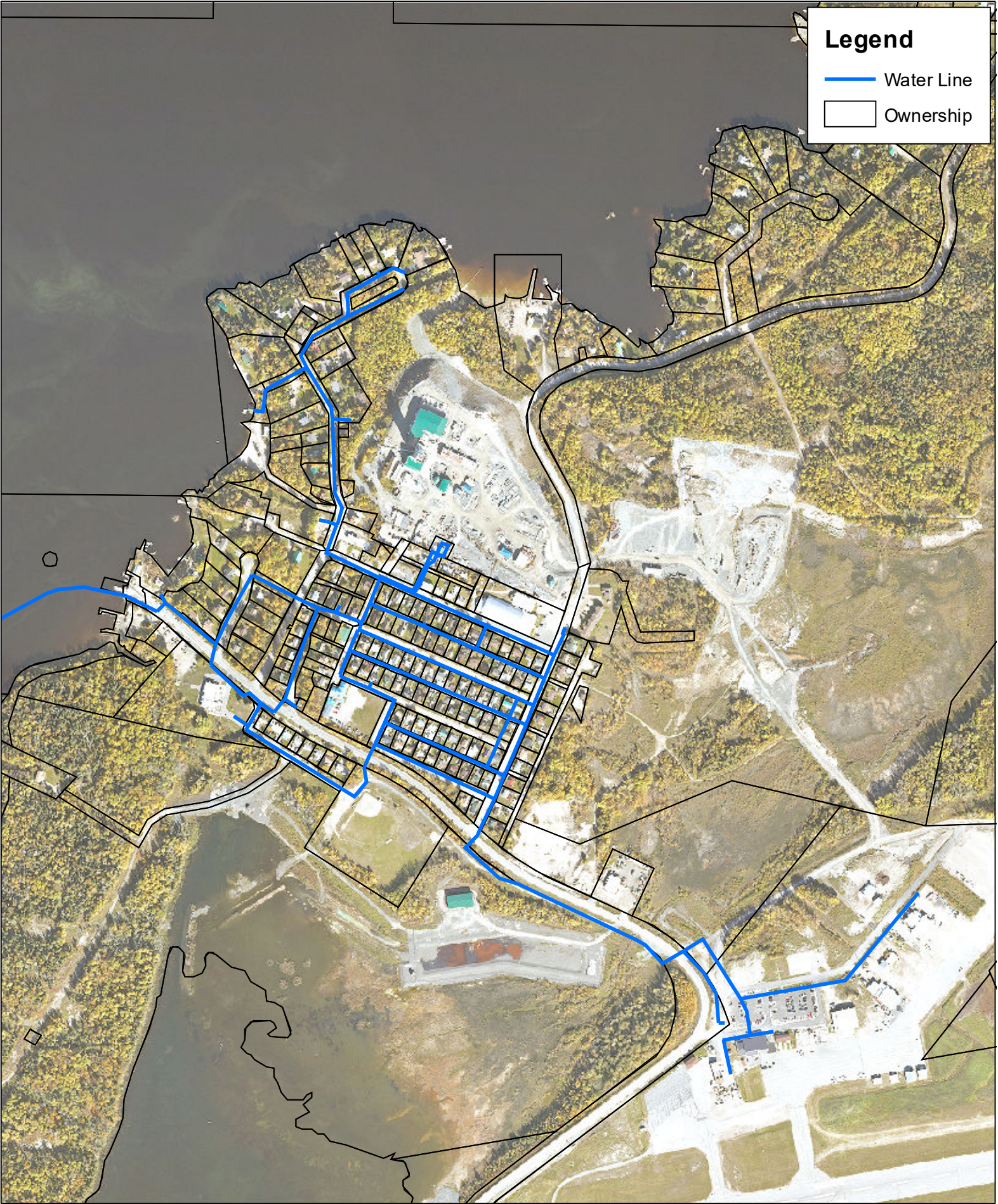
The Municipality is in the early stages of procuring crown land to provide areas for residential and commercial development. It is estimated that this beginning phase of development will cost approximately \$11.2 million (including road and water/wastewater infrastructure) however, no engineering or other studies have been done. The actual costs will become more refined as the project progresses. It is intended that this development will be funded through Municipal property sales with the possibility of Provincial or Federal funding. It is not anticipated that this development will significantly impact the lifecycle costs of existing assets.



Legend

- Water Line
- Ownership

0 0.2 0.4 0.8 Kilometers

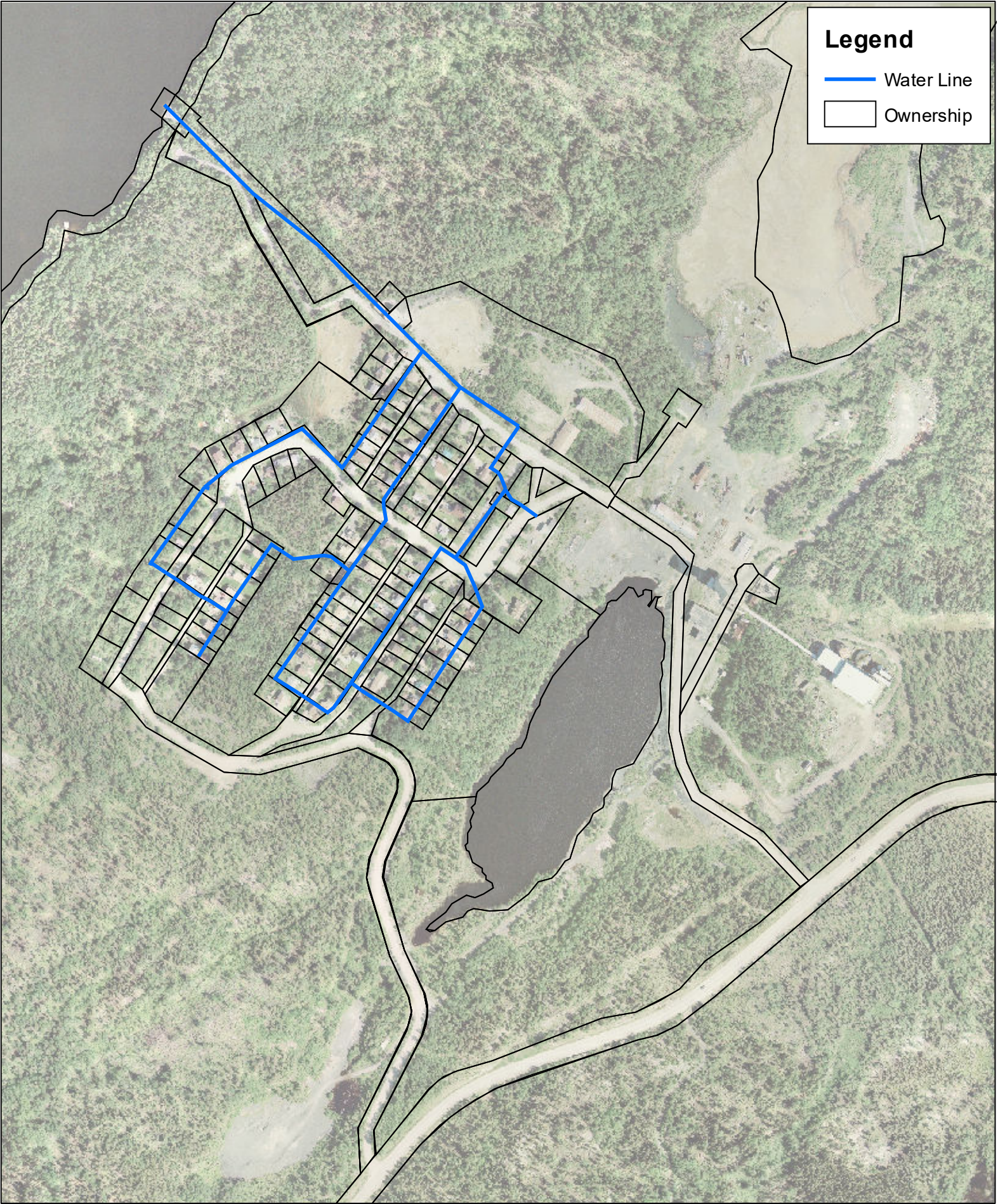


Legend

Water Line

Ownership

0 0.2 0.4 0.8 Kilometers

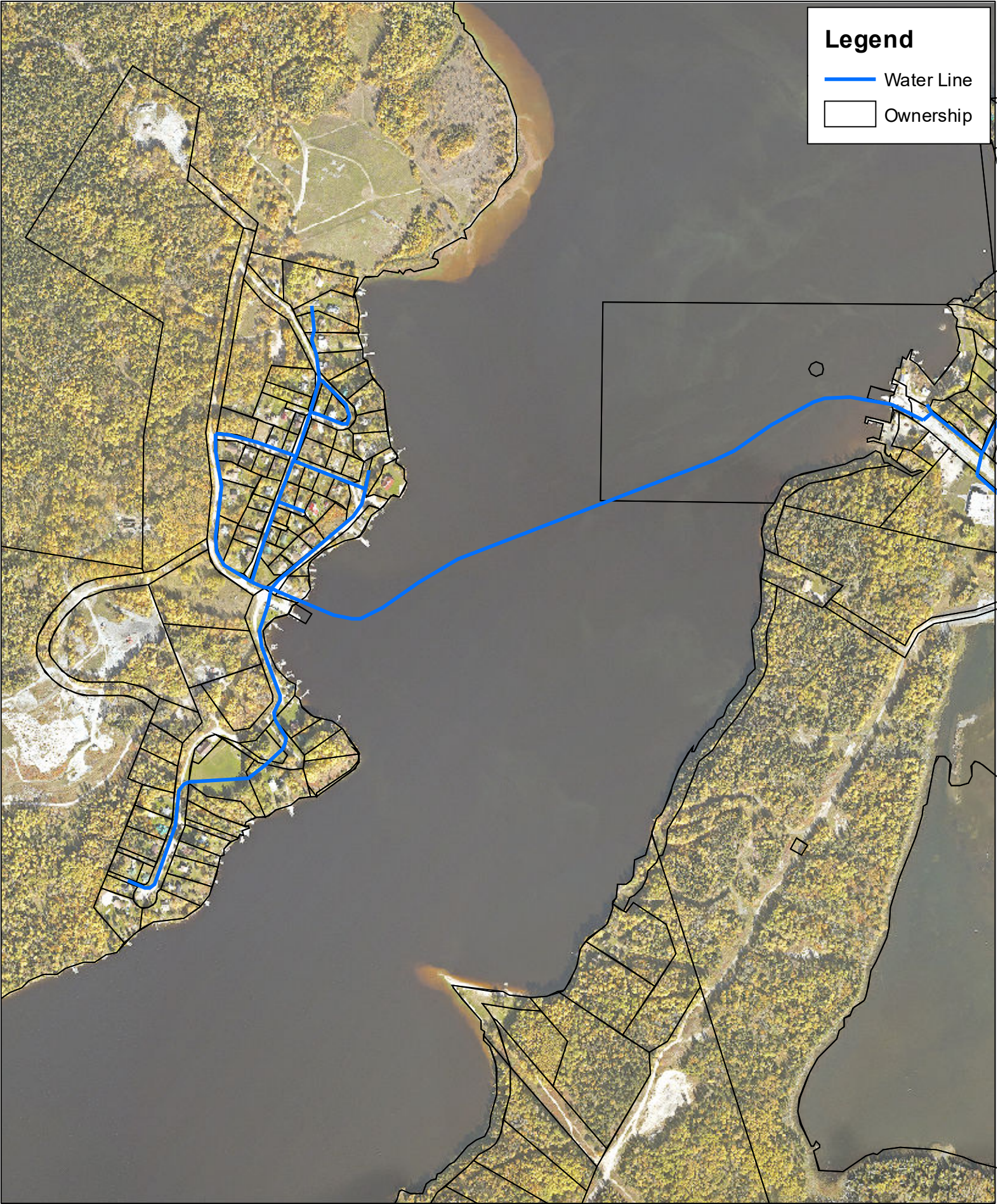


Legend

— Water Line

□ Ownership

0 0.15 0.3 0.6 Kilometers

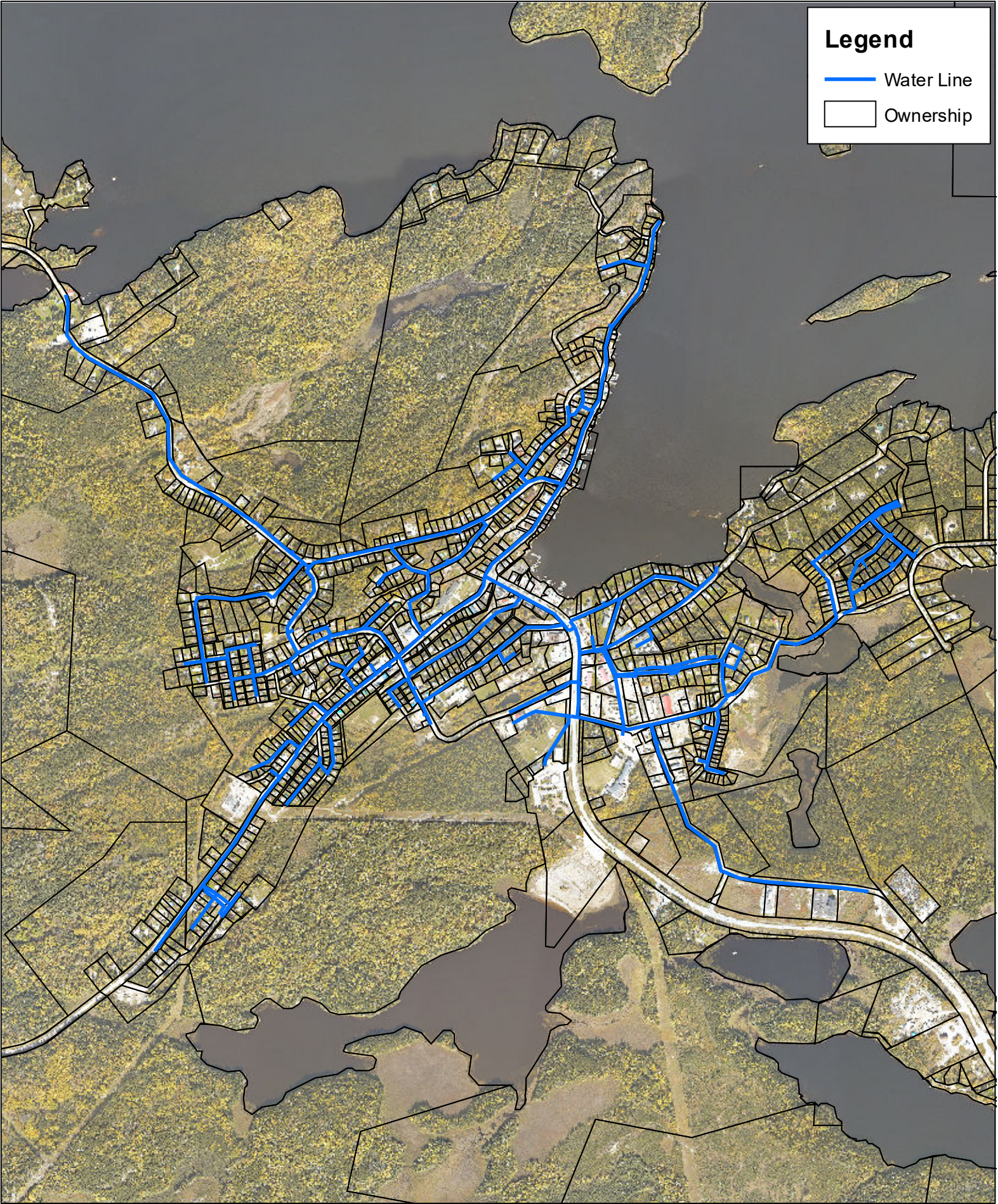


Legend

Water Line

Ownership

0 0.2 0.4 0.8 Kilometers



Legend

— Water Line

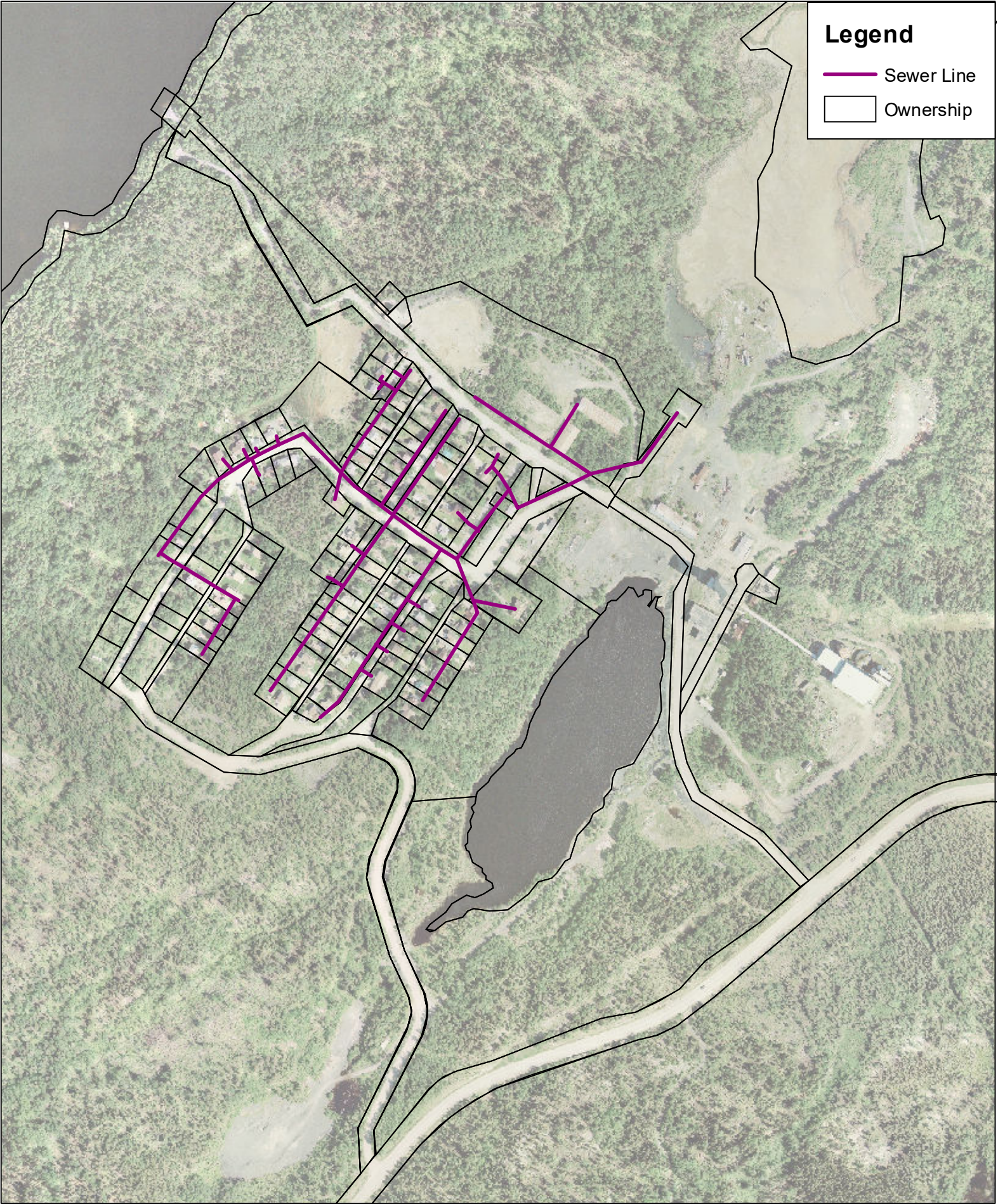
□ Ownership

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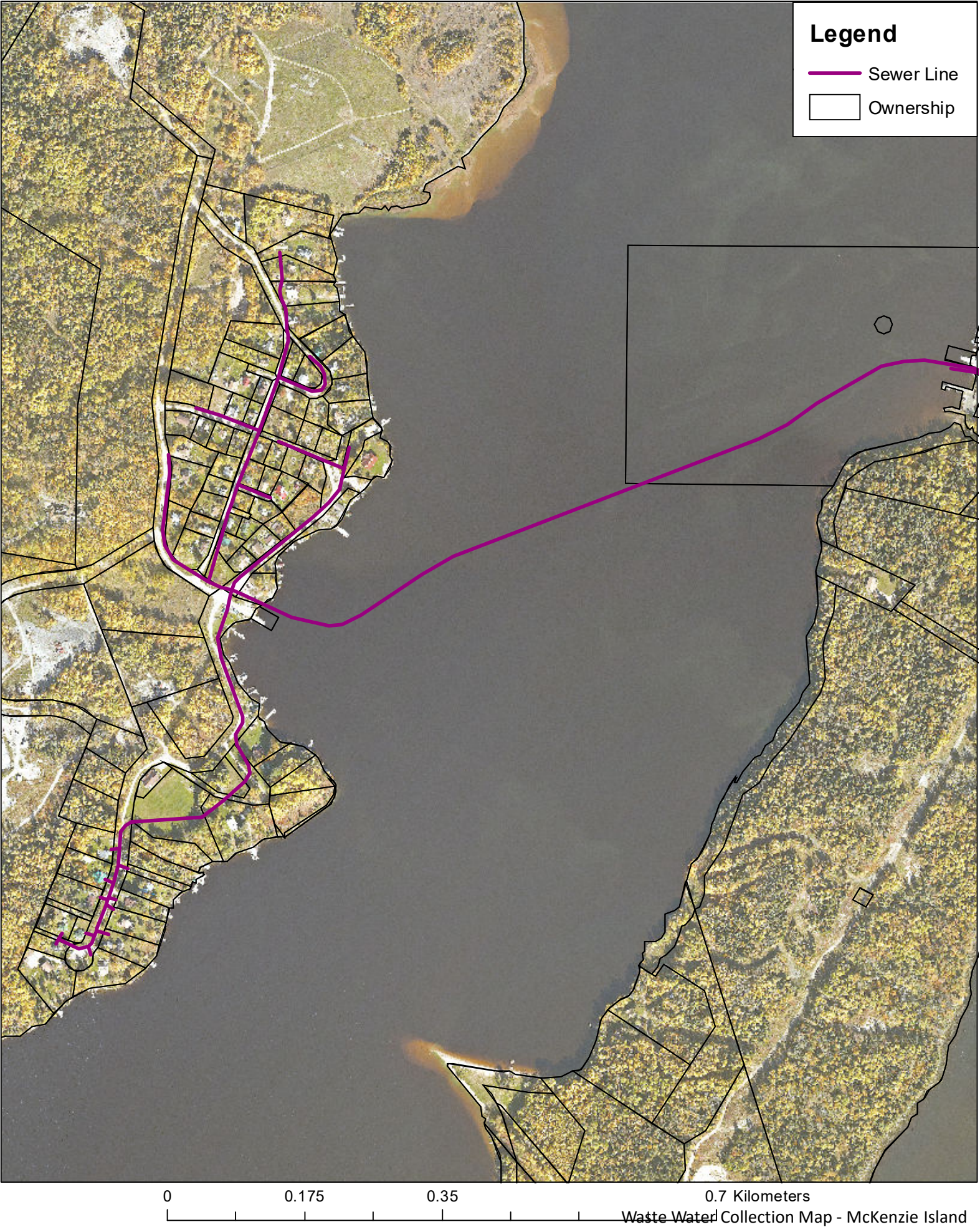
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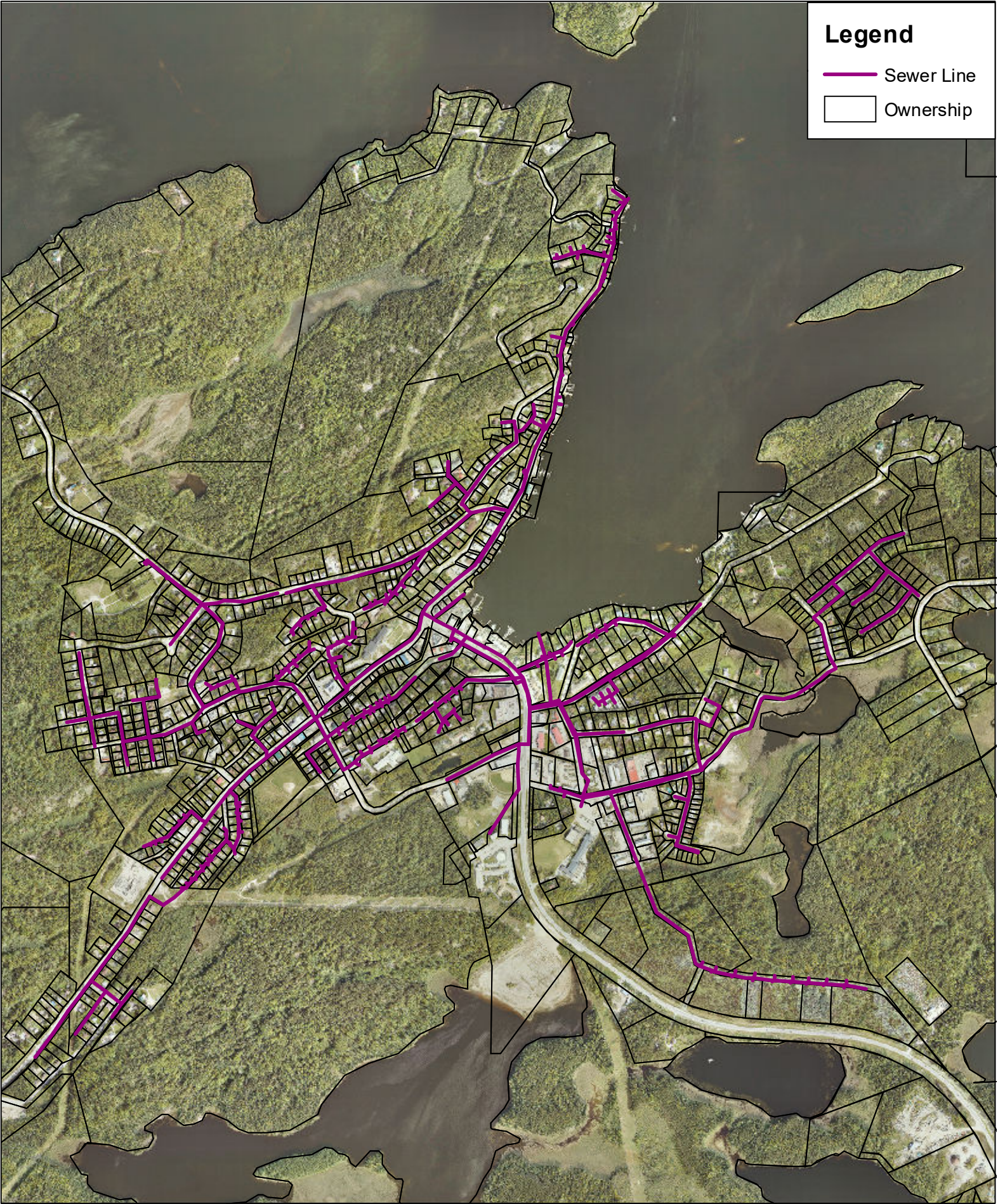
1

2 Kilometers





0 0.15 0.3 0.6 Kilometers

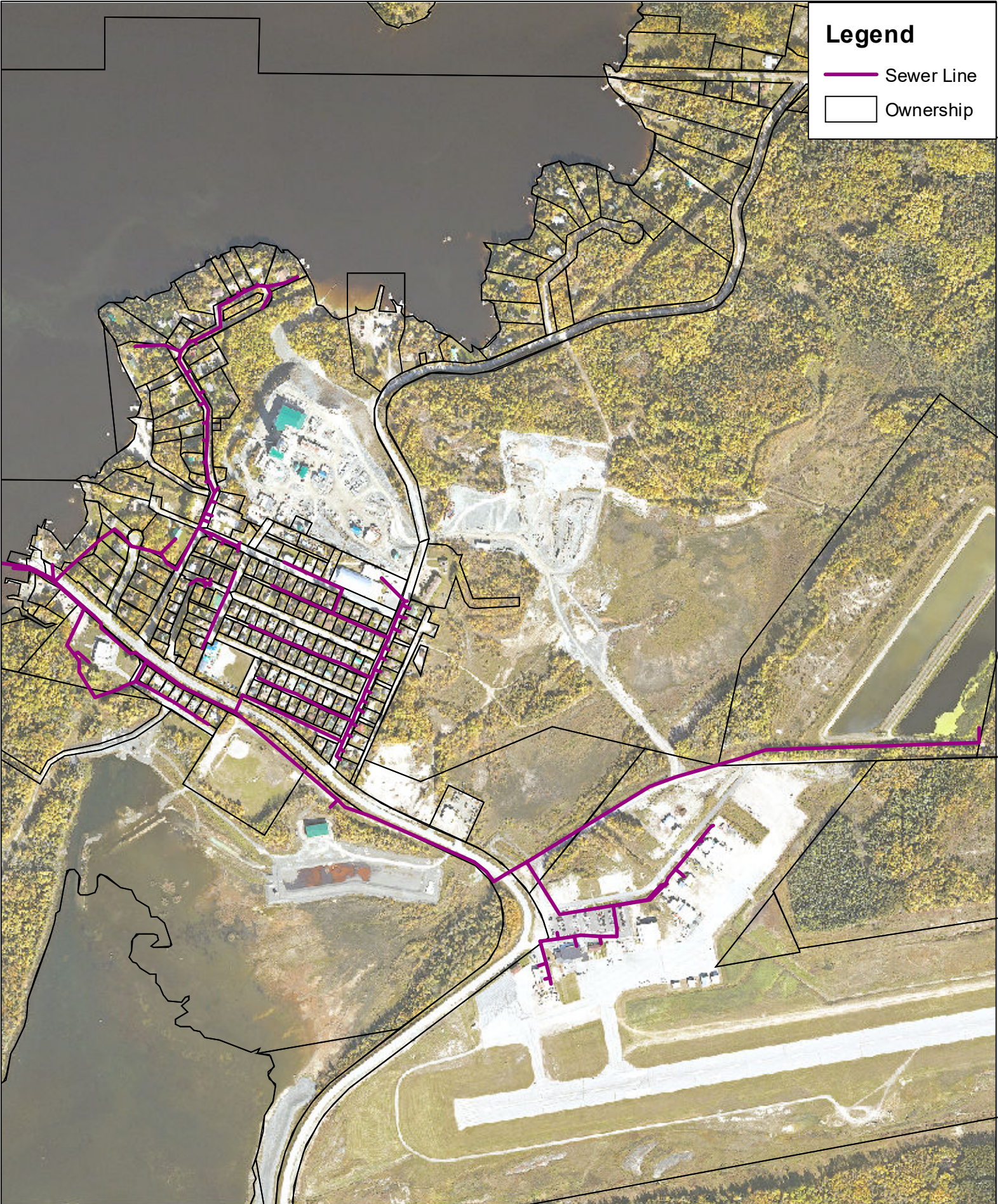




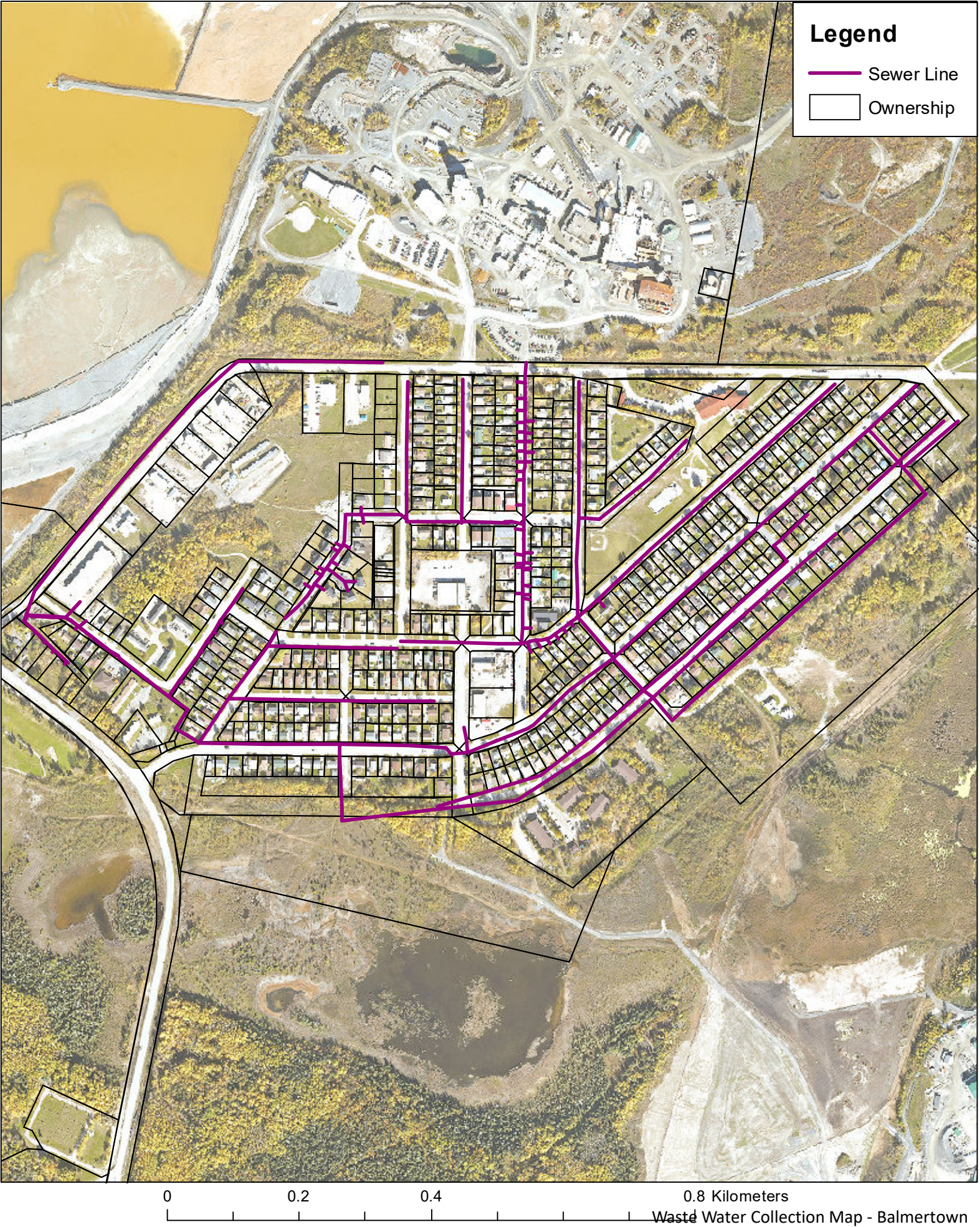
Legend

-  Sewer Line
-  Ownership

0 0.425 0.85 1.7 Kilometers

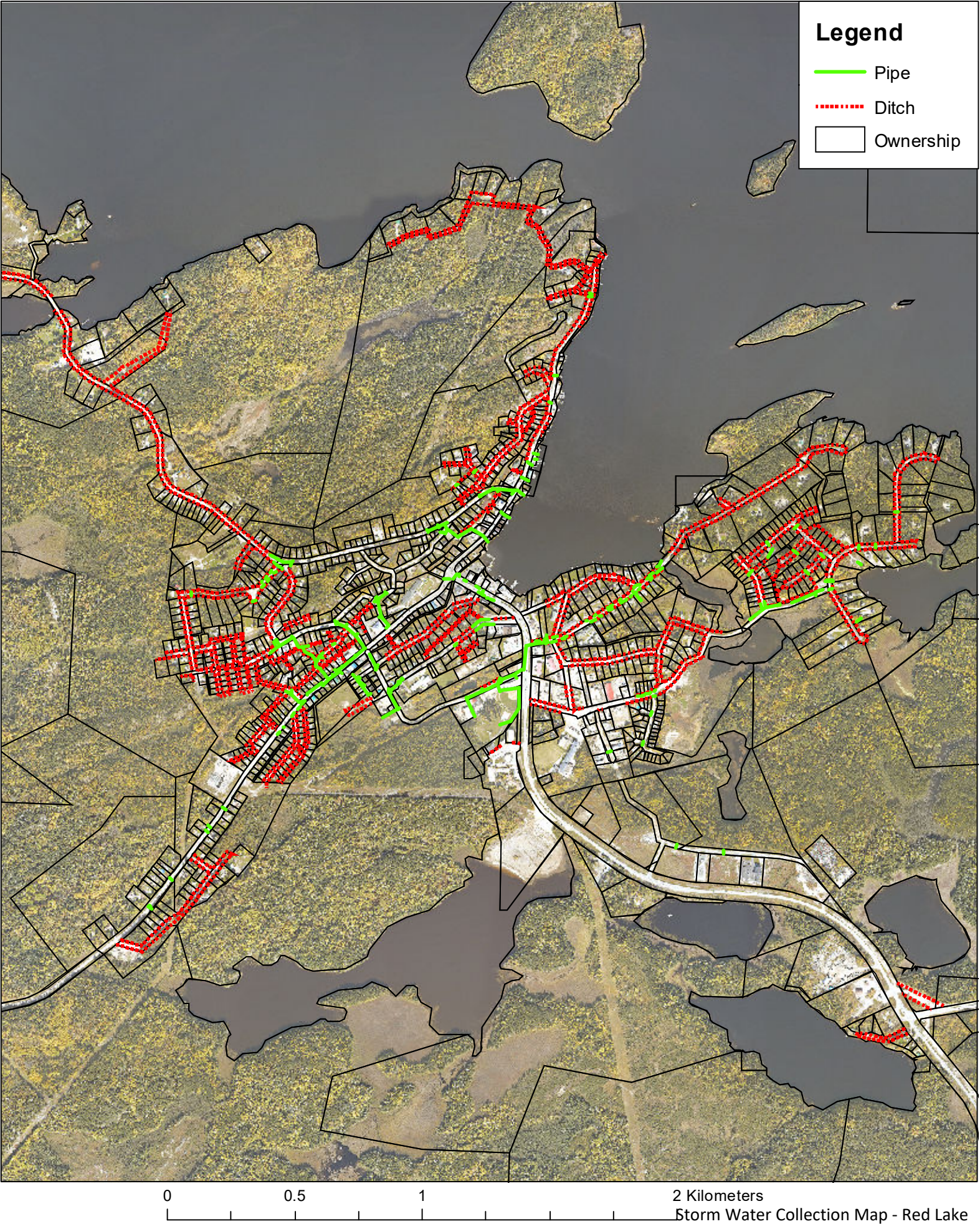


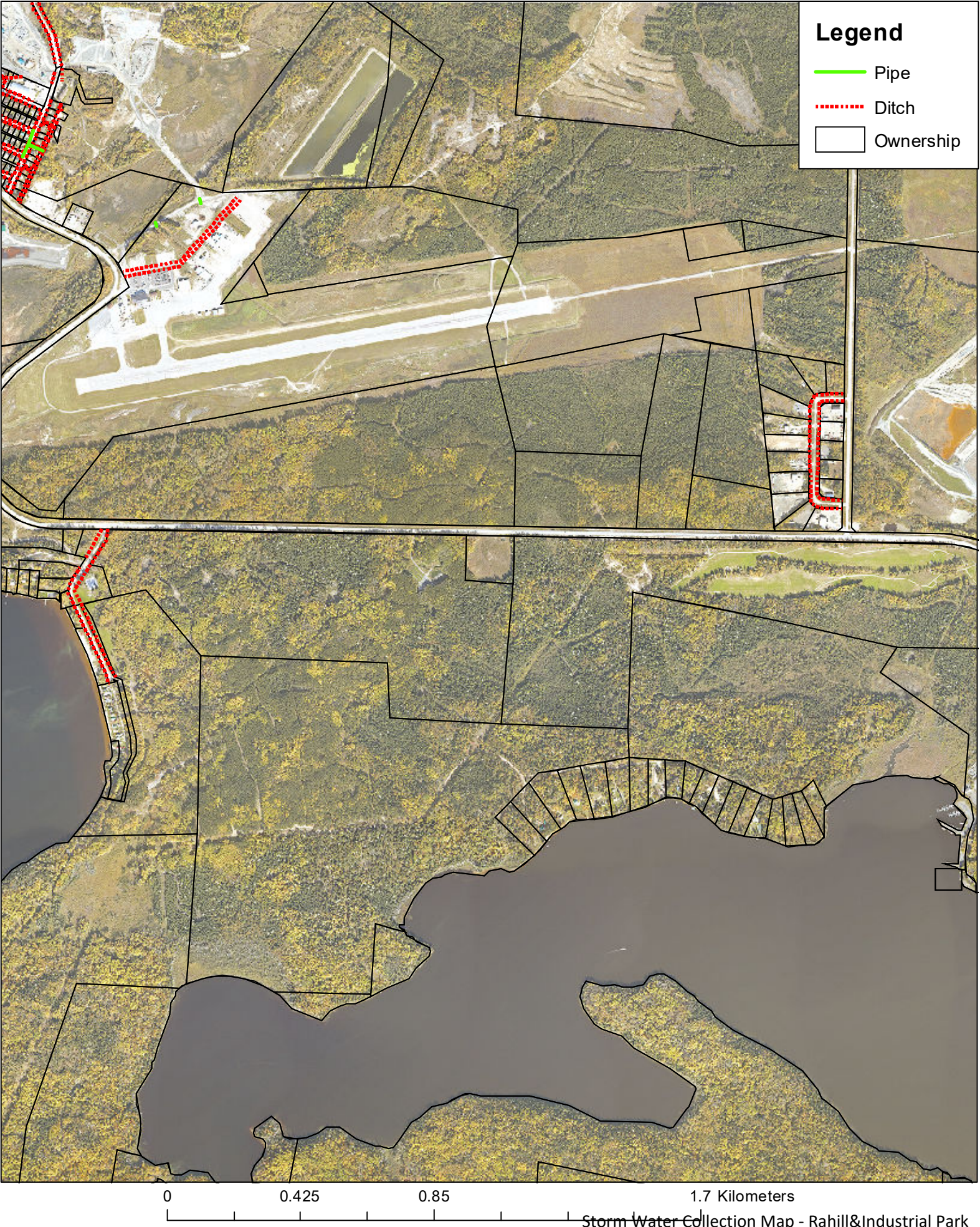
0 0.25 0.5 1 Kilometers



Rating Scale		System								
Grade	Condition	Structural/Building	Mechanical	Electrical	Process Equipment	Site Civil	Instrumentation	Environmental	Performance	Operability
1	Very Good	Building structure is physically sound. Well maintained and secure weatherproof structure.	Equipment is physically sound and performing as designed/intended.	No abnormalities and resembles brand new.	Equipment is brand new or well-maintained with no defects.	Access to the site is ideal. Security features (lighting, fencing, cameras, etc.) are as expected for such a facility. Suitable space for parking and asset maintenance. No observable drainage issues.	Instrumentation is fully functional and well maintained. No defects.	No obvious risk to flooding. No observable odours or noise issues at the site. Adjacent and downstream environment does not appear to be sensitive in the event of overflows or asset failure.	Little or no maintenance required, asset never experiences downtime. Very infrequent alarms, and system is operating below its rated capacity.	Asset is easily accessible with a service truck, and does not require any special equipment to access. Asset is generally laid out well, with no confined spaces. Operators describe it as one of their ideal sites.
2	Good	Structure is performing as intended. Some maintenance needed to prevent initial stages of decay or dereliction.	Minor signs of equipment deterioration such as minor vibrations, looseness, misalignment, slight leaks. Protective coating and enclosure still functioning.	Minor signs of deterioration. Requires infrequent/minor repairs, but does not affect performance or its ability to properly function.	Equipment may not be the current generation/model manufactured, but is in good shape and all replacement components are available from the supplier.	Access to the site is not a significant issue. Security features are present and operable, but show some signs of wear. Minor drainage issues that do not impact accessibility or operation.	No deterioration on fittings or displays that impacts safety, strength or appearance. Minor wear and tear but no impacts on operation. All replacement components are still available.	-	-	-
3	Fair	Showing deterioration, with some components physically deficient. Structure appearance affected by minor cracking, staining, peeling, paintwork or minor leakage.	Obvious signs of deterioration. Minor failures with increasing corrosion of metal components, bearings and or gland	Showing signs of deterioration, which is beginning to effect the safety, efficiency and operation of the system.	Showing signs of deterioration. Equipment may not be compatible with the current standard (obsolete design, no longer manufactured) but spare parts are available.	Access to the site has some limitations, with space for only 1 service vehicle. Most security features are present, but some are either missing or inoperable. There are signs of some drainage issues.	Instruments show signs of deterioration. May not be compatible with current standards (obsolete design or no longer manufactured), but spare parts are available.	Visual signs or operator input imply a low-moderate risk of flooding. Some odours and noises, but generally limited to the immediate surroundings. Immediately adjacent environment does not appear sensitive, but such an environment exists downstream.	Routine maintenance required, but with infrequent downtime. Asset gives off routine alarms or requires routing operator visits. System is operating at our around its rated capacity.	Asset is accessible, but not ideal. Traffic control required to work on some parts of the site. Site layout is fair, but there are some areas that are difficult to access or service.
4	Poor	Major portion of the structure is physically deficient. Structure is still operating as intended, but showing signs of stability loss or deformation. Potential problems include leakage, rotting woodwork and decayed brickwork.	Significant leaks, vibration, looseness, misalignment or out of balance. Parts and components function but require significant maintenance to remain operational.	The performance and serviceability is becoming a maintenance issue. System is functioning, but significant maintenance is required.	Asset functions, but with frequent problems and significant defects. Difficult/impossible to maintain spare parts, or costs/lead times are excessive.	Access to the site is fairly limited. Little no dedicated parking, and obvious drainage issues. Most of the security features are either not present or not functional.	Instruments function, but have frequent problems due to significant defects. Requires constant and frequent maintenance. Difficult to obtain spare parts.	-	-	-
5	Critical	Physically unsound. Serious structural problems having a detrimental effect on the performance of the building.	Unreliable with frequent breakdowns and adverse impacts on performance. Equipment now incurring excessive maintenance.	High risk of breakdowns with a serious impact on system safety, efficiency and operation. The remaining life is exceeded and excessive maintenance is required.	Asset has surpassed its useful life. If a serious failure occurs, a complete replacement is required.	Access to the site is a nightmare, with no parking (or parking impacts adjacent traffic). No security features (fencing, cameras, lighting, etc.) present, and standing water/drainage issues are evident.	Asset is past the end of its useful life, and no replacement or spare parts are available. Significant signs of wear and tear. Measurements cannot be trusted due to inaccuracies.	Asset appears to be in a floodplain, or has recent issues of flooding. Foul odours/loud noises are evident as you approach the site, and the adjacent environment is sensitive.	Asset requires frequent and major maintenance. Significant downtime due to failing equipment. Asset operates above its rated capacity or does not meet design requirements.	Asset is very difficult to access, and traffic control is always required. Several confined spaces, and site layout is very poor.

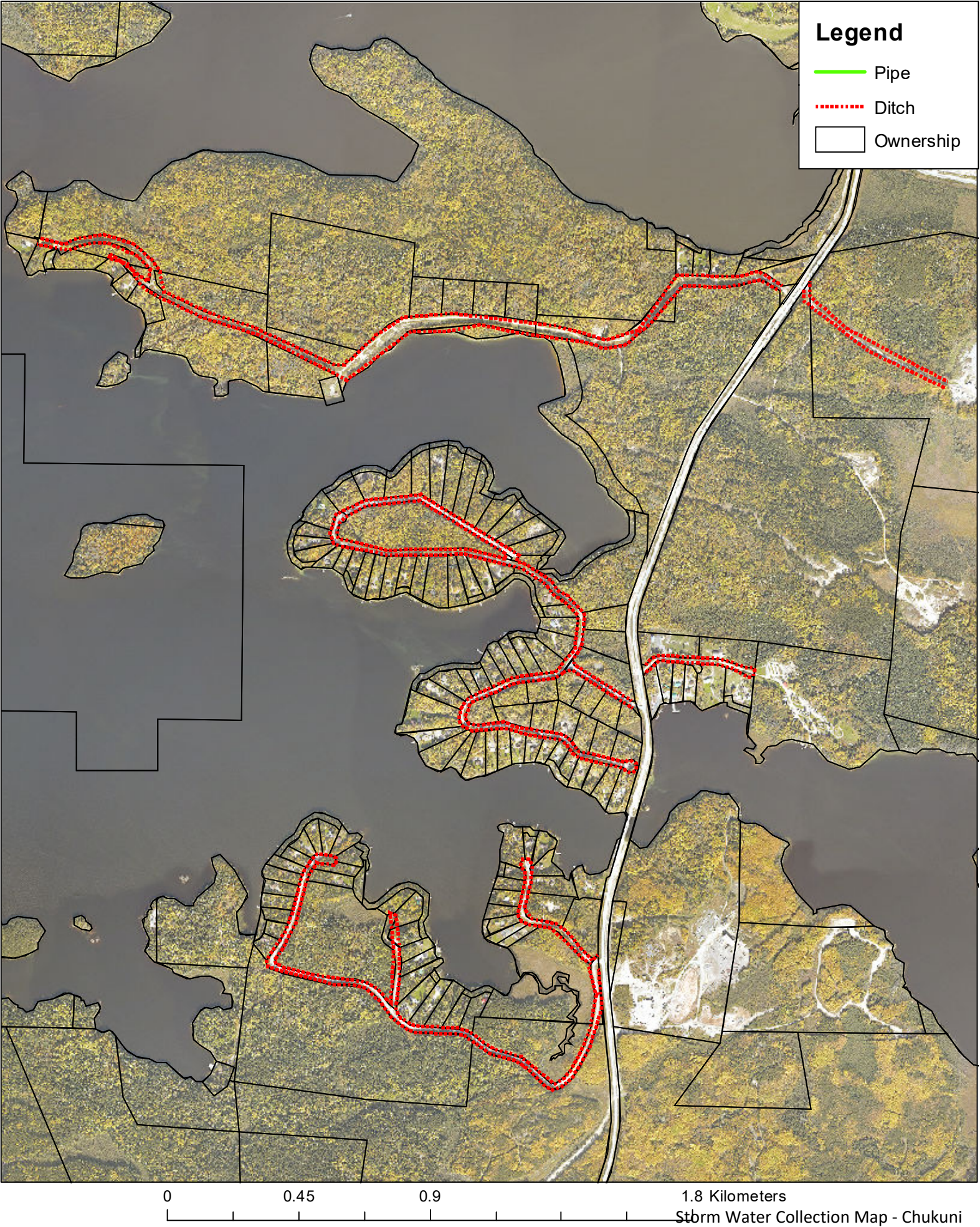


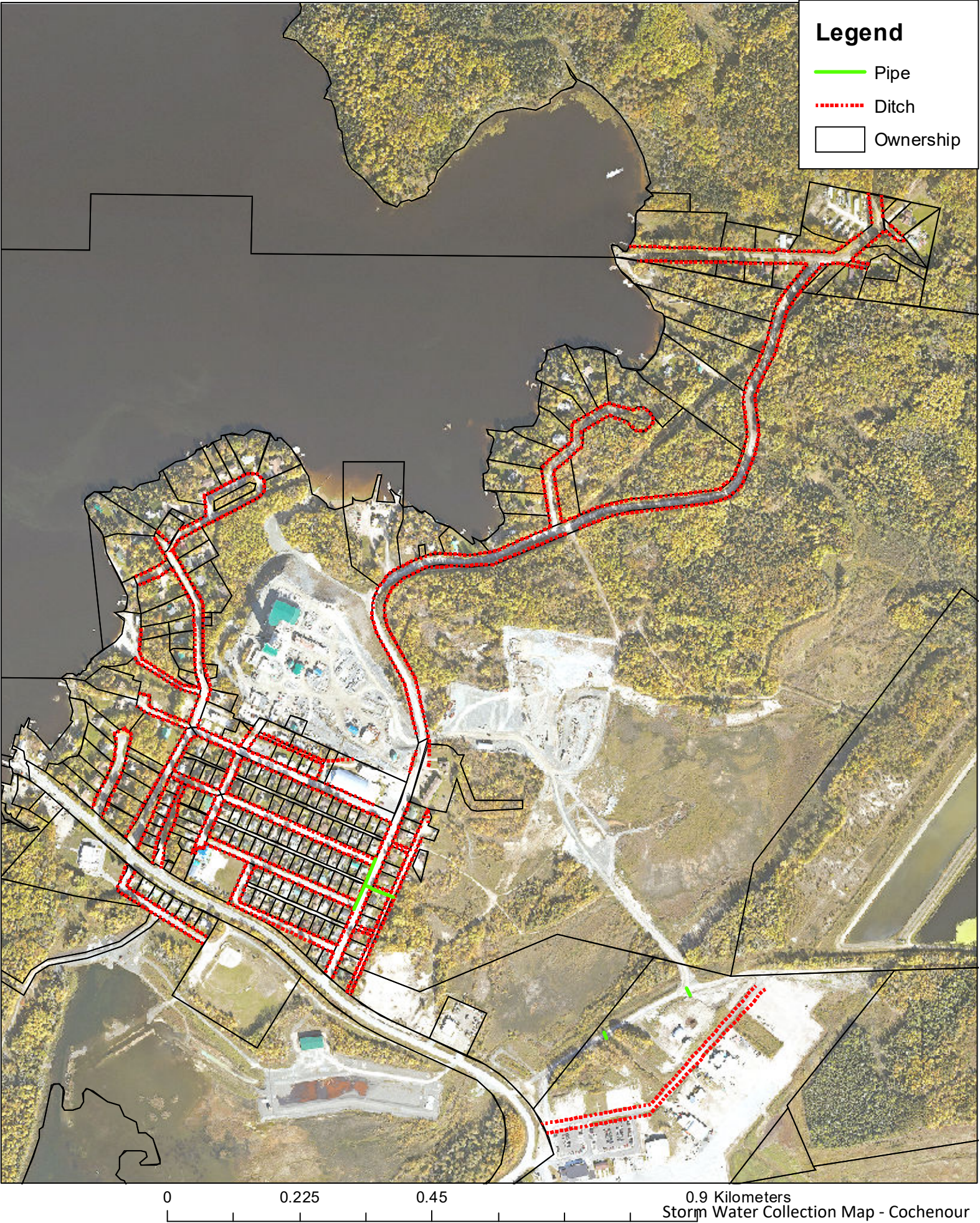


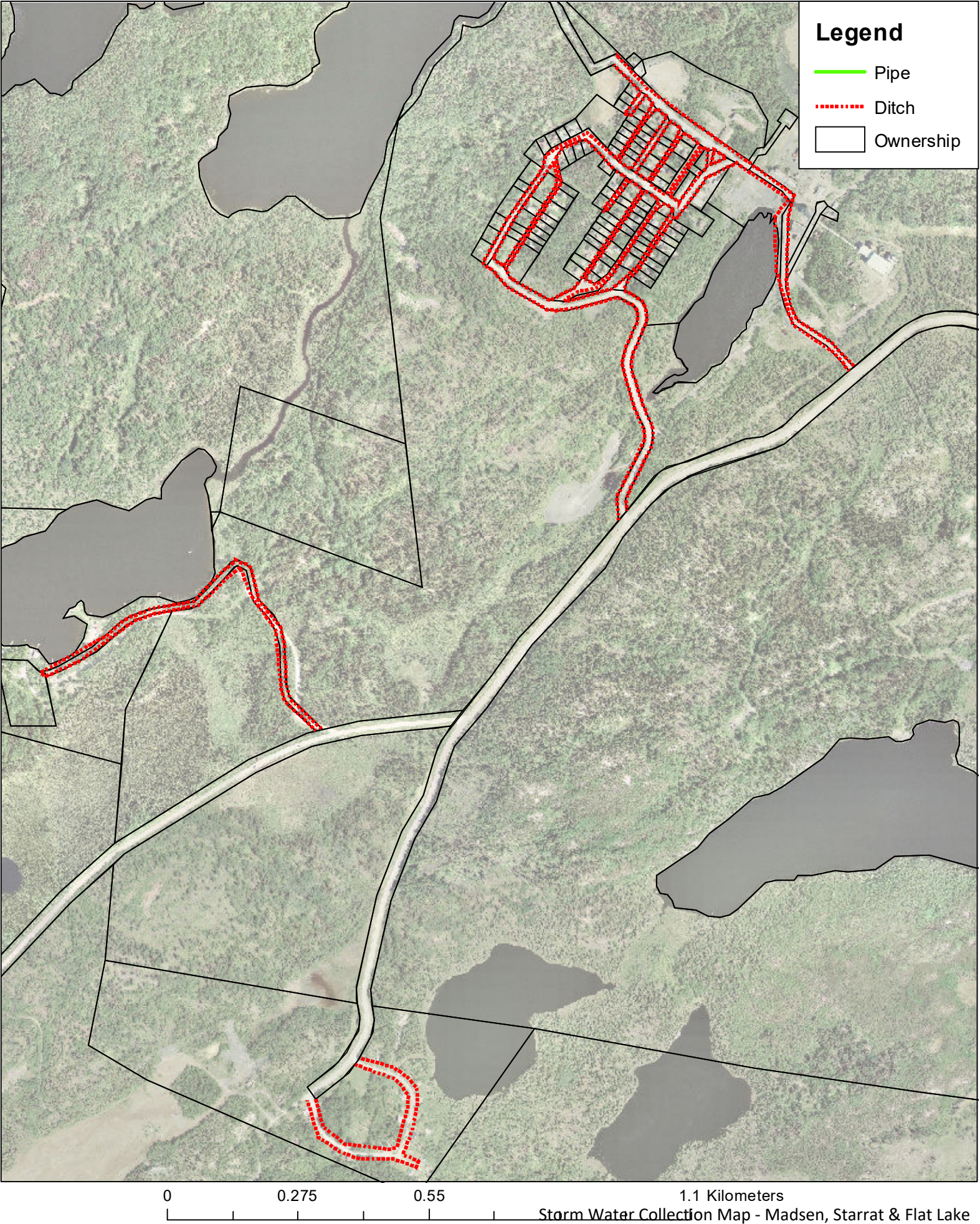




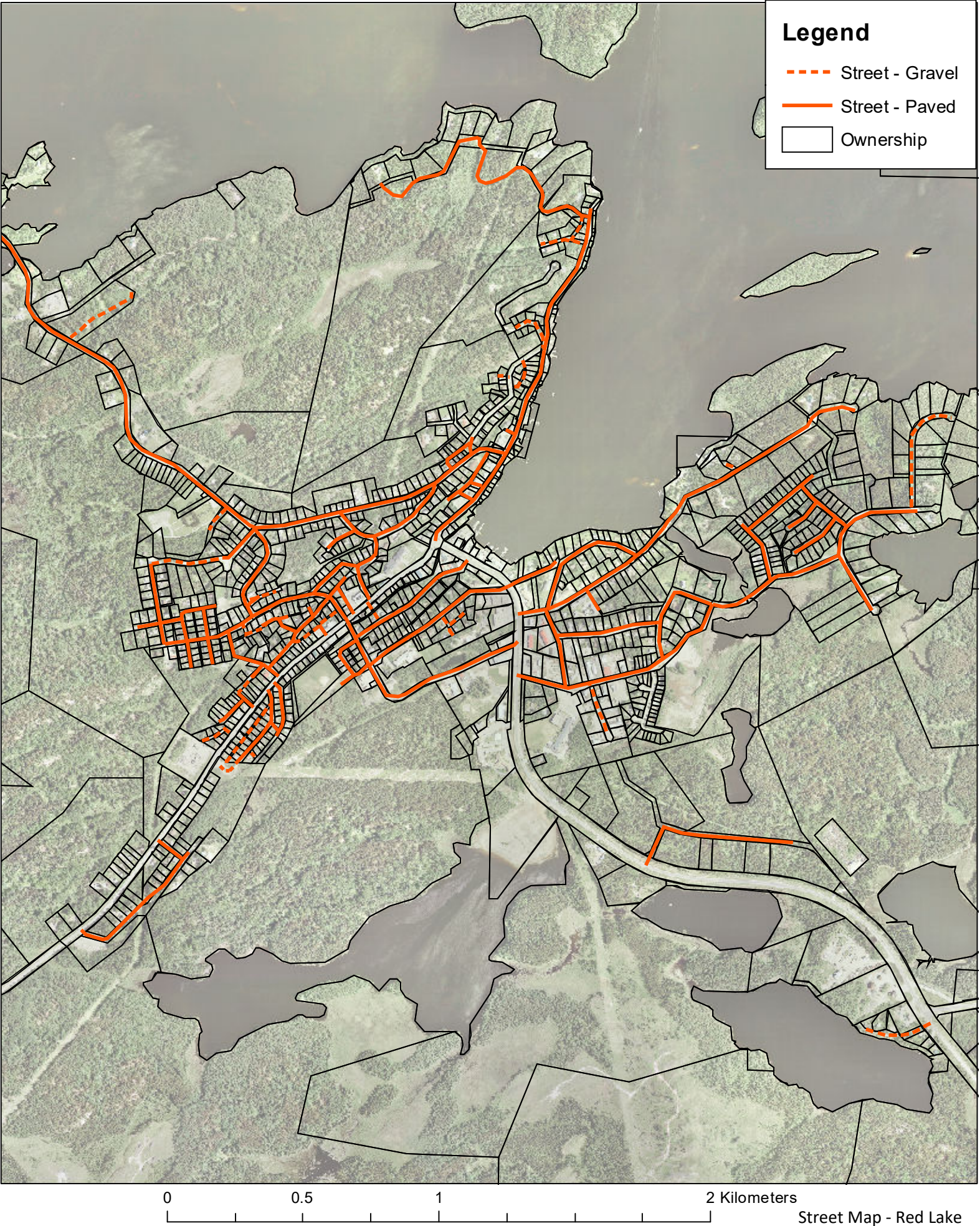




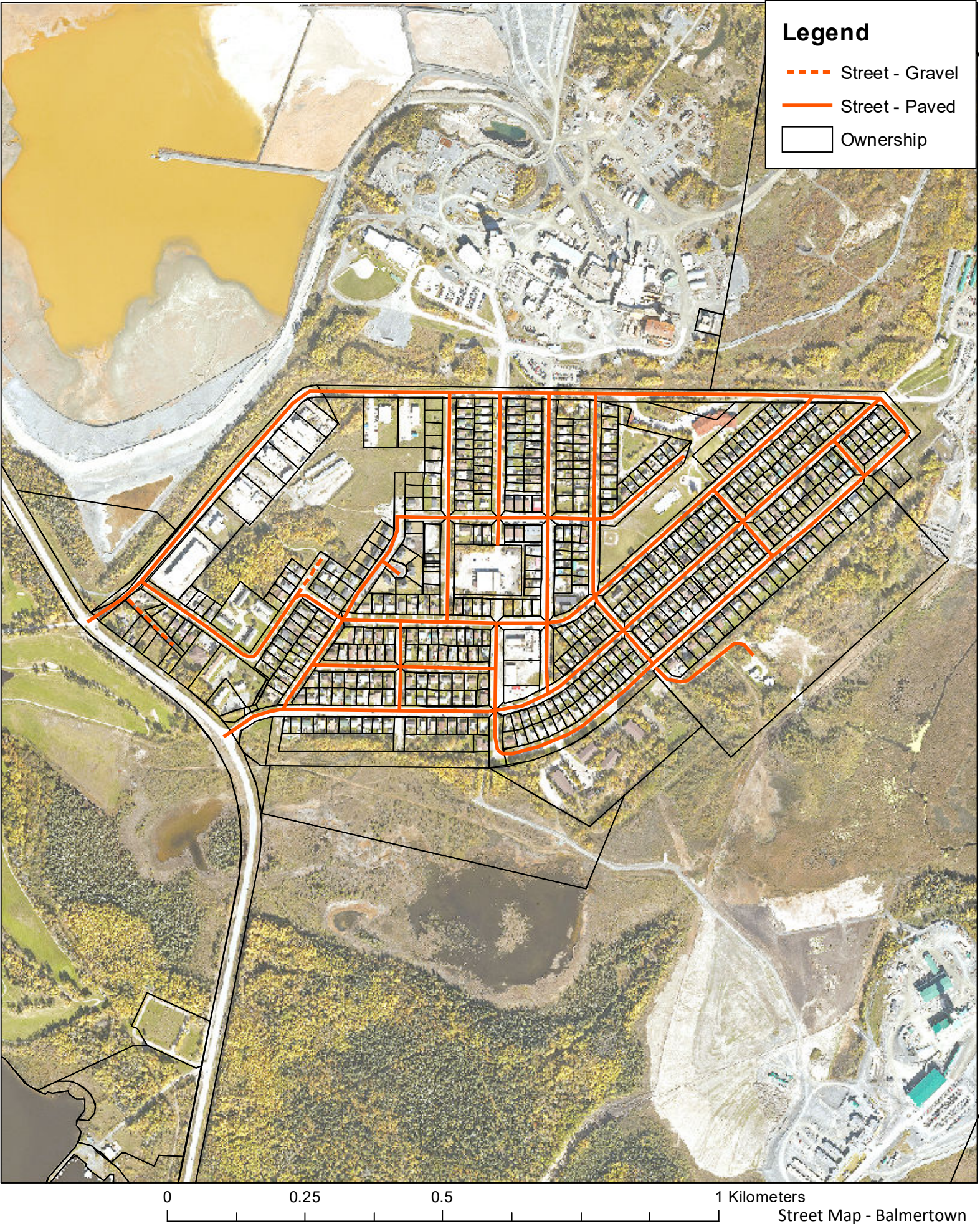


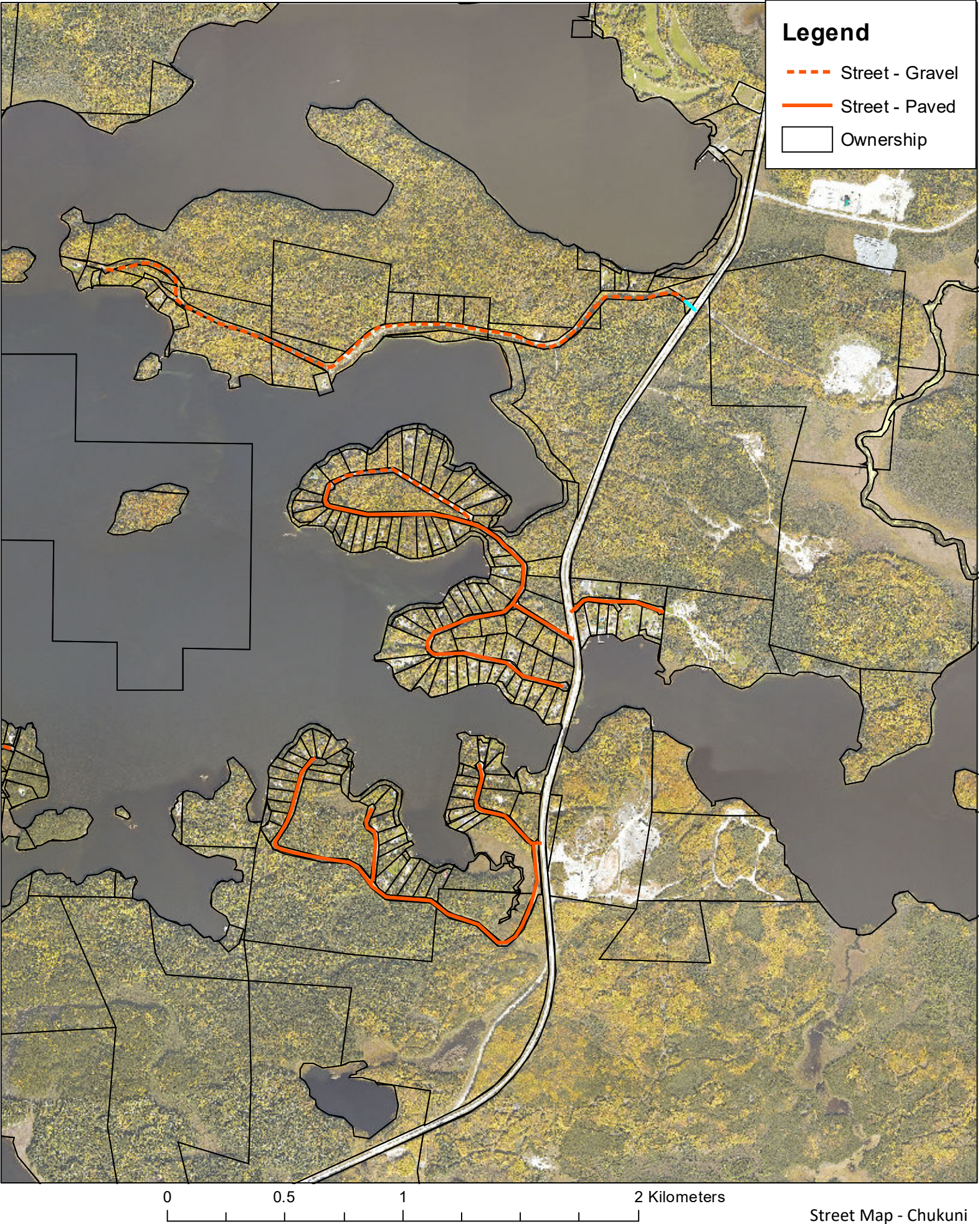


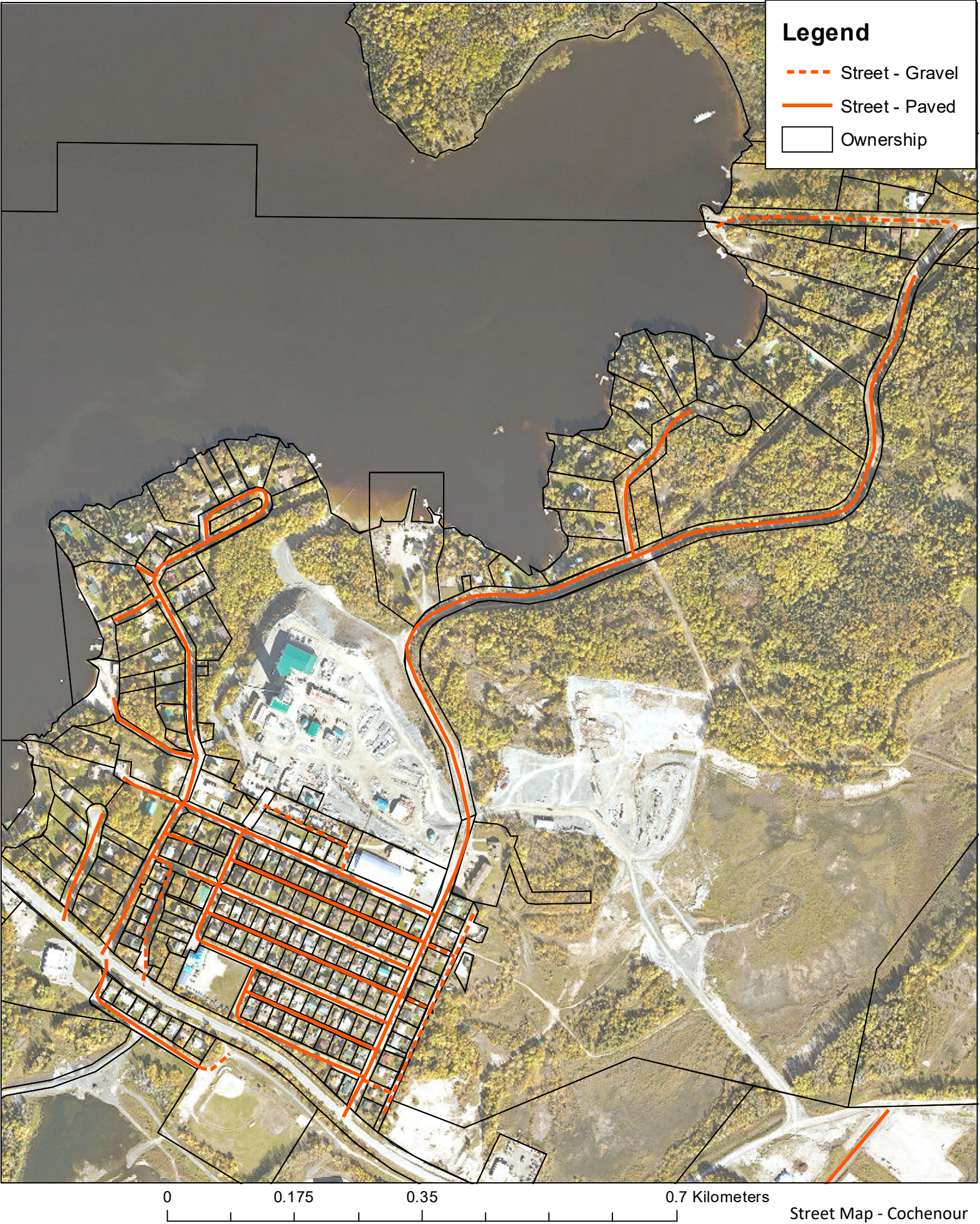


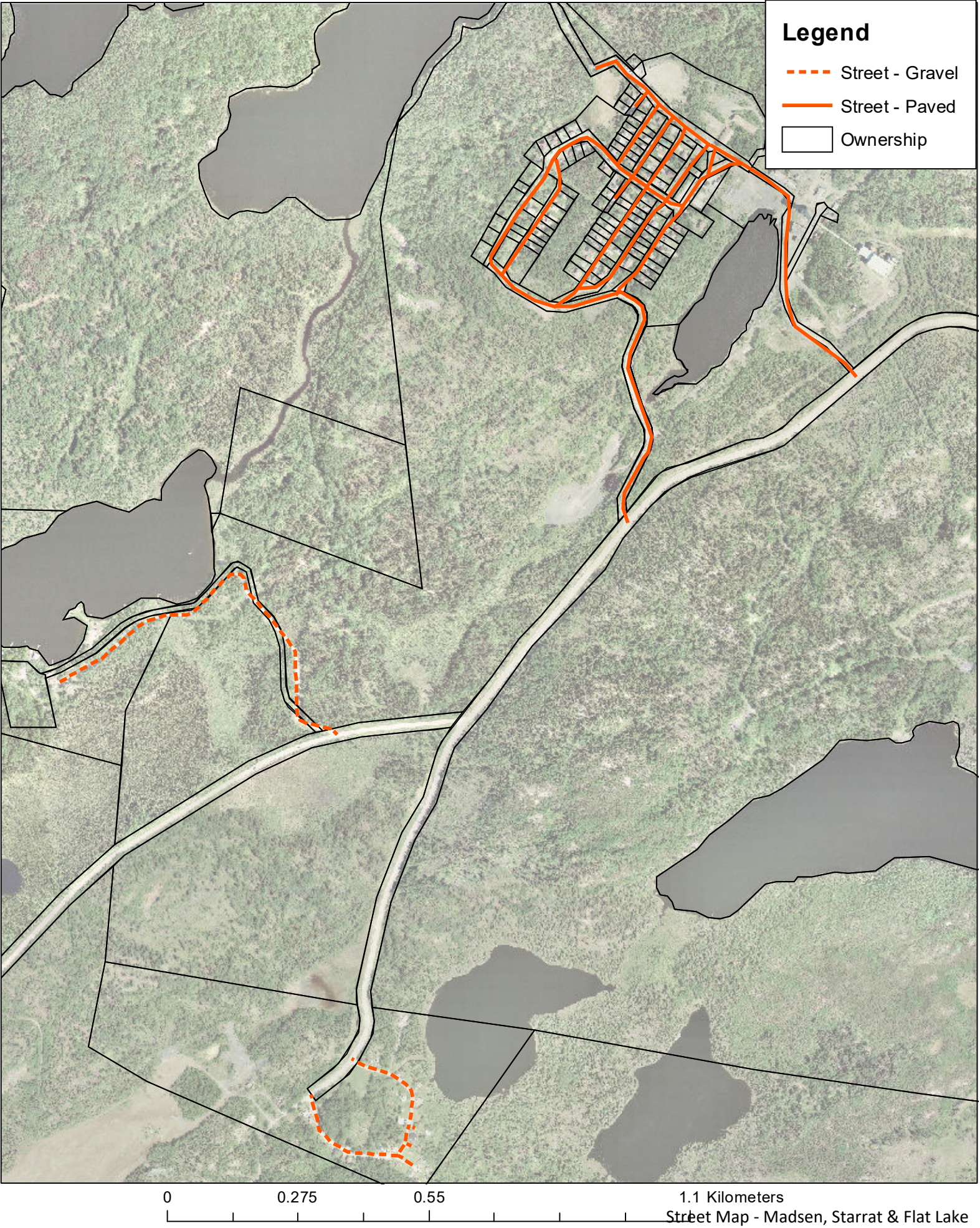






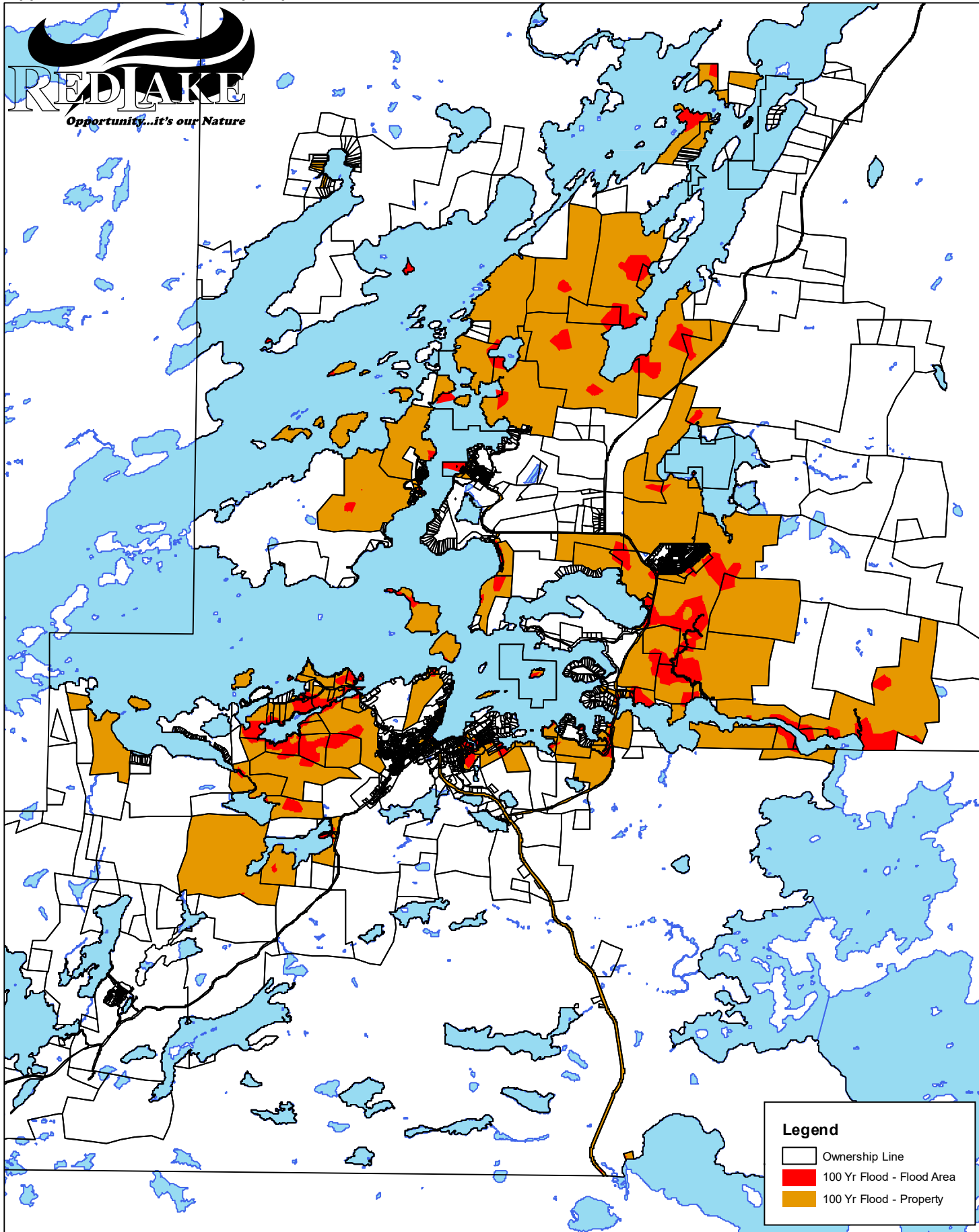




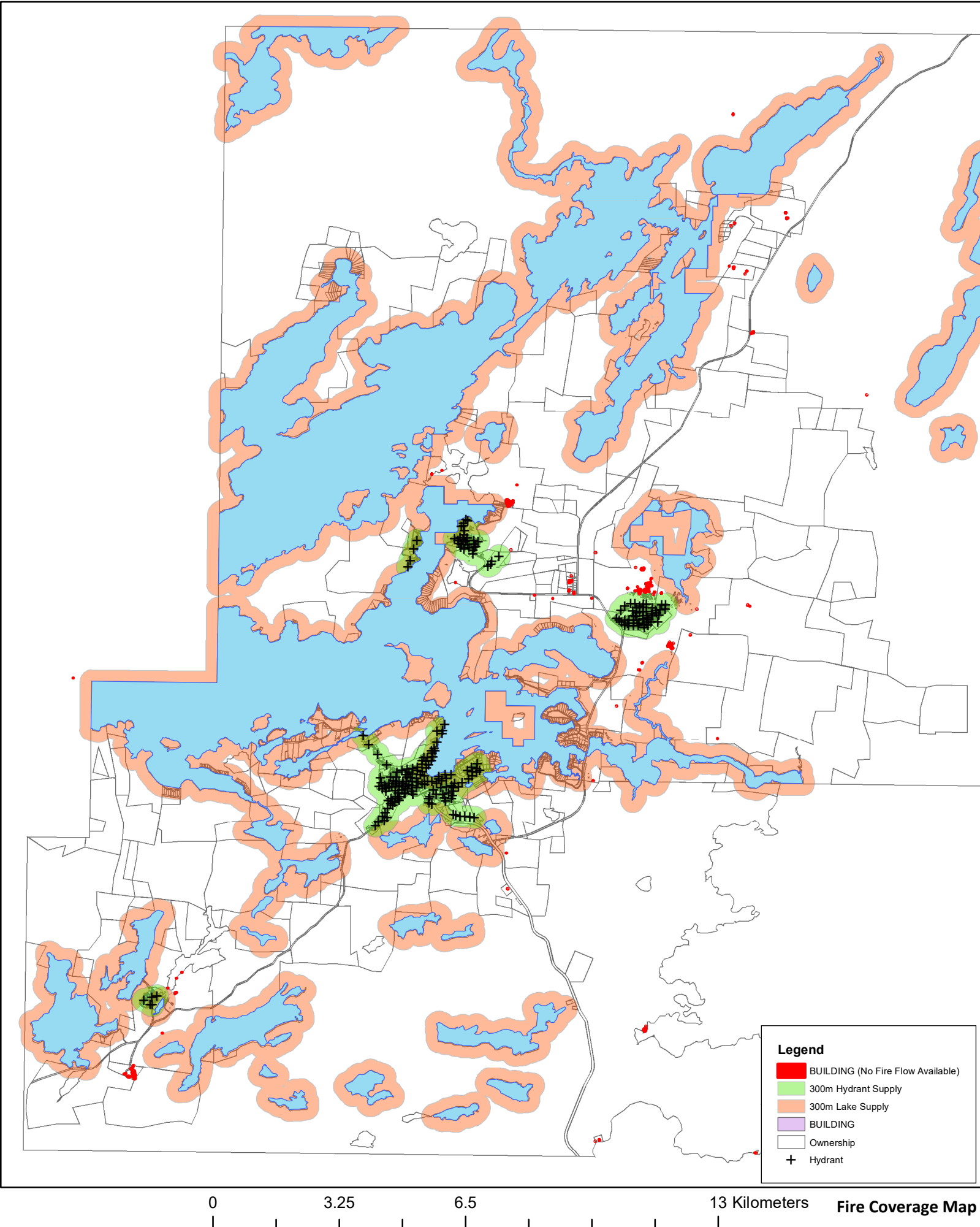




Appendix F – Flood Resiliency Map



Properties affected by a 100yr storm flood (lake level above 357m) having a flooded area greater than 10 square meters: 400.



Appendix H - Effluent Discharge

The Municipality of Red Lake owns two (2) extended aeration wastewater treatment plants, one (1) seasonal retention facultative lagoon, and one (1) community septic tank that provides primary treatment only. None of the facilities currently provide total phosphorus removal. The overall goal of the treatment process at all facilities is to reduce or remove contaminants from influent wastewater (raw sewage) to a level that will not adversely impact or impair receiving waters, including preventing the introduction of pathogens that could affect downstream users. A description of the effluent that is discharged from the respective treatment facilities is provided below.

1. Red Lake Water Pollution Control Plant

The Red Lake Water Pollution Control Plant is an extended aeration (mechanical) treatment plant that provides secondary treatment and disinfection, with an average daily rated capacity of 2,460 m³/day. The entirety of the sewage works serve the urban area of the Red Lake town site and consist of nominally separated sanitary sewers, sewage pumping stations and associated force-mains, and an extended aeration water pollution control plant. Sanitary sewers collect wastewater and direct it to multiple pumping stations located throughout the community, which in turn deliver the wastewater either to pumping station no. 1 or 3. Force mains from these two pumping stations convey sewage to the water pollution control plant for treatment.

The facility includes a preliminary treatment system consisting of grit removal channels and a stationary bar screen for debris removal, two circular secondary treatment units designated as the small plant and the large plant each containing an aeration reactor and secondary clarifier, a common aerobic digester integrated into the large treatment unit, a chlorine contact chamber for effluent disinfection configured with a temporary dechlorination chemical feed system, and an outfall sewer discharging final effluent to Howey Bay, Red Lake.

The facility is regulated by the terms and conditions of amended Environmental Compliance Approval no. 3803-BTFLQ3, issued to the Municipality of Red Lake on December 22, 2020. The effluent discharged by the facility meets the effluent compliance limits provided in the ECA and summarized in the table below. The facility is classified as an extended aeration plant without total phosphorus removal as per Ministry Guideline F-5-1, and effluent total phosphorus and total ammonia nitrogen are not regulated parameters at the facility.

Effluent Criteria for the Red Lake Water Pollution Control Plant			
Parameter	Sample Frequency & Type	Averaging Calculator	Compliance Limit
CBOD5	Weekly Composite	Monthly Average Concentration	25 mg/L
Total Suspended Solids	Weekly Composite	Monthly Average Concentration	25 mg/L
Total Ammonia Nitrogen	Weekly Composite	Monthly Average Concentration	10 mg/L
E. coli	Weekly Grab	Monthly Geometric Mean Density	200 CFU/100 mL

Appendix H - Effluent Discharge

Toxicity to Rainbow Trout and <i>Daphnia magna</i>	Quarterly Grab	Single Sample Result	Non-acutely lethal (no more than 50% mortality)
Total Residual Chlorine	Weekly Grab	Single Sample Result	0.02 g/L

2. Balmertown Water Pollution Control Plant

The Balmertown Water Pollution Control Plant is an extended aeration (mechanical) treatment plant that provides secondary treatment and has an average daily rated capacity of 1,224 m³/day. The entirety of the sewage works serve the urban area of Balmertown and consist of nominally separated sanitary sewers, a sewage pumping station and associated force-main, and an extended aeration water pollution control plant.

The facility includes a sewage pumping station that accepts raw sewage from the sanitary sewage collection system, a preliminary treatment system consisting of grit removal channels and a stationary bar screen for debris removal, one circular secondary treatment that includes an aeration reactor, secondary clarifier and aerobic digester, an effluent chamber, and an outfall system consisting of 160 m of 600 mm diameter outfall sewer discharging to an open swale east of the effluent chamber and 130 m of open swale outfall discharging to Balmer Creek approximately 290 m east of the effluent chamber.

The facility is regulated by the terms and conditions of amended Certificate of Approval no. 1376-5C3K4N, issued to the Municipality of Red Lake on July 19, 2002. The effluent discharged by the facility meets the effluent compliance limits provided in the Certificate of Approval and summarized in the table below. The facility does not provide total phosphorus removal, and in accordance with Ministry Guideline F-5-1 there are no effluent limits for total phosphorus and total ammonia nitrogen.

Effluent Criteria for the Balmertown Water Pollution Control Plant			
Parameter	Sample Frequency & Type	Averaging Calculator	Compliance Limit
CBOD5	Monthly Composite	Annual Average Concentration	25 mg/L
Total Suspended Solids	Monthly Composite	Annual Average Concentration	25 mg/L
pH	3 Grab Samples per Week	Single Sample Result	6.0 – 9.5

3. Cochenour Sewage Lagoon

The Cochenour Sewage Lagoon is a seasonal retention facultative lagoon that provides secondary treatment, with an average daily rated capacity of 767 m³/day. The entirety of the sewage works serves the communities of Cochenour and McKenzie Island and consists of sanitary gravity sewers, a main raw

Appendix H - Effluent Discharge

sewage pumping station, a sanitary force-main, two (2) sewage stabilization ponds and a discharge system that conveys treated effluent to Bruce Channel, Red Lake.

The facility is regulated by the terms and conditions of amended Environmental Compliance Approval no. 9838-9Q7K9B, issued to the Municipality of Red Lake on November 17, 2014. The effluent discharged by the facility meets the effluent compliance limits and design objective provided in the ECA and summarized in the table below. Although the facility is classified as a seasonal retention lagoon without total phosphorus removal as per Ministry Guideline F-5-1, the ECA does include design objectives pertaining to total phosphorus and total ammonia nitrogen.

Effluent Criteria for the Cochenour Sewage Lagoon			
<i>Compliance Limits</i>			
Parameter	Sample Frequency & Type	Averaging Calculator	Compliance Limit/Design Objective
CBOD5	Twice-weekly Grab during seasonal discharge period	Seasonal Average Effluent Concentration	25 mg/L
Total Suspended Solids	Twice-weekly Grab during seasonal discharge period	Seasonal Average Effluent Concentration	25 mg/L
pH	Twice-weekly Grab during seasonal discharge period	Single Sample Result	6.0 – 9.5
<i>Design Objectives</i>			
Total Phosphorus	Twice-weekly Grab during seasonal discharge period	Seasonal Average Effluent Concentration	1.0 mg/L
Total Ammonia Nitrogen	Twice-weekly Grab during seasonal discharge period	Seasonal Average Effluent Concentration	10 g/L

4. Madsen Sewage Works

The Madsen Sewage Works consist of domestic (household) components, a low pressure and gravity sewer system, and a septic tank serving the community of Madsen. Raw sewage is collected in tanks in individual homes and is pumped through low pressure sewers to gravity collector sewers. The gravity sewers direct sanitary sewage to the 260,000 L twin-compartment concrete community septic tank, which provides primary treatment only.

Appendix H - Effluent Discharge

As a primary treatment facility, the Madsen Sewage Works relies upon physical treatment (i.e., settling) to process incoming wastewater. Solids may settle in the septic tank, but a sizable portion of biochemical oxygen demand and suspended solids passes through the tank and is continuously discharged to an industrial sewage works. Water exiting the septic tank and industrial sewage works flows through Slobozian Lake and ultimately drains to Coin Creek and Red Lake.

The construction, operation and maintenance of the Madsen Sewage Works is governed by several regulatory instruments. Generally, the current system-specific approval issued by the Ministry is the most significant regulatory instrument governing the operation of a system. However, Certificate of Approval Number 3-0543-82-006 pertaining to the Madsen Sewage Works is outdated and does not include effluent compliance limits or design objectives. In accordance with Ministry Guideline F-5-1, effluent guidelines for primary treatment facilities without total phosphorus removal are 30% and 50% removal of BOD5 and suspended solids, respectively. The facility is generally capable of achieving these effluent guidelines over the course of a calendar year but may not achieve one or both objectives in a given calendar month. The 2021 annual BOD5 removal was 59% and the annual TSS removal was 60%.

Effluent Criteria for the Madsen Sewage Works			
Parameter	Sample Frequency & Type	Averaging Calculator	Guideline
BOD5	Monthly Composite	N/A	30% Removal
Total Suspended Solids	Monthly Composite	N/A	50% Removal

Operating Costs

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Water and Wastewater	162,000	162,000	162,000	162,000	162,000	162,000	162,000	162,000	162,000	162,000
Stormwater Management	-	-	-	-	-	-	-	-	-	-
Bridges	36,975	20,000	20,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
Roads	83,721	72,147	89,621	88,436	88,802	82,501	87,237	94,570	98,460	134,039
	292,696	264,147	281,621	275,436	275,802	269,501	274,237	281,570	285,460	321,039
Average Annual Operating Costs										282,151

Capital Costs

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Water and Wastewater	22,053,427	2,942,953	884,045	4,064,740	3,723,025	3,713,092	4,563,992	5,811,618	5,141,242	4,933,292
Stormwater Management	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
Bridges	-	-	1,101,600	345,000	-	-	-	-	-	-
Roads	1,070,051	3,543,819	2,592,246	2,155,997	4,132,314	1,166,346	1,071,893	769,635	303,233	3,153,477
	23,198,478	6,561,772	4,652,891	6,640,737	7,930,339	4,954,438	5,710,885	6,656,253	5,519,475	8,161,768
Total Capital Costs										79,987,037

Annual Funding

NORDS	129,859
OCIF	491,728
Gas Tax	260,508
	<u>882,095</u>

Funding Sources

Annual Funding (10 years)	8,820,950
Working Reserves	1,035,291.70
W&S Reserves	647,617.47
Gas Tax	1,492,577.97
OCIF	75,739.94
	<u>12,072,177.08</u>

Funding Deficit **67,914,859.48**

Appendix J - Lifecycle Scenarios Analysis

Integrated Costs - Summary

	Blast - Rehab - PVC			Blast - Replace - PVC		
Year	Current Year	Inflation Rate	Inflationary Price	Current Year	Inflation Rate	Inflationary Price
0	470,852.00	0%	470,852.00	470,852.00	0%	470,852.00
1	2,200.00	2%	2,244.00	2,200.00	2%	2,244.00
2	2,214.33	4%	2,302.91	2,214.33	4%	2,302.91
3	2,500.00	6%	2,650.00	2,500.00	6%	2,650.00
4	2,214.33	8%	2,391.48	2,214.33	8%	2,391.48
5	2,228.67	10%	2,451.53	2,228.67	10%	2,451.53
6	2,243.00	12%	2,512.16	2,243.00	12%	2,512.16
7	2,257.33	14%	2,573.36	2,257.33	14%	2,573.36
8	2,271.67	16%	2,635.13	2,271.67	16%	2,635.13
9	2,286.00	18%	2,697.48	2,286.00	18%	2,697.48
10	3,047.78	20%	3,657.33	3,047.78	20%	3,657.33
11	2,257.33	22%	2,753.95	2,257.33	22%	2,753.95
12	2,266.89	24%	2,810.94	2,266.89	24%	2,810.94
13	2,276.44	26%	2,868.32	2,276.44	26%	2,868.32
14	2,286.00	28%	2,926.08	2,286.00	28%	2,926.08
15	2,292.00	30%	2,979.60	2,292.00	30%	2,979.60
16	2,305.11	32%	3,042.75	2,305.11	32%	3,042.75
17	2,314.67	34%	3,101.65	2,314.67	34%	3,101.65
18	2,324.22	36%	3,160.94	2,324.22	36%	3,160.94
19	2,333.78	38%	3,220.61	2,333.78	38%	3,220.61
20	2,339.00	40%	3,274.60	2,339.00	40%	3,274.60
21	2,348.00	42%	3,334.16	2,348.00	42%	3,334.16
22	2,362.45	44%	3,401.92	2,362.45	44%	3,401.92
23	2,372.00	46%	3,463.12	2,372.00	46%	3,463.12
24	2,381.56	48%	3,524.70	2,381.56	48%	3,524.70
25	2,391.11	50%	3,586.67	2,391.11	50%	3,586.67
26	2,400.67	52%	3,649.01	2,400.67	52%	3,649.01
27	2,410.22	54%	3,711.74	2,410.22	54%	3,711.74
28	2,419.78	56%	3,774.85	2,419.78	56%	3,774.85
29	2,429.33	58%	3,838.35	2,429.33	58%	3,838.35
30	77,200.00	60%	123,520.00	77,200.00	60%	123,520.00
31	2,223.89	62%	3,602.70	2,223.89	62%	3,602.70
32	2,247.78	64%	3,686.36	2,247.78	64%	3,686.36
33	2,523.89	66%	4,189.66	2,523.89	66%	4,189.66
34	2,247.78	68%	3,776.27	2,247.78	68%	3,776.27
35	1,722.07	70%	2,927.51	1,722.07	70%	2,927.51
36	1,142.40	72%	1,964.93	1,142.40	72%	1,964.93
37	1,160.29	74%	2,018.90	1,160.29	74%	2,018.90
38	1,174.62	76%	2,067.34	1,174.62	76%	2,067.34
39	1,188.96	78%	2,116.34	1,188.96	78%	2,116.34
40	1,942.40	80%	3,496.32	1,942.40	80%	3,496.32
41	1,165.07	82%	2,120.42	1,165.07	82%	2,120.42
42	1,184.18	84%	2,178.89	1,184.18	84%	2,178.89
43	1,212.85	86%	2,255.89	1,212.85	86%	2,255.89
44	1,231.96	88%	2,316.08	1,231.96	88%	2,316.08
45	125,690.67	90%	238,812.27	1,251.07	90%	2,377.03
46	1,819.78	92%	3,493.97	1,270.18	92%	2,438.74
47	1,838.89	94%	3,567.45	1,289.29	94%	2,501.22
48	1,858.00	96%	3,641.68	1,308.40	96%	2,564.47
49	1,876.00	98%	3,714.48	1,326.40	98%	2,626.27
50	293,180.00	100%	586,360.00	470,852.00	100%	941,704.00
		NPV	744,799.15		NPV	\$759,631.70

1,561,218.82

1,675,840.70

Pipe Lining is Viable

	Inflated Costs	Net Present Value
Individually	1,677,519.58	819,830.05
Integrated	1,561,218.82	744,799.15
Savings	116,300.76	75,030.90

Pipe Lining is Not Viable

	Inflated Costs	Net Present Value
Individually	1,872,941.50	849,115.89
Integrated	1,675,840.70	759,631.70
Savings	197,100.80	89,484.19

Appendix J - Lifecycle Scenarios Analysis

Integrated Costs - Per 100 m								
Year	Lining Pipe				Replacing Pipe			
	Road	Water	Sewer	Total	Road	Water	Sewer	Total
0	291,580.00	96,922.00	82,350.00	470,852.00	291,580.00	96,922.00	82,350.00	470,852.00
1	-	600.00	1,600.00	2,200.00	-	600.00	1,600.00	2,200.00
2	14.33	600.00	1,600.00	2,214.33	14.33	600.00	1,600.00	2,214.33
3	300.00	600.00	1,600.00	2,500.00	300.00	600.00	1,600.00	2,500.00
4	14.33	600.00	1,600.00	2,214.33	14.33	600.00	1,600.00	2,214.33
5	28.67	600.00	1,600.00	2,228.67	28.67	600.00	1,600.00	2,228.67
6	43.00	600.00	1,600.00	2,243.00	43.00	600.00	1,600.00	2,243.00
7	57.33	600.00	1,600.00	2,257.33	57.33	600.00	1,600.00	2,257.33
8	71.67	600.00	1,600.00	2,271.67	71.67	600.00	1,600.00	2,271.67
9	86.00	600.00	1,600.00	2,286.00	86.00	600.00	1,600.00	2,286.00
10	847.78	600.00	1,600.00	3,047.78	847.78	600.00	1,600.00	3,047.78
11	57.33	600.00	1,600.00	2,257.33	57.33	600.00	1,600.00	2,257.33
12	66.89	600.00	1,600.00	2,266.89	66.89	600.00	1,600.00	2,266.89
13	76.44	600.00	1,600.00	2,276.44	76.44	600.00	1,600.00	2,276.44
14	86.00	600.00	1,600.00	2,286.00	86.00	600.00	1,600.00	2,286.00
15	92.00	600.00	1,600.00	2,292.00	92.00	600.00	1,600.00	2,292.00
16	105.11	600.00	1,600.00	2,305.11	105.11	600.00	1,600.00	2,305.11
17	114.67	600.00	1,600.00	2,314.67	114.67	600.00	1,600.00	2,314.67
18	124.22	600.00	1,600.00	2,324.22	124.22	600.00	1,600.00	2,324.22
19	133.78	600.00	1,600.00	2,333.78	133.78	600.00	1,600.00	2,333.78
20	139.00	600.00	1,600.00	2,339.00	139.00	600.00	1,600.00	2,339.00
21	148.00	600.00	1,600.00	2,348.00	148.00	600.00	1,600.00	2,348.00
22	162.45	600.00	1,600.00	2,362.45	162.45	600.00	1,600.00	2,362.45
23	172.00	600.00	1,600.00	2,372.00	172.00	600.00	1,600.00	2,372.00
24	181.56	600.00	1,600.00	2,381.56	181.56	600.00	1,600.00	2,381.56
25	191.11	600.00	1,600.00	2,391.11	191.11	600.00	1,600.00	2,391.11
26	200.67	600.00	1,600.00	2,400.67	200.67	600.00	1,600.00	2,400.67
27	210.22	600.00	1,600.00	2,410.22	210.22	600.00	1,600.00	2,410.22
28	219.78	600.00	1,600.00	2,419.78	219.78	600.00	1,600.00	2,419.78
29	229.33	600.00	1,600.00	2,429.33	229.33	600.00	1,600.00	2,429.33
30	75,000.00	600.00	1,600.00	77,200.00	75,000.00	600.00	1,600.00	77,200.00
31	23.89	600.00	1,600.00	2,223.89	23.89	600.00	1,600.00	2,223.89
32	47.78	600.00	1,600.00	2,247.78	47.78	600.00	1,600.00	2,247.78
33	323.89	600.00	1,600.00	2,523.89	323.89	600.00	1,600.00	2,523.89
34	47.78	600.00	1,600.00	2,247.78	47.78	600.00	1,600.00	2,247.78
35	71.67	50.40	1,600.00	1,722.07	71.67	50.40	1,600.00	1,722.07
36	92.00	50.40	1,000.00	1,142.40	92.00	50.40	1,000.00	1,142.40
37	109.89	50.40	1,000.00	1,160.29	109.89	50.40	1,000.00	1,160.29
38	124.22	50.40	1,000.00	1,174.62	124.22	50.40	1,000.00	1,174.62
39	138.56	50.40	1,000.00	1,188.96	138.56	50.40	1,000.00	1,188.96
40	892.00	50.40	1,000.00	1,942.40	892.00	50.40	1,000.00	1,942.40
41	114.67	50.40	1,000.00	1,165.07	114.67	50.40	1,000.00	1,165.07
42	133.78	50.40	1,000.00	1,184.18	133.78	50.40	1,000.00	1,184.18
43	162.45	50.40	1,000.00	1,212.85	162.45	50.40	1,000.00	1,212.85
44	181.56	50.40	1,000.00	1,231.96	181.56	50.40	1,000.00	1,231.96
45	200.67	67,845.00	57,645.00	125,690.67	200.67	50.40	1,000.00	1,251.07
46	219.78	600.00	1,000.00	1,819.78	219.78	50.40	1,000.00	1,270.18
47	238.89	600.00	1,000.00	1,838.89	238.89	50.40	1,000.00	1,289.29
48	258.00	600.00	1,000.00	1,858.00	258.00	50.40	1,000.00	1,308.40
49	276.00	600.00	1,000.00	1,876.00	276.00	50.40	1,000.00	1,326.40
50	291,580.00	600.00	1,000.00	293,180.00	291,580.00	96,922.00	82,350.00	470,852.00

Appendix J - Lifecycle Scenarios Analysis

Water Mains - Summary												
	Blast - Rehab - PVC			Blast - Replace - PVC			No Blast - Rehab - HDPE			No Blast - Replace - HDPE		
Year	Current Year	Inflation Rate	Inflationary Price	Current Year	Inflation Rate	Inflationary Price	Current Year	Inflation Rate	Inflationary Price	Current Year	Inflation Rate	Inflationary Price
0	236,922.00	0%	236,922.00	236,922.00	0%	236,922.00	161,922.00	0%	161,922.00	161,922.00	0%	161,922.00
1	-	2%	-	-	2%	-	600.00	2%	612.00	600.00	2%	612.00
2	-	4%	-	-	4%	-	600.00	4%	624.00	600.00	4%	624.00
3	-	6%	-	-	6%	-	600.00	6%	636.00	600.00	6%	636.00
4	-	8%	-	-	8%	-	600.00	8%	648.00	600.00	8%	648.00
5	-	10%	-	-	10%	-	600.00	10%	660.00	600.00	10%	660.00
6	-	12%	-	-	12%	-	600.00	12%	672.00	600.00	12%	672.00
7	-	14%	-	-	14%	-	600.00	14%	684.00	600.00	14%	684.00
8	-	16%	-	-	16%	-	600.00	16%	696.00	600.00	16%	696.00
9	-	18%	-	-	18%	-	600.00	18%	708.00	600.00	18%	708.00
10	-	20%	-	-	20%	-	600.00	20%	720.00	600.00	20%	720.00
11	-	22%	-	-	22%	-	600.00	22%	732.00	600.00	22%	732.00
12	-	24%	-	-	24%	-	600.00	24%	744.00	600.00	24%	744.00
13	-	26%	-	-	26%	-	600.00	26%	756.00	600.00	26%	756.00
14	-	28%	-	-	28%	-	600.00	28%	768.00	600.00	28%	768.00
15	-	30%	-	-	30%	-	600.00	30%	780.00	600.00	30%	780.00
16	-	32%	-	-	32%	-	600.00	32%	792.00	600.00	32%	792.00
17	-	34%	-	-	34%	-	600.00	34%	804.00	600.00	34%	804.00
18	-	36%	-	-	36%	-	600.00	36%	816.00	600.00	36%	816.00
19	-	38%	-	-	38%	-	600.00	38%	828.00	600.00	38%	828.00
20	-	40%	-	-	40%	-	600.00	40%	840.00	600.00	40%	840.00
21	-	42%	-	-	42%	-	600.00	42%	852.00	600.00	42%	852.00
22	-	44%	-	-	44%	-	600.00	44%	864.00	600.00	44%	864.00
23	-	46%	-	-	46%	-	600.00	46%	876.00	600.00	46%	876.00
24	-	48%	-	-	48%	-	600.00	48%	888.00	600.00	48%	888.00
25	11,486.00	50%	17,229.00	11,486.00	50%	17,229.00	600.00	50%	900.00	600.00	50%	900.00
26	-	52%	-	-	52%	-	600.00	52%	912.00	600.00	52%	912.00
27	-	54%	-	-	54%	-	600.00	54%	924.00	600.00	54%	924.00
28	-	56%	-	-	56%	-	600.00	56%	936.00	600.00	56%	936.00
29	-	58%	-	-	58%	-	600.00	58%	948.00	600.00	58%	948.00
30	-	60%	-	-	60%	-	600.00	60%	960.00	600.00	60%	960.00
31	-	62%	-	-	62%	-	600.00	62%	972.00	600.00	62%	972.00
32	-	64%	-	-	64%	-	600.00	64%	984.00	600.00	64%	984.00
33	-	66%	-	-	66%	-	600.00	66%	996.00	600.00	66%	996.00
34	-	68%	-	-	68%	-	600.00	68%	1,008.00	600.00	68%	1,008.00
35	-	70%	-	-	70%	-	50.40	70%	85.68	50.40	70%	85.68
36	-	72%	-	-	72%	-	50.40	72%	86.69	50.40	72%	86.69
37	-	74%	-	-	74%	-	50.40	74%	87.70	50.40	74%	87.70
38	-	76%	-	-	76%	-	50.40	76%	88.70	50.40	76%	88.70
39	-	78%	-	-	78%	-	50.40	78%	89.71	50.40	78%	89.71
40	11,486.00	80%	20,674.80	11,486.00	80%	20,674.80	50.40	80%	90.72	50.40	80%	90.72
41	-	82%	-	-	82%	-	50.40	82%	91.73	50.40	82%	91.73
42	-	84%	-	-	84%	-	50.40	84%	92.74	50.40	84%	92.74
43	-	86%	-	-	86%	-	50.40	86%	93.74	50.40	86%	93.74
44	-	88%	-	-	88%	-	50.40	88%	94.75	50.40	88%	94.75
45	80,845.40	90%	153,606.26	-	90%	-	80,845.40	90%	153,606.26	50.40	90%	95.76
46	-	92%	-	-	92%	-	600.00	92%	1,152.00	50.40	92%	96.77
47	-	94%	-	-	94%	-	600.00	94%	1,164.00	50.40	94%	97.78
48	-	96%	-	-	96%	-	600.00	96%	1,176.00	50.40	96%	98.78
49	-	98%	-	-	98%	-	600.00	98%	1,188.00	50.40	98%	99.79
50	-	100%	-	161,922.00	100%	323,844.00	600.00	100%	1,200.00	161,972.40	100%	323,944.80
NPV			\$278,924.31	NPV			NPV			NPV		
			428,432.06									

Appendix J - Lifecycle Scenarios Analysis

Water Mains
Per 100 Meters

Year	Blast - Rehab - PVC				Blast - Replace - PVC				No Blast - Rehab - HDPE				No Blast - Replace - HDPE					
	Breaks	Pipe Replacement	Construction	Total	Breaks	Pipe Replacement	Construction	Total	Breaks	Heat Trace Costs	Pipe Replacement	Construction	Total	Breaks	Heat Trace Costs	Pipe Replacement	Construction	Total
0			236,922.00	236,922.00			236,922.00	236,922.00				161,922.00	161,922.00				161,922.00	161,922.00
1				-				-		600.00			600.00		600.00			600.00
2				-				-		600.00			600.00		600.00			600.00
3				-				-		600.00			600.00		600.00			600.00
4				-				-		600.00			600.00		600.00			600.00
5				-				-		600.00			600.00		600.00			600.00
6				-				-		600.00			600.00		600.00			600.00
7				-				-		600.00			600.00		600.00			600.00
8				-				-		600.00			600.00		600.00			600.00
9				-				-		600.00			600.00		600.00			600.00
10				-				-		600.00			600.00		600.00			600.00
11				-				-		600.00			600.00		600.00			600.00
12				-				-		600.00			600.00		600.00			600.00
13				-				-		600.00			600.00		600.00			600.00
14				-				-		600.00			600.00		600.00			600.00
15				-				-		600.00			600.00		600.00			600.00
16				-				-		600.00			600.00		600.00			600.00
17				-				-		600.00			600.00		600.00			600.00
18				-				-		600.00			600.00		600.00			600.00
19				-				-		600.00			600.00		600.00			600.00
20				-				-		600.00			600.00		600.00			600.00
21				-				-		600.00			600.00		600.00			600.00
22				-				-		600.00			600.00		600.00			600.00
23				-				-		600.00			600.00		600.00			600.00
24				-				-		600.00			600.00		600.00			600.00
25	11,486.00		11,486.00	11,486.00	11,486.00		11,486.00	11,486.00		600.00			600.00		600.00			600.00
26				-				-		600.00			600.00		600.00			600.00
27				-				-		600.00			600.00		600.00			600.00
28				-				-		600.00			600.00		600.00			600.00
29				-				-		600.00			600.00		600.00			600.00
30				-				-		600.00			600.00		600.00			600.00
31				-				-		600.00			600.00		600.00			600.00
32				-				-		600.00			600.00		600.00			600.00
33				-				-	4,023.11	600.00			600.00	4,023.11	600.00			600.00
34				-				-		600.00			600.00		600.00			600.00
35				-				-		50.40			50.40		50.40			50.40
36				-				-		50.40			50.40		50.40			50.40
37				-				-		50.40			50.40		50.40			50.40
38				-				-		50.40			50.40		50.40			50.40
39				-				-		50.40			50.40		50.40			50.40
40	11,486.00		11,486.00	11,486.00	11,486.00		11,486.00	11,486.00		50.40			50.40		50.40			50.40
41				-				-		50.40			50.40		50.40			50.40
42				-				-		50.40			50.40		50.40			50.40
43				-				-		50.40			50.40		50.40			50.40
44				-				-		50.40			50.40		50.40			50.40
45		80,845.40	80,845.40	80,845.40				-			80,845.40		80,845.40		50.40			50.40
46				-				-		600.00			600.00		50.40			50.40
47				-				-		600.00			600.00		50.40			50.40
48				-				-		600.00			600.00		50.40			50.40
49				-				-		600.00			600.00		50.40			50.40
50				-		161,922.00		161,922.00		600.00			600.00		50.40	161,922.00		161,972.40

Appendix J - Lifecycle Scenarios Analysis

Sewer Mains - Summary												
Year	Blast - Rehab - PVC			Blast - Replace - PVC			No Blast - Rehab - HDPE			No Blast - Replace - HDPE		
	Current Year	Inflation Rate	Inflationary Price	Current Year	Inflation Rate	Inflationary Price	Current Year	Inflation Rate	Inflationary Price	Current Year	Inflation Rate	Inflationary Price
0	161,552.00	0%	161,552.00	161,552.00	0%	161,552.00	82,350.00	0%	82,350.00	82,350.00	0%	82,350.00
1	-	2%	-	-	2%	-	1,600.00	2%	1,632.00	1,600.00	2%	1,632.00
2	-	4%	-	-	4%	-	1,600.00	4%	1,664.00	1,600.00	4%	1,664.00
3	472.00	6%	500.32	472.00	6%	500.32	1,600.00	6%	1,696.00	1,600.00	6%	1,696.00
4	-	8%	-	-	8%	-	1,600.00	8%	1,728.00	1,600.00	8%	1,728.00
5	-	10%	-	-	10%	-	1,600.00	10%	1,760.00	1,600.00	10%	1,760.00
6	472.00	12%	528.64	472.00	12%	528.64	1,600.00	12%	1,792.00	1,600.00	12%	1,792.00
7	-	14%	-	-	14%	-	1,600.00	14%	1,824.00	1,600.00	14%	1,824.00
8	-	16%	-	-	16%	-	1,600.00	16%	1,856.00	1,600.00	16%	1,856.00
9	472.00	18%	556.96	472.00	18%	556.96	1,600.00	18%	1,888.00	1,600.00	18%	1,888.00
10	-	20%	-	-	20%	-	1,600.00	20%	1,920.00	1,600.00	20%	1,920.00
11	-	22%	-	-	22%	-	1,600.00	22%	1,952.00	1,600.00	22%	1,952.00
12	472.00	24%	585.28	472.00	24%	585.28	1,600.00	24%	1,984.00	1,600.00	24%	1,984.00
13	-	26%	-	-	26%	-	1,600.00	26%	2,016.00	1,600.00	26%	2,016.00
14	-	28%	-	-	28%	-	1,600.00	28%	2,048.00	1,600.00	28%	2,048.00
15	472.00	30%	613.60	472.00	30%	613.60	1,600.00	30%	2,080.00	1,600.00	30%	2,080.00
16	-	32%	-	-	32%	-	1,600.00	32%	2,112.00	1,600.00	32%	2,112.00
17	-	34%	-	-	34%	-	1,600.00	34%	2,144.00	1,600.00	34%	2,144.00
18	472.00	36%	641.92	472.00	36%	641.92	1,600.00	36%	2,176.00	1,600.00	36%	2,176.00
19	-	38%	-	-	38%	-	1,600.00	38%	2,208.00	1,600.00	38%	2,208.00
20	-	40%	-	-	40%	-	1,600.00	40%	2,240.00	1,600.00	40%	2,240.00
21	472.00	42%	670.24	472.00	42%	670.24	1,600.00	42%	2,272.00	1,600.00	42%	2,272.00
22	-	44%	-	-	44%	-	1,600.00	44%	2,304.00	1,600.00	44%	2,304.00
23	-	46%	-	-	46%	-	1,600.00	46%	2,336.00	1,600.00	46%	2,336.00
24	472.00	48%	698.56	472.00	48%	698.56	1,600.00	48%	2,368.00	1,600.00	48%	2,368.00
25	-	50%	-	-	50%	-	1,600.00	50%	2,400.00	1,600.00	50%	2,400.00
26	-	52%	-	-	52%	-	1,600.00	52%	2,432.00	1,600.00	52%	2,432.00
27	472.00	54%	726.88	472.00	54%	726.88	1,600.00	54%	2,464.00	1,600.00	54%	2,464.00
28	-	56%	-	-	56%	-	1,600.00	56%	2,496.00	1,600.00	56%	2,496.00
29	-	58%	-	-	58%	-	1,600.00	58%	2,528.00	1,600.00	58%	2,528.00
30	472.00	60%	755.20	472.00	60%	755.20	1,600.00	60%	2,560.00	1,600.00	60%	2,560.00
31	-	62%	-	-	62%	-	1,600.00	62%	2,592.00	1,600.00	62%	2,592.00
32	-	64%	-	-	64%	-	1,600.00	64%	2,624.00	1,600.00	64%	2,624.00
33	29,258.00	66%	48,568.28	29,258.00	66%	48,568.28	1,600.00	66%	2,656.00	1,600.00	66%	2,656.00
34	-	68%	-	-	68%	-	1,600.00	68%	2,688.00	1,600.00	68%	2,688.00
35	-	70%	-	-	70%	-	1,600.00	70%	2,720.00	1,600.00	70%	2,720.00
36	472.00	72%	811.84	472.00	72%	811.84	1,000.00	72%	1,720.00	1,000.00	72%	1,720.00
37	-	74%	-	-	74%	-	1,000.00	74%	1,740.00	1,000.00	74%	1,740.00
38	-	76%	-	-	76%	-	1,000.00	76%	1,760.00	1,000.00	76%	1,760.00
39	472.00	78%	840.16	472.00	78%	840.16	1,000.00	78%	1,780.00	1,000.00	78%	1,780.00
40	-	80%	-	-	80%	-	1,000.00	80%	1,800.00	1,000.00	80%	1,800.00
41	-	82%	-	-	82%	-	1,000.00	82%	1,820.00	1,000.00	82%	1,820.00
42	472.00	84%	868.48	472.00	84%	868.48	1,000.00	84%	1,840.00	1,000.00	84%	1,840.00
43	-	86%	-	-	86%	-	1,000.00	86%	1,860.00	1,000.00	86%	1,860.00
44	-	88%	-	-	88%	-	1,000.00	88%	1,880.00	1,000.00	88%	1,880.00
45	71,117.00	90%	135,122.30	472.00	90%	896.80	71,645.00	90%	136,125.50	1,000.00	90%	1,900.00
46	-	92%	-	-	92%	-	1,000.00	92%	1,920.00	1,000.00	92%	1,920.00
47	-	94%	-	-	94%	-	1,000.00	94%	1,940.00	1,000.00	94%	1,940.00
48	472.00	96%	925.12	472.00	96%	925.12	1,000.00	96%	1,960.00	1,000.00	96%	1,960.00
49	-	98%	-	-	98%	-	1,000.00	98%	1,980.00	1,000.00	98%	1,980.00
50	-	100%	-	82,350.00	100%	164,700.00	1,000.00	100%	2,000.00	83,350.00	100%	166,700.00
NPV			\$209,450.75	NPV			NPV			\$161,806.92		
			354,965.78							320,635.50		
										351,110.00		

	Inflated Costs	Net Present Value
Scenario 1	354,965.78	\$209,450.75
Scenario 2	385,440.28	\$210,971.17
Scenario 3	320,635.50	\$160,286.51
Scenario 4	351,110.00	\$161,806.92

Appendix J - Lifecycle Scenarios Analysis

Sewer Main Per 100 Meters																			
Blast - Rehab - PVC					Blast - Replace - PVC					No Blast - Rehab - HDPE					No Blast - Replace - HDPE				
Year	Breaks	Jetting	Pipe Replacement	Construction	Total	Breaks	Jetting	Pipe Replacement	Construction	Total	Breaks	Additional Maintenance	Heat Trace	Pipe Replacement	Construction	Total	Breaks	Additional Maintenance	Heat Trace
0				161,552.00	161,552.00				161,552.00	161,552.00					82,350.00	82,350.00			
1				-	-				-	-	1,000.00		600.00			1,600.00		1,000.00	600.00
2				-	-				-	-	1,000.00		600.00			1,600.00		1,000.00	600.00
3		472.00			472.00		472.00			472.00			600.00			1,600.00		1,000.00	600.00
4					-					-	1,000.00		600.00			1,600.00		1,000.00	600.00
5					-					-	1,000.00		600.00			1,600.00		1,000.00	600.00
6		472.00			472.00		472.00			472.00	1,000.00		600.00			1,600.00		1,000.00	600.00
7					-					-	1,000.00		600.00			1,600.00		1,000.00	600.00
8					-					-	1,000.00		600.00			1,600.00		1,000.00	600.00
9		472.00			472.00		472.00			472.00	1,000.00		600.00			1,600.00		1,000.00	600.00
10					-					-	1,000.00		600.00			1,600.00		1,000.00	600.00
11					-					-	1,000.00		600.00			1,600.00		1,000.00	600.00
12		472.00			472.00		472.00			472.00	1,000.00		600.00			1,600.00		1,000.00	600.00
13					-					-	1,000.00		600.00			1,600.00		1,000.00	600.00
14					-					-	1,000.00		600.00			1,600.00		1,000.00	600.00
15		472.00			472.00		472.00			472.00	1,000.00		600.00			1,600.00		1,000.00	600.00
16					-					-	1,000.00		600.00			1,600.00		1,000.00	600.00
17					-					-	1,000.00		600.00			1,600.00		1,000.00	600.00
18		472.00			472.00		472.00			472.00	1,000.00		600.00			1,600.00		1,000.00	600.00
19					-					-	1,000.00		600.00			1,600.00		1,000.00	600.00
20					-					-	1,000.00		600.00			1,600.00		1,000.00	600.00
21		472.00			472.00		472.00			472.00	1,000.00		600.00			1,600.00		1,000.00	600.00
22					-					-	1,000.00		600.00			1,600.00		1,000.00	600.00
23					-					-	1,000.00		600.00			1,600.00		1,000.00	600.00
24		472.00			472.00		472.00			472.00	1,000.00		600.00			1,600.00		1,000.00	600.00
25					-					-	1,000.00		600.00			1,600.00		1,000.00	600.00
26					-					-	1,000.00		600.00			1,600.00		1,000.00	600.00
27		472.00			472.00		472.00			472.00	1,000.00		600.00			1,600.00		1,000.00	600.00
28					-					-	1,000.00		600.00			1,600.00		1,000.00	600.00
29					-					-	1,000.00		600.00			1,600.00		1,000.00	600.00
30		472.00			472.00		472.00			472.00	1,000.00		600.00			1,600.00		1,000.00	600.00
31					-					-	1,000.00		600.00			1,600.00		1,000.00	600.00
32					-					-	1,000.00		600.00			1,600.00		1,000.00	600.00
33	28,786.00	472.00			29,258.00	28,786.00	472.00			29,258.00	1,000.00		600.00			1,600.00		1,000.00	600.00
34					-					-	1,000.00		600.00			1,600.00		1,000.00	600.00
35					-					-	1,000.00		600.00			1,600.00		1,000.00	600.00
36		472.00			472.00		472.00			472.00	1,000.00		600.00			1,600.00		1,000.00	600.00
37					-					-	1,000.00					1,000.00			
38					-					-	1,000.00					1,000.00			
39		472.00			472.00		472.00			472.00	1,000.00					1,000.00			
40					-					-	1,000.00					1,000.00			
41					-					-	1,000.00					1,000.00			
42		472.00			472.00		472.00			472.00	1,000.00					1,000.00			
43					-					-	1,000.00					1,000.00			
44					-					-	1,000.00					1,000.00			
45		472.00	70,645.00		71,117.00		472.00			472.00	1,000.00			70,645.00		71,645.00			
46					-					-	1,000.00					1,000.00			
47					-					-	1,000.00					1,000.00			
48		472.00			472.00		472.00			472.00	1,000.00					1,000.00			
49					-					-	1,000.00					1,000.00			
50					-			82,350.00		82,350.00	1,000.00					1,000.00		82,350.00	83,350.00

Appendix J - Lifecycle Scenarios Analysis

Paved Roads - Summary									
	Highest Level			Mid Level			Lowest Level		
Year	Current Year	Inflation Rate	Inflationary Price	Current Year	Inflation Rate	Inflationary Price	Current Year	Inflation Rate	Inflationary Price
0	291,580.00	0%	291,580.00	291,580.00	0%	291,580.00	291,580.00	0%	291,580.00
1	-	2%	-	-	2%	-	-	2%	-
2	14.33	4%	14.91	17.00	4%	17.68	17.00	4%	17.68
3	300.00	6%	318.00	38.22	6%	40.52	38.22	6%	40.52
4	14.33	8%	15.48	57.33	8%	61.92	57.33	8%	61.92
5	28.67	10%	31.53	76.44	10%	84.09	76.44	10%	84.09
6	43.00	12%	48.16	92.00	12%	103.04	92.00	12%	103.04
7	57.33	14%	65.36	114.67	14%	130.72	114.67	14%	130.72
8	71.67	16%	83.13	133.78	16%	155.18	133.78	16%	155.18
9	86.00	18%	101.48	152.00	18%	179.36	152.00	18%	179.36
10	847.78	20%	1,017.33	1,092.00	20%	1,310.40	167.22	20%	200.67
11	57.33	22%	69.95	109.89	22%	134.06	181.56	22%	221.50
12	66.89	24%	82.94	124.22	24%	154.04	195.89	24%	242.90
13	76.44	26%	96.32	138.56	26%	174.58	210.22	26%	264.88
14	86.00	28%	110.08	152.00	28%	194.56	224.56	28%	287.43
15	92.00	30%	119.60	167.22	30%	217.39	238.89	30%	310.56
16	105.11	32%	138.75	181.56	32%	239.65	253.00	32%	333.96
17	114.67	34%	153.65	195.89	34%	262.49	267.56	34%	358.53
18	124.22	36%	168.94	210.22	36%	285.90	281.89	36%	383.37
19	133.78	38%	184.61	224.56	38%	309.89	291.45	38%	402.19
20	139.00	40%	194.60	238.89	40%	334.45	75,000.00	40%	105,000.00
21	148.00	42%	210.16	253.00	42%	359.26	253.00	42%	359.26
22	162.45	44%	233.92	267.56	44%	385.28	263.00	44%	378.72
23	172.00	46%	251.12	281.89	46%	411.56	273.00	46%	398.58
24	181.56	48%	268.70	269.00	48%	398.12	283.00	48%	418.84
25	191.11	50%	286.67	75,000.00	50%	112,500.00	293.00	50%	439.50
26	200.67	52%	305.01	23.89	52%	36.31	303.00	52%	460.56
27	210.22	54%	323.74	47.78	54%	73.58	313.00	54%	482.02
28	219.78	56%	342.85	71.67	56%	111.80	323.00	56%	503.88
29	229.33	58%	362.35	92.00	58%	145.36	333.00	58%	526.14
30	75,000.00	60%	120,000.00	109.89	60%	175.82	343.00	60%	548.80
31	23.89	62%	38.70	124.22	62%	201.24	353.00	62%	571.86
32	47.78	64%	78.36	138.56	64%	227.23	363.00	64%	595.32
33	323.89	66%	537.66	152.00	66%	252.32	373.00	66%	619.18
34	47.78	68%	80.27	167.22	68%	280.93	383.00	68%	643.44
35	71.67	70%	121.83	1,119.44	70%	1,903.06	393.00	70%	668.10
36	92.00	72%	158.24	133.78	72%	230.10	403.00	72%	693.16
37	109.89	74%	191.21	148.11	74%	257.71	413.00	74%	718.62
38	124.22	76%	218.63	162.45	76%	285.90	423.00	76%	744.48
39	138.56	78%	246.63	176.00	78%	313.28	433.00	78%	770.74
40	892.00	80%	1,605.60	191.11	80%	344.00	291,580.00	80%	524,844

Appendix J - Lifecycle Scenarios Analysis

Paved Road - No Underground Infrastructure Per 100 Meters																					
	Highest Level							Mid Level							Lowest Level						
Year	Activity	PCI	Pot Hole Allocation	Crack Sealing	Rehabilitation	Replacement	Total	Activity	PCI	Pot Hole Allocation	Crack Sealing	Rehabilitation	Replacement	Total	Activity	PCI	Pot Hole Allocation	Crack Sealing	Rehabilitation	Replacement	Total
0	Construct					291,580.00	291,580.00	Construct						291,580.00	291,580.00	Construct				291,580.00	291,580.00
1	Defer	100	-				-	Defer	100	-				-	Defer	100	-				-
2	Defer	97	14.33				14.33	Defer	96	17.00				17.00	Defer	96	17.00				17.00
3	Crack Seal	100	-	300.00			300.00	Defer	92	38.22				38.22	Defer	92	38.22				38.22
4	Defer	97	14.33				14.33	Defer	88	57.33				57.33	Defer	88	57.33				57.33
5	Defer	94	28.67				28.67	Defer	84	76.44				76.44	Defer	84	76.44				76.44
6	Defer	91	43.00				43.00	Defer	80	92.00				92.00	Defer	80	92.00				92.00
7	Defer	88	57.33				57.33	Defer	76	114.67				114.67	Defer	76	114.67				114.67
8	Defer	85	71.67				71.67	Defer	72	133.78				133.78	Defer	72	133.78				133.78
9	Defer	82	86.00				86.00	Defer	68	152.00				152.00	Defer	68	152.00				152.00
10	Crack Seal	90	47.78	800.00			847.78	Crack Seal	80	92.00	1,000.00			1,092.00	Defer	65	167.22				167.22
11	Defer	88	57.33				57.33	Defer	77	109.89				109.89	Defer	62	181.56				181.56
12	Defer	86	66.89				66.89	Defer	74	124.22				124.22	Defer	59	195.89				195.89
13	Defer	84	76.44				76.44	Defer	71	138.56				138.56	Defer	56	210.22				210.22
14	Defer	82	86.00				86.00	Defer	68	152.00				152.00	Defer	53	224.56				224.56
15	Defer	80	92.00				92.00	Defer	65	167.22				167.22	Defer	50	238.89				238.89
16	Defer	78	105.11				105.11	Defer	62	181.56				181.56	Defer	47	253.00				253.00
17	Defer	76	114.67				114.67	Defer	59	195.89				195.89	Defer	44	267.56				267.56
18	Defer	74	124.22				124.22	Defer	56	210.22				210.22	Defer	41	281.89				281.89
19	Defer	72	133.78				133.78	Defer	53	224.56				224.56	Defer	39	291.45				291.45
20	Defer	70	139.00				139.00	Defer	50	238.89				238.89	Overlay	49			75,000.00		75,000.00
21	Defer	68	148.00				148.00	Defer	47	253.00				253.00	Defer	47	253.00				253.00
22	Defer	66	162.45				162.45	Defer	44	267.56				267.56	Defer	45	263.00				263.00
23	Defer	64	172.00				172.00	Defer	41	281.89				281.89	Defer	43	273.00				273.00
24	Defer	62	181.56				181.56	Defer	38	269.00				269.00	Defer	41	283.00				283.00
25	Defer	60	191.11				191.11	Overlay	100	-		75,000.00		75,000.00	Defer	39	293.00				293.00
26	Defer	58	200.67				200.67	Defer	95	23.89				23.89	Defer	37	303.00				303.00
27	Defer	56	210.22				210.22	Defer	90	47.78				47.78	Defer	35	313.00				313.00
28	Defer	54	219.78				219.78	Defer	85	71.67				71.67	Defer	33	323.00				323.00
29	Defer	52	229.33				229.33	Defer	80	92.00				92.00	Defer	31	333.00				333.00
30	Overlay	100	-		75,000.00		75,000.00	Defer	77	109.89				109.89	Defer	29	343.00				343.00
31	Defer	95	23.89				23.89	Defer	74	124.22				124.22	Defer	27	353.00				353.00
32	Defer	90	47.78				47.78	Defer	71	138.56				138.56	Defer	25	363.00				363.00
33	Crack Seal	95	23.89	300.00			323.89	Defer	68	152.00				152.00	Defer	23	373.00				373.00
34	Defer	90	47.78				47.78	Defer	65	167.22				167.22	Defer	21	383.00				383.00
35	Defer	85	71.67				71.67	Crack Seal	75	119.44	1,000.00			1,119.44	Defer	19	393.00				393.00
36	Defer	80	92.00				92.00	Defer	72	133.78				133.78	Defer	17	403.00				403.00
37	Defer	77	109.89				109.89	Defer	69	148.11				148.11	Defer	15	413.00				413.00
38	Defer	74	124.22				124.22	Defer	66	162.45				162.45	Defer	13	423.00				423.00
39	Defer	71	138.56				138.56	Defer	63	176.00				176.00	Defer	11	433.00				433.00
40	Crack Seal	80	92.00	800.00			892.00	Defer	60	191.11				191.11	Rebuild					291,580.00	291,580.00
41	Defer	76	114.67				114.67	Defer	57	205.45				205.45	Defer	96	17.00				17.00
42	Defer	72	133.78				133.78	Defer	54	219.78				219.78	Defer	92	38.22				38.22
43	Defer	66	162.45				162.45	Defer	51	234.11				234.11	Defer	88	57.33				57.33
44	Defer	62	181.56				181.56	Defer	48	248.45				248.45	Defer	84	76.44				76.44
45	Defer	58	200.67				200.67	Rebuild					291,580.00	291,580.00	Defer	80	92.00				92.00
46	Defer	54	219.78				219.78	Defer	100	-				-	Defer	76	114.67				114.67
47	Defer	50	238.89				238.89	Defer	96	17.00				17.00	Defer	72	133.78				133.78
48	Defer	46	258.00				258.00	Defer	92	38.22				38.22	Defer	68	152.00				152.00
49	Defer	42	276.00				276.00	Defer	88	57.33				57.33	Defer	65	167.22				167.22
50	Rebuild					291,580.00	291,580.00	Defer	84	76.44				76.44	Defer	62	181.56				181.56

Appendix K – Capital Project and Paving Lists

2022 Core Assets Capital Projects List								
FID	Community	Type	Street Name	Description	Road Length	Water Length	Sewer Length	Estimated Cost
241	Balmertown	Linear Infrastructure	Fourth St	Eric Radford Way to Lassie Rd	366.71	362.84	344.97	1,727,496.81
231	Balmertown	Linear Infrastructure	Lassie Rd	Fifth St to Eric Radford Way	637.45	658.95	640.59	2,972,745.64
236	Balmertown	Linear Infrastructure	Brewis	Fourth St to End	205.78	199.16	199.81	980,153.44
224	Balmertown	Linear Infrastructure	Fourth St	Delta Rd to End	221.52	253.03	185.86	1,000,472.14
96	Red Lake	Linear Infrastructure	Howey St	McDougall St to End	571.06	695.54	649.19	2,554,400.74
112	Red Lake	Linear Infrastructure	Howey St	McDougall St to Hwy 105	826.84	843.80	1,213.01	4,414,310.49
44	Red Lake	Linear Infrastructure	Forestry Rd	Hammell Rd to End	2,623.22	1,348.82	446.40	5,054,248.45
77	Red Lake	Linear Infrastructure	Hammell Rd	Hasaga St to Forestry Rd	388.98	410.75	714.37	2,201,846.30
266	Cochenour	Linear Infrastructure	Back Lane	Elliot - Macintosh back Lane (Mills Av to Edward Av)	291.54	282.24	228.35	963,965.33
280	Cochenour	Linear Infrastructure	Back Lane	William - Elliot back lane (Mills Av to Edward Av)	291.24	278.62	220.73	946,938.93
261	Cochenour	Linear Infrastructure	Elliot St	Edward Av to End	336.40	359.80	18.04	1,141,169.83
270	Cochenour	Linear Infrastructure	Back Lane	Murdock - Macintosh back lane (Murdock St to Edward Av)	199.27	185.57	175.33	674,832.41
279	Cochenour	Linear Infrastructure	Edward Av	Hwy 125 to McMarmac Rd	448.27	396.90	330.24	1,724,550.38
249	Balmertown	Linear Infrastructure	Dexter Rd	Sixth St to Fifth St	89.89	64.09	74.31	412,862.90
NA	Red Lake	WPCP - Process Equipment	NA	Chemical Metering and Storage Building	NA	NA	NA	3,700,450.00
NA	Red Lake	Lift Station 1 - Process Equipment	NA	Forcemain	NA	NA	NA	2,528,500.00

Appendix K – Capital Project and Paving Lists

2022 Road Paving List

FID	Community	Street Name	Description	Road Length	Estimated Cost to Replace	Underground Infrastructure and Age	Recommended Action
295	Cochenour	Willans Cr	McMarmac Rd to End	238.21	244,160.94	No	Rehabilitate or Replace
294	Cochenour	McMarmac Rd	McMarmac Rd to Edward Av	1,250.71	1,416,961.62	No	Rehabilitate or Replace
293	Cochenour	Un-named Ln	Cochenour Cr to End	73.29	27,484.05	Yes - 39	Asphalt Patching
267	Cochenour	Macintosh St	Mills Av to Edward Av	281.76	174,127.65	Yes - 42	Asphalt Patching
264	Cochenour	Mills Av	William St to Elliot St	94.65	93,985.52	Yes - 41	Asphalt Patching
263	Cochenour	Mills Av	Elliot St to End	79.33	78,775.19	Yes - 40	Asphalt Patching
232	Balmertown	Second St	Lassie Rd to Dickenson Rd	81.04	103,806.29	Yes - 72	Asphalt Patching
229	Balmertown	First St	Dickensen Rd to Detta Rd	85.01	89,766.02	Yes - 42	Asphalt Patching
213	Balmertown	Dickenson Rd	Hwy125 to Sixth St	494.68	633,689.99	Yes - 42	Asphalt Patching
208	Balmertown	Stovel Av	Campbell Rd to Sixth St	335.13	307,651.71	Yes - 42	Asphalt Patching
206	Balmertown	Sixth St	Lassie Rd to Dickenson Rd	159.47	228,195.50	Yes - 38	Asphalt Patching
197	Balmertown	Eric Radford Way	McNeely Rd to Detta Rd	1,119.91	1,182,625.38	Yes - 29	Overlay
193	Balmertown	McNeely Rd	Hwy125 to Eric Radford Way	577.68	346,608.01	Yes - 25	Overlay
187	Balmertown	Industrial Park Rd	Nungessor Rd to Nungessor Rd	523.09	653,864.43	No	Rehabilitate or Replace
185	Balmertown	Pickrel Dr	Hwy125 to End	425.72	500,221.11	No	Rehabilitate or Replace
181	Balmertown	McManus St	End to End	2,242.29	2,580,556.59	No	Rehabilitate or Replace
178	Balmertown	Huston Pl	Delenor Rd to End	517.46	646,823.54	No	Rehabilitate or Replace
177	Balmertown	Dash Cr	Dellenor Dr to End	352.05	440,062.01	No	Rehabilitate or Replace
176	Balmertown	Dellenor Rd	Hwy125 to End	1,998.33	2,797,663.56	No	Rehabilitate or Replace
133	Red Lake	Nugget St	Howey Bay Rd to Young St	298.46	251,599.96	Yes - 42	Asphalt Patching
105	Red Lake	Un-named Ln	Goldshore Rd to CIBC Parking Lot	178.09	120,210.50	No	Rehabilitate or Replace
95	Red Lake	Waterfront Rd	Howey St to End	1,215.97	1,246,374.33	No	Rehabilitate or Replace
63	Red Lake	Dynes St	Spruce St to End	122.39	55,074.75	Yes - 45	Asphalt Patching
62	Red Lake	Spruce St	Howey St to Church St	77.56	29,085.02	Yes - 45	Asphalt Patching
28	Madsen - Starrat	Springbank Dr	Main St to Access Rd	239.75	71,925.91	Yes - 40	Asphalt Patching
27	Madsen - Starrat	Madsen Dr	Lake Rd to Main St	159.60	59,851.49	Yes - 40	Asphalt Patching
24	Madsen - Starrat	Birch Ln	Lake Rd to Main St	141.41	144,940.82	No	Rehabilitate or Replace
22	Madsen - Starrat	Poplar Rd	Lake Rd to Main St	146.38	54,894.02	Yes - 40	Asphalt Patching
18	Madsen - Starrat	Shepherd St	Main St to Lake Rd	155.16	159,041.32	No	Rehabilitate or Replace
16	Madsen - Starrat	Poplar Rd	Main St to End	64.15	24,055.63	Yes - 40	Asphalt Patching
14	Madsen - Starrat	Madsen Dr	Main St to Access Rd	266.51	99,939.87	Yes - 40	Asphalt Patching
12	Madsen - Starrat	Birch Ln	Access Rd to Main St	332.96	124,859.15	Yes - 40	Asphalt Patching
11	Madsen - Starrat	Access Rd	Hwy 618 to Main St	861.58	516,949.85	Yes - 40	Asphalt Patching
10	Madsen - Starrat	Beveridge St	Main St to Access Rd	280.61	147,319.57	Yes - 40	Asphalt Patching
9	Madsen - Starrat	Main St	Birch Ln to Access Rd	997.90	598,737.67	Yes - 40	Asphalt Patching
8	Madsen - Starrat	Main St	Mine St to Birch Ln	249.05	149,430.89	Yes - 40	Asphalt Patching
6	Madsen - Starrat	Lake Rd	Mine St to Park Ln	183.28	96,224.38	Yes - 40	Asphalt Patching
4	Madsen - Starrat	Lake Rd	Park Ln to End	128.75	67,591.68	Yes - 40	Asphalt Patching