

Inverness Water and Wastewater Assessment

PRESENTATION FOR MUNICIPAL COUNCIL

Project Overview

Dillon was contracted to complete an assessment of existing water and wastewater (W&WW) infrastructure within the MOCI.

- **Project goal:**
 - Overview of W&WW infrastructure
 - Identify potential capital investments over the next 10 years
- **Project Focus:**
 - Linear Infrastructure → Piping
 - Complex Infrastructure
 - Treatment plants
 - Water storage tanks
 - Lift stations

Executive Summary

- MOCI owns an estimated **\$186 Million** of W&WW assets currently.
- Estimated 10 Year Investment Cost - **\$103,100,000** in today's dollars

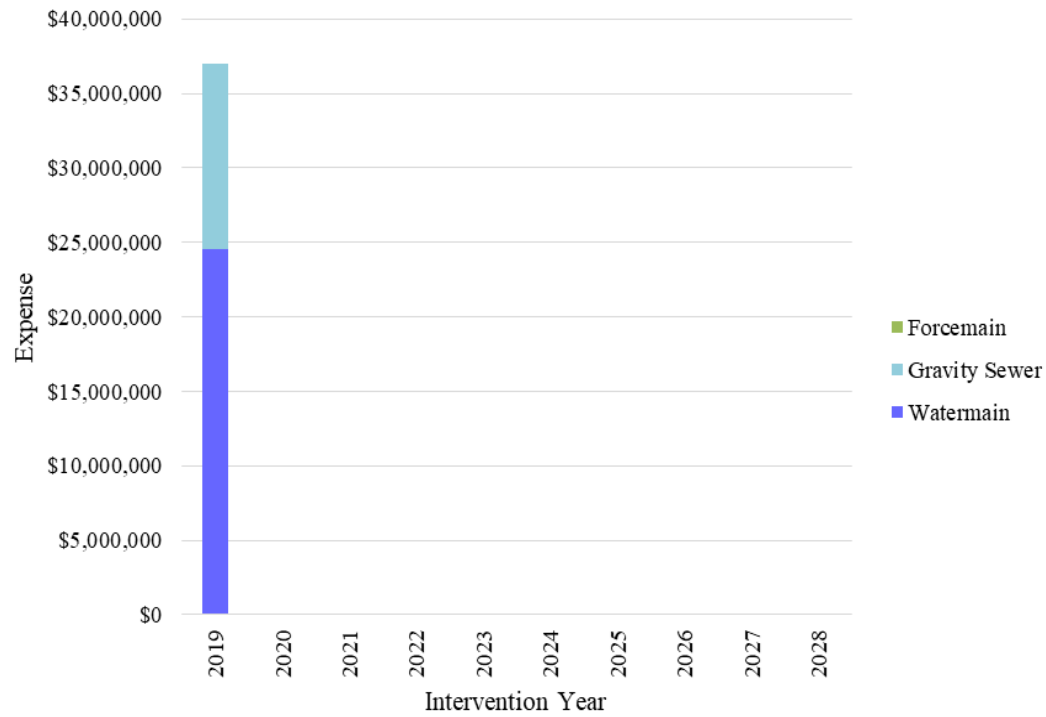


Figure 1 – Forecasted Investment for Linear Infrastructure

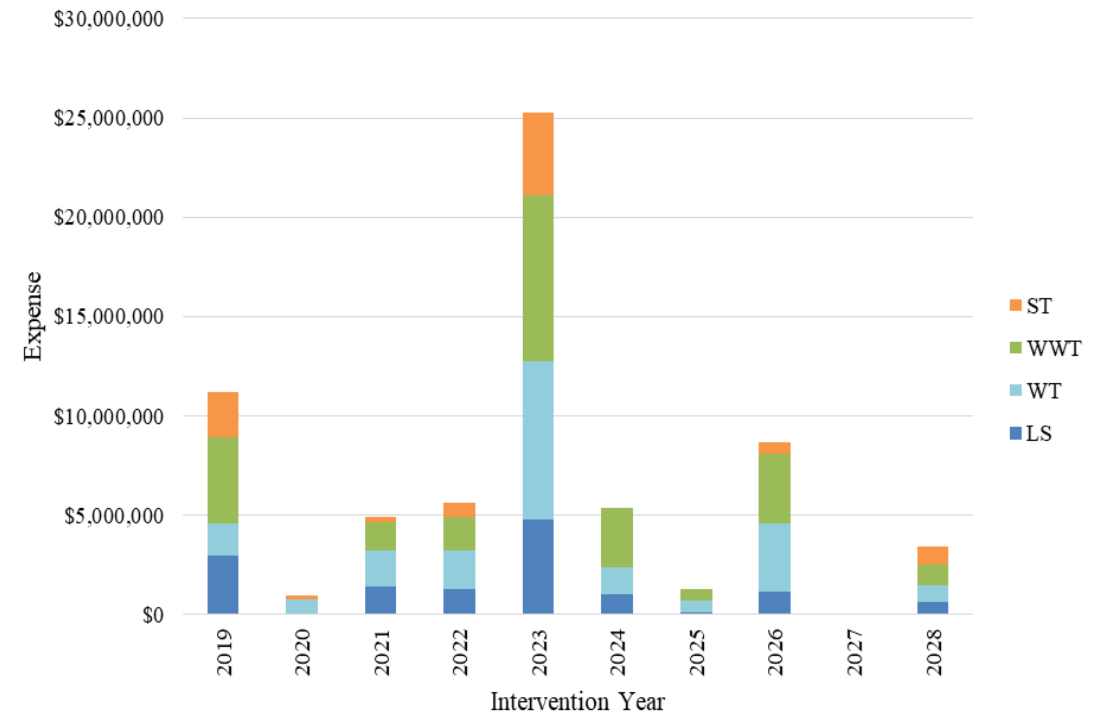


Figure 2 – Forecasted Investment for Complex Infrastructure

Executive Summary

General condition of MOCI W&WW infrastructure is **worse** than the national average.

Table 1 – Comparison to 2016 CIRC (Complex Assets)

Condition	2016 CIRC (Average across W&WW)	MOCI Condition Ratings
Very Good/Excellent (1)	45.5%	6%
Good (2)	37.5%	19%
Fair (3)	26.5%	60%
Poor (4)	7.0%	15%
Very Poor/Critical (5)	1.5%	0%

Executive Summary

- Recommended minimum annual capital investment:
 - \$10.3 Million per year → over the next 10 years
 - 5.56% of the overall asset replacement value (approximately **\$186 M**)
- In Comparison:
 - 2016 CIRC Minimum – 1.65%
 - Industry Rule of Thumb – 2% to 3%

Project Methodology

- **Project Goals and Objectives Workshop** - January 2019
- **Field Program** - January 7th to January 18th 2019
 - Site Visits to all lift stations, treatment plants and reservoirs
- **Condition assessments**
 - Canadian Infrastructure Report Card 1-5 rating scheme
- **Analysis**
 - Current asset condition, estimated remaining life and replacement costs
- **Draft Report** – February 22nd 2019
- **Final Report** – March 27th 2019

Inverness Water/Wasterwater Assessment

Location
46°8'N 61°15'W

Esri contributors

▼ Photos
+

Select Infrastructure
☐ Linear
☒ Pump Station
☐ Water Treatment
☐ Wastewater Treatment

Region
☐ Port Hood
☐ Judique
☐ Inverness
☐ Cheticamp
☐ Port Hastings
☐ Mabou
☐ Whycocomagh

Division
☐ Wastewater
☐ Water

Civic Address

Asset Type
☐ Booster Station
☐ Pump Station
☐ Valve Chamber
☐ Watermain
☐ Forcemain
☐ Sanitary Sewer
☐ Wastewater Treatment
☐ Water Treatment

Unique ID
e.g., L1, PS1, WT1, WW1

Asset Name

Install Year

▼ Condition Data
1 = Very Good 2 = Good 3 = Fair 4 = Poor 5 = Critical

Performance Rating
Considers if the asset frequently loses operation, requires significant maintenance, is under capacity, generates alarms, receives complaints.
☐ 1
☐ 3
☐ 5
☐ 2
☐ 4

Performance Rating Comment

Operability Rating
Considers if the asset is difficult to access, is laid out well, spare parts are readily available, minor health & safety concerns.
☐ 1
☐ 3
☐ 5
☐ 2
☐ 4

Operability Rating Comment

Figure 3 – Data Collection Form

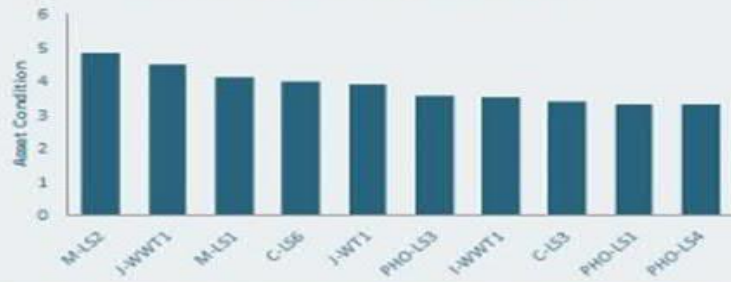
Asset Management Tool

Region	Select Infrastructure	Division	Civic Address	Asset Type	Asset Name	Unique ID	Install Year	Last Major Upgrade	Process/Technology	Source Water	# of Wells
Cheticamp	Water Treatment	Water	Off of Barren Road by water tower	Water Treatment	Cheticamp WTP	C-WT1	1970	2008	None	Groundwater (Secure)	3
Inverness	Water Treatment	Water	15450 Ceilidh Trail	Water Treatment	Inverness WTP1	I-WT1	2002	2017	Filtration	Groundwater (Secure)	2
Inverness	Water Treatment	Water	31 Broad Cove Banks Road	Water Treatment	Inverness WTP2	I-WT2	2008	2008	Filtration	Groundwater (Secure)	1

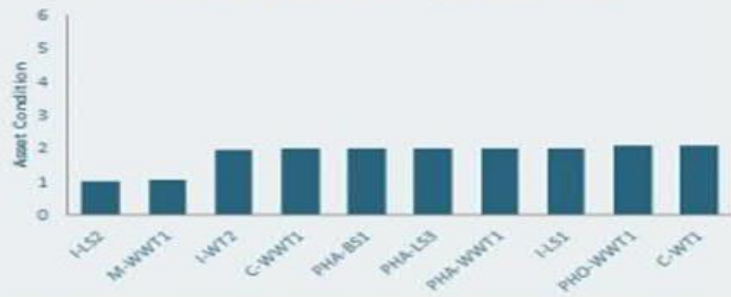
Figure 4 – Example of Asset Inventory Sheet

Asset Summary (Present)

Assets By Condition (Top 10)



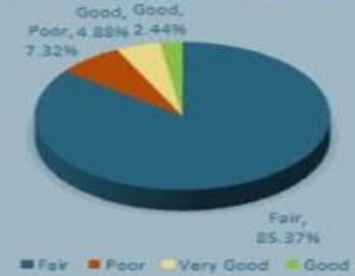
Assets By Condition (Bottom 10)



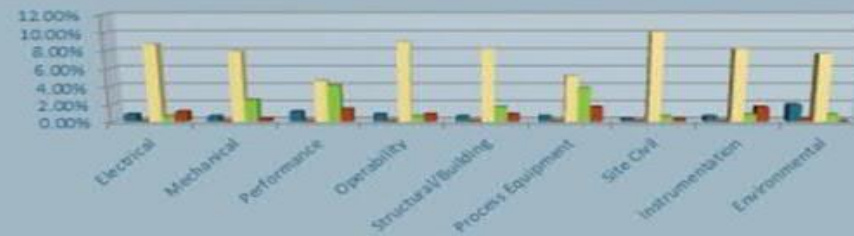
Asset Portfolio Statistics

Total Assets:	41
Assets with Condition Data:	41
Total Asset Members:	391
Average Assets Condition:	2.78 (Fair)
Worst Asset Condition:	4.82 (Poor)
Best Asset Condition:	1.00 (Very Good)

Asset Condition Grades



System Condition Grades (All Assets)



Asset Portfolio Expenses

Asset Portfolio Value:	\$70,219,294	(est. 2019-01-01)
Total Projected Expense:	\$65,349,458	(10-year period)
Maximum Annual Expenditure:	\$20,279,697	
Average Annual Expenditure:	\$ 6,534,946	
Average Capital Reinvestment Rate:	9.31%/a	

Projected Asset System Expense (By Year)

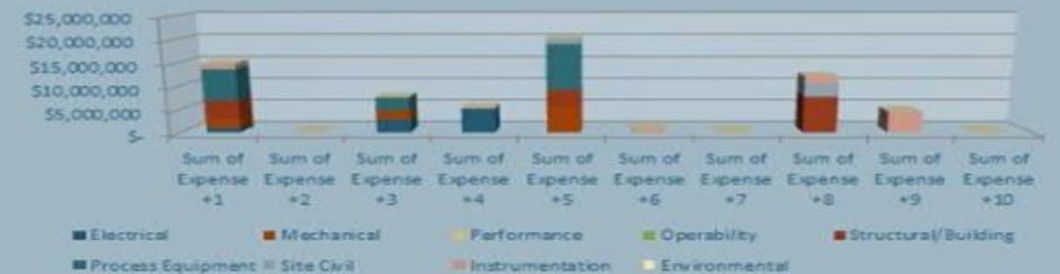


Figure 5 – Portfolio Condition Summary

Asset Detail Report

Asset Detail

Asset ID : **LS1** C-LS1
Location : 81 La Point du Harve

Implementation : **1993-01-01**
Asset Value : **\$ 433,086** (est. 2019-01-01)

Projected Expense : **\$ 433,086** (10-year period)
Average Annual Expenditure : **\$ 43,309**
Average Capital Reinvestment Rate : **10.00%/a**

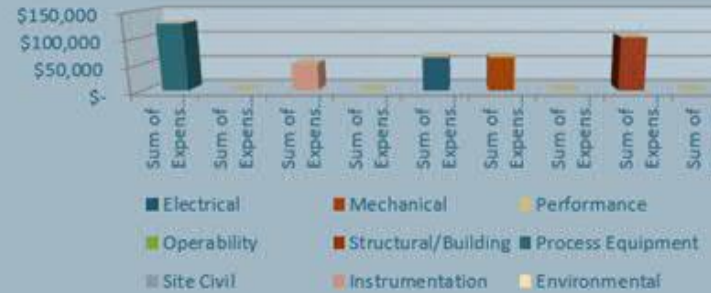
Asset Condition Detail by Systems

Asset Condition : **3.12** (Fair)

Total Number of Systems : 9
Systems Observed in Asset : 9
Total Number of Components : 9

Asset Component Conditions (by System)

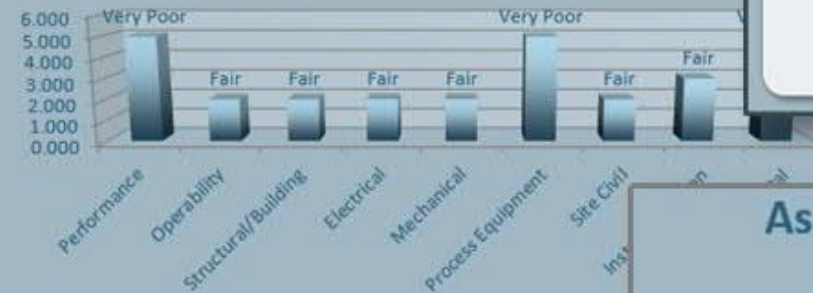
Projected Asset Expense (By Year)



Projected Date of Next Intervention



Asset Systems Condition Grade



Asset Component Conditions (by System)

Figure 6 – Asset Detail

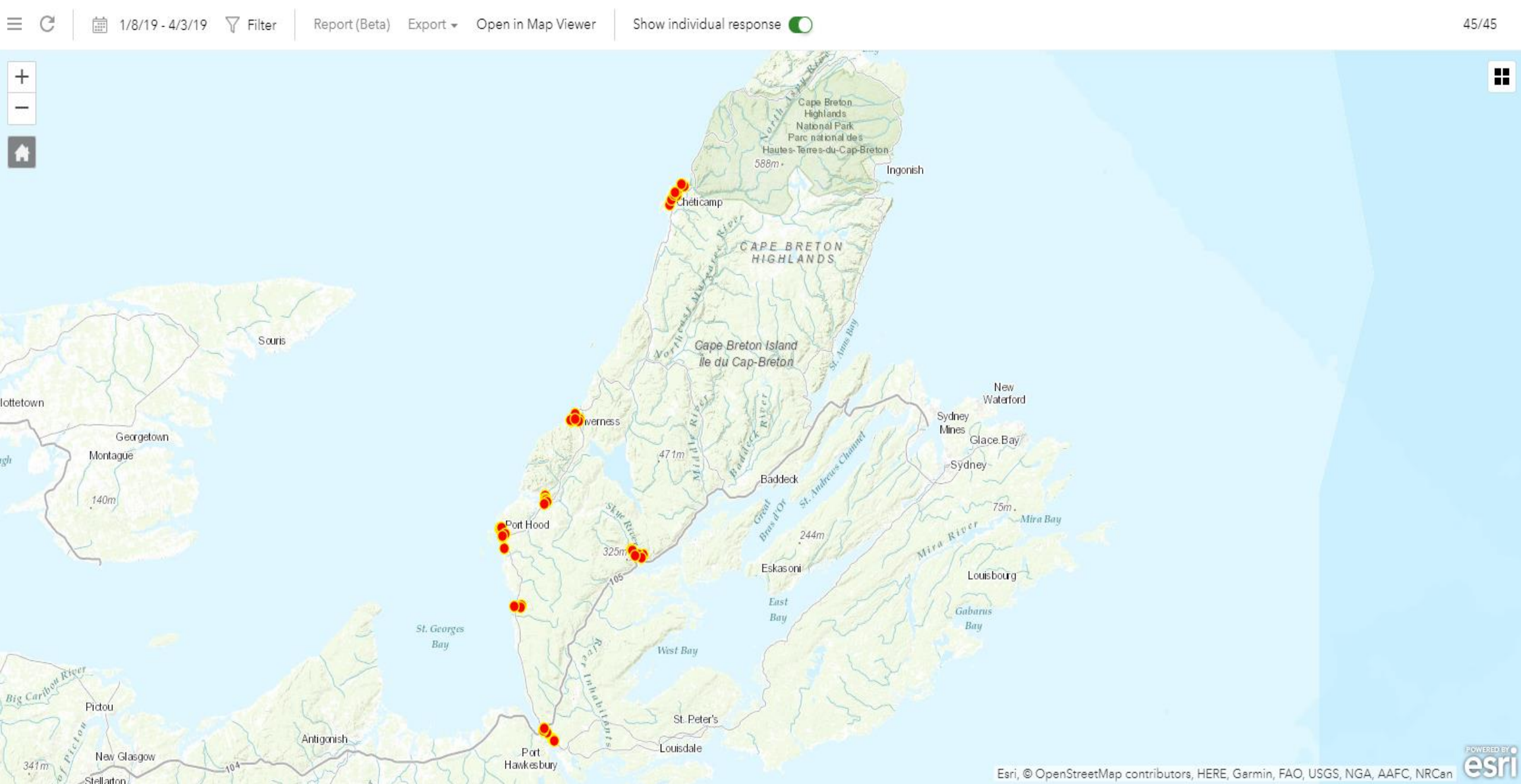


Figure 7 – Screenshot of GIS Mapping

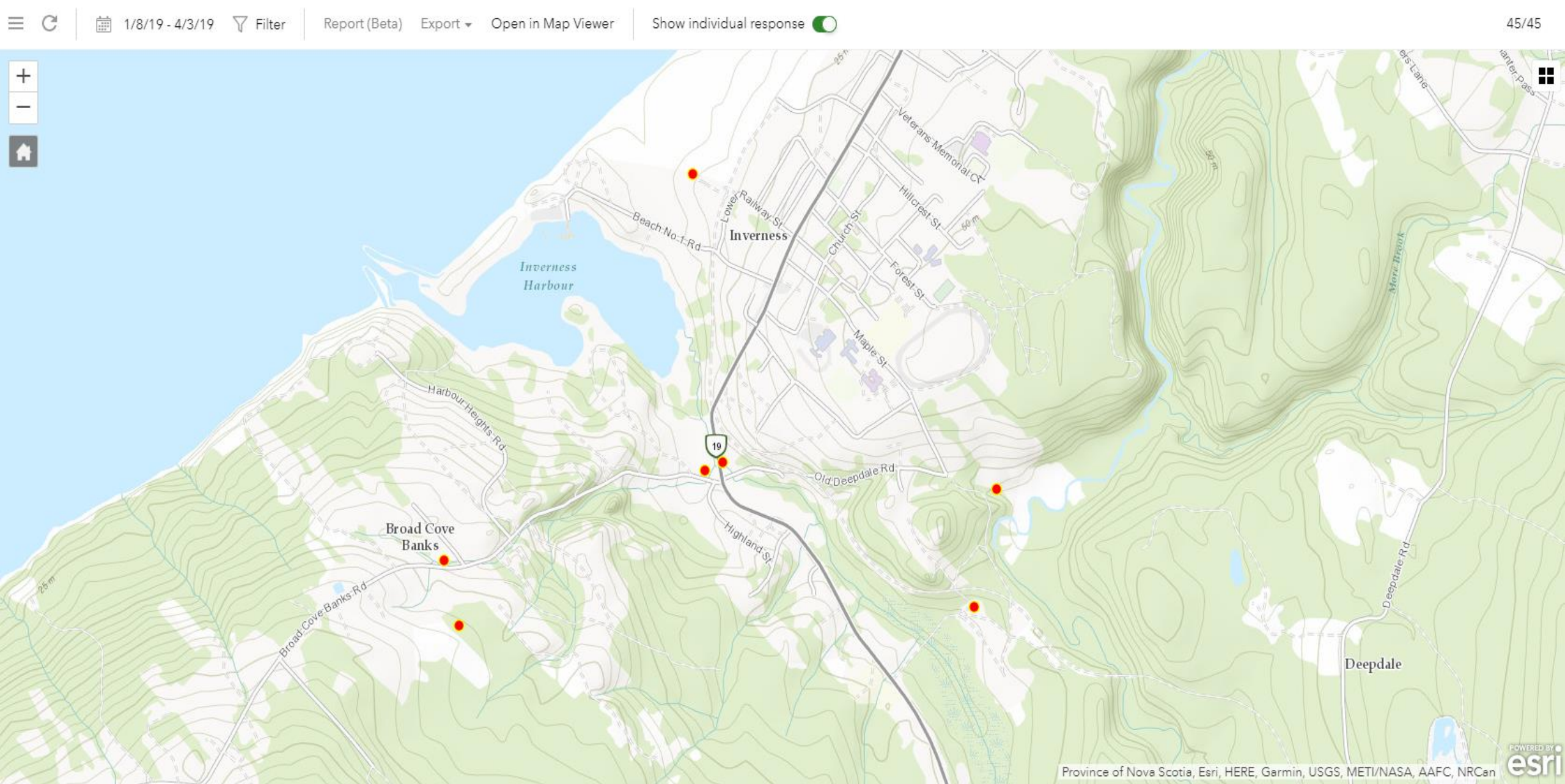


Figure 8 – Screenshot of GIS Mapping

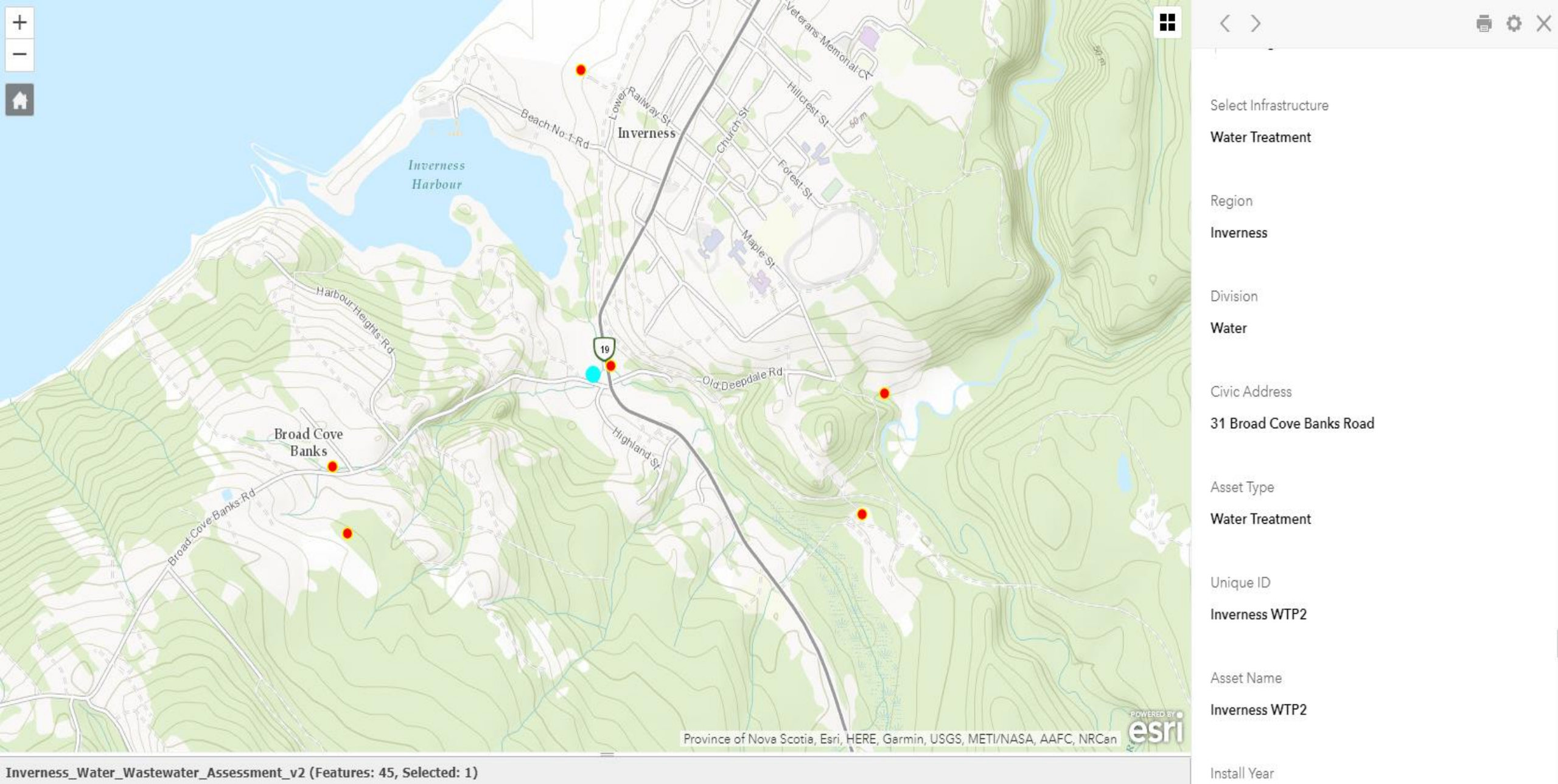


Figure 9 – Screenshot of GIS Mapping

Asset Hierarchy

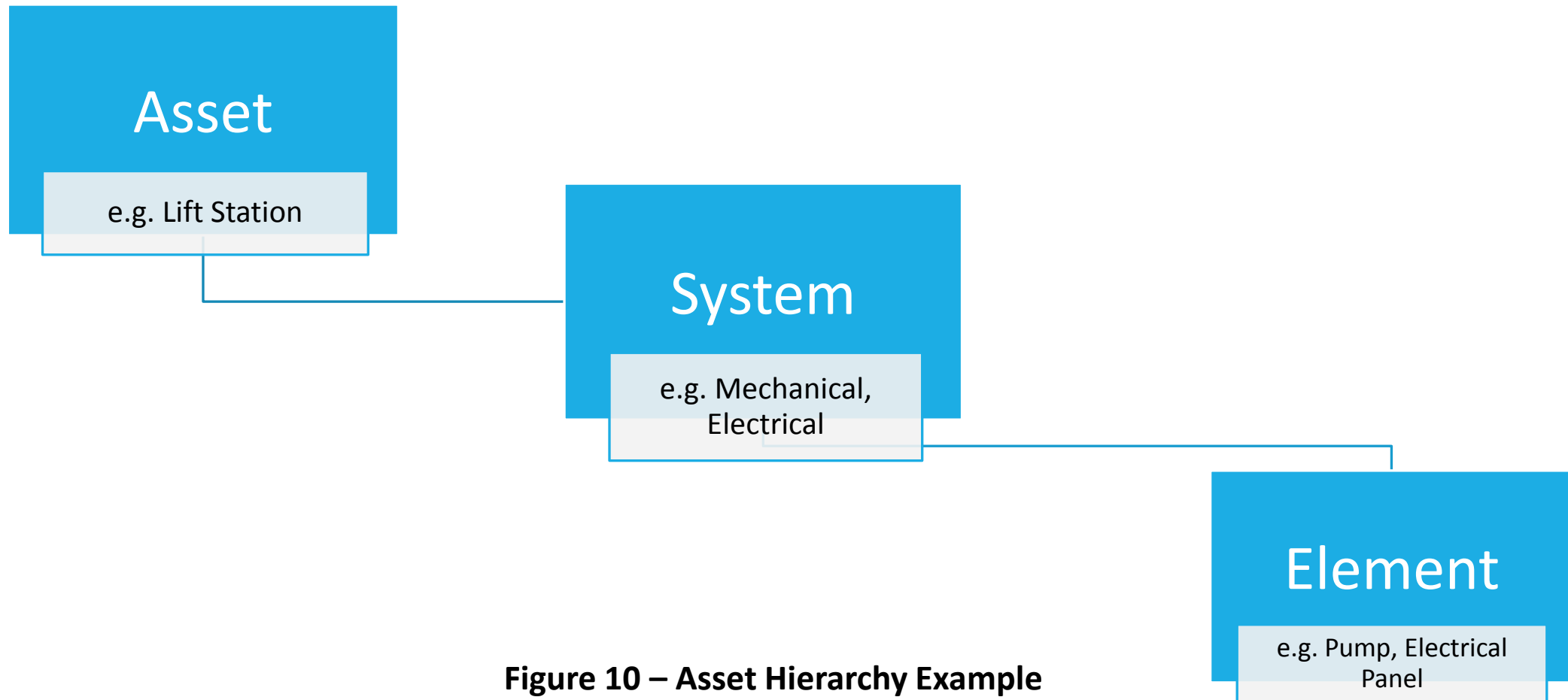


Figure 10 – Asset Hierarchy Example

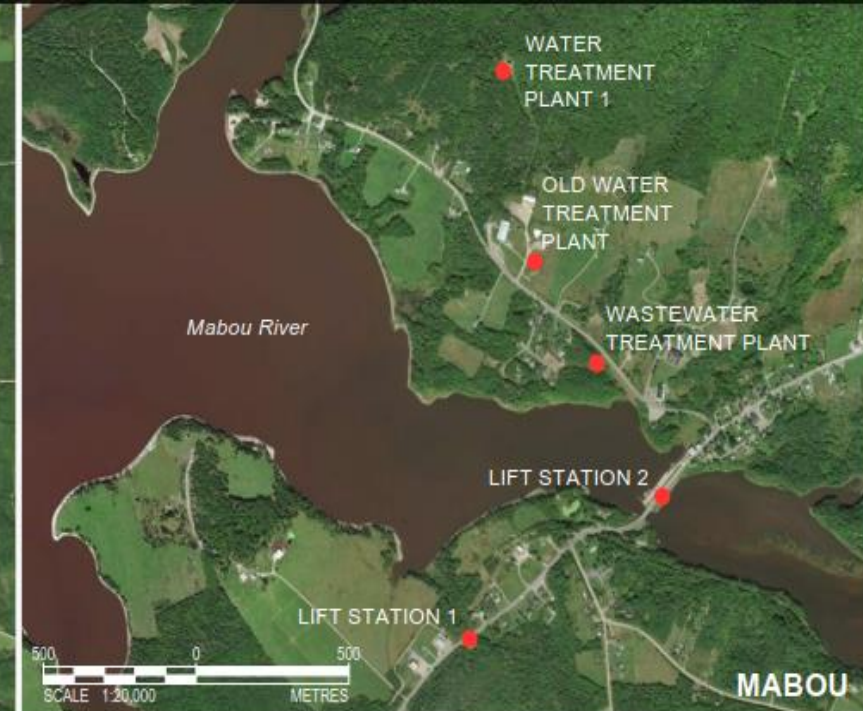
Inventory

MOCI Owns and Operates:

- **23** lift stations
- **2** water booster stations
- **7** WWTPs
- **9** WTPs (**2** inactive)
- **7** water reservoirs
- **45.7 km** of sanitary sewer
- **10.7 km** of wastewater forcemain
- **71.3 km** of watermains

General Breakdown of Assets (largest to smallest):

1. Inverness
2. Port Hood
3. Whycocomagh
4. Mabou
5. Cheticamp
6. Port Hastings
7. Judique





PORT HASTINGS

LIFT STATION 1

LIFT STATION 2

CAPE BRETON ISLAND

BOOSTER STATION

LIFT STATION 3

WASTEWATER TREATMENT PLANT

Strait of Canso

PORT HAWKESBURY

System Connections

Approximately **2,900** + connections

Table 2 – Estimated Wastewater Connections (MOCI 2018)

Community	Estimated System Connections	Percentage of MOCI
Inverness	1,500	51.4%
Cheticamp	450	15.4%
Whycocomagh	330	11.3%
Port Hood	300	10.2%
Mabou	160	5.5%
Port Hastings	105	3.6%
Judique	75	2.6%
TOTAL	2,920	100%

Condition Rating Scale

Table 3 – Condition Ratings for Assets

Rating	Condition	Description
1	Very Good	Like new/physically sound and performing as intended.
2	Good	Minor superficial deterioration.
3	Fair	Showing deterioration and wear.
4	Poor	Major portion of the asset is deficient, functions but has major problems.
5	Very Poor	Physically unsound, unreliable and has reached or exceeded useful life.

How Does an Asset Change Over Time?

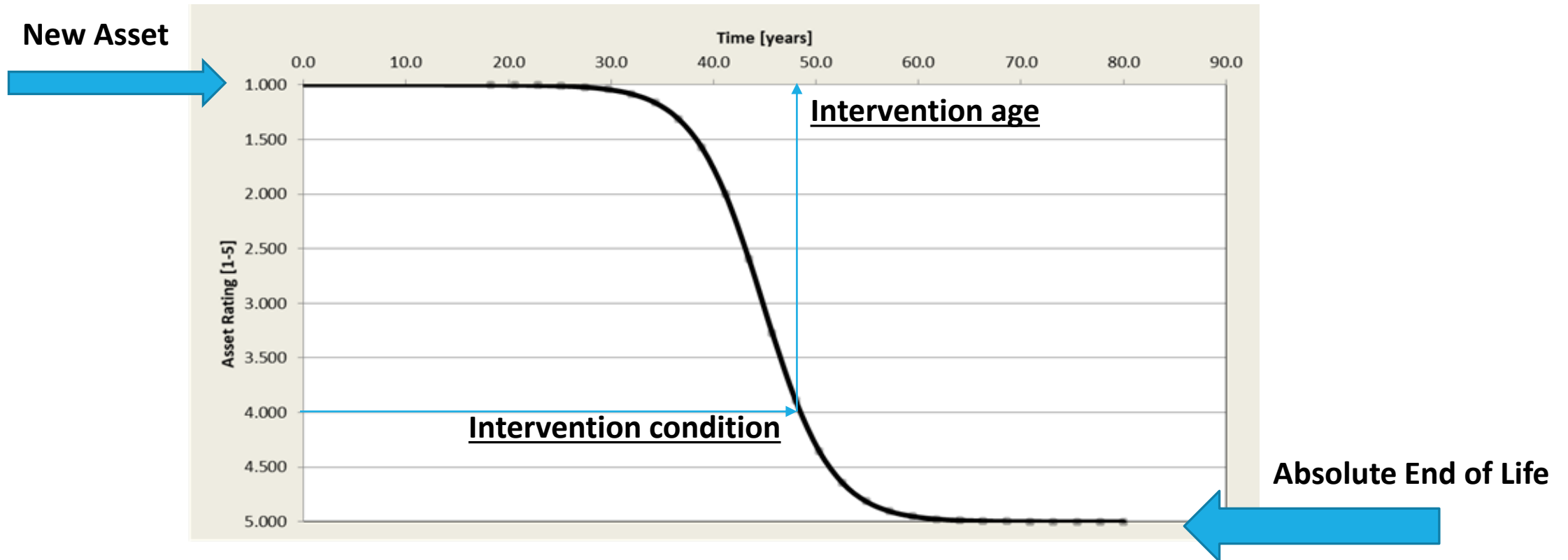


Figure 11 – Deterioration Curve for PVS/DPE Piping for W&WW Applications

Condition – Linear Infrastructure

- General condition of linear infrastructure is “fair” (middle scale)
- Watermains generally in **Worse** condition
- Forcemains generally **Fair** or **Very Good** condition

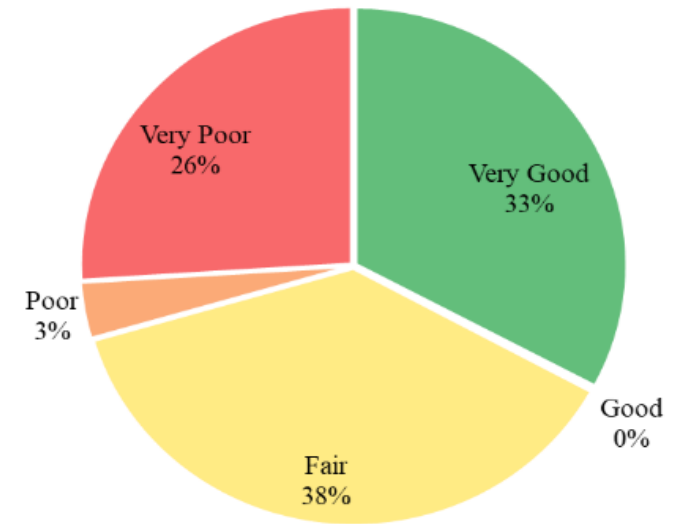


Figure 12 – All Communities, All Linear Assets

Condition – Linear Infrastructure

Table 4 - General Condition of Linear Infrastructure by Community

Community	Median Condition	Description
Inverness	Very Poor	Physically unsound, unreliable and has reached or exceeded useful life.
Cheticamp	Fair	Showing deterioration and wear.
Whycocomagh*	Very Good*	Like new/physically sound and performing as intended.
Port Hood	Fair	Showing deterioration and wear.
Mabou	Fair	Showing deterioration and wear.
Port Hastings	Fair	Showing deterioration and wear.
Judique	Poor	Major portion of the asset is deficient, functions but has major problems

Condition – Complex Infrastructure

- General condition of complex infrastructure is “**fair**” (middle of scale)
 - WWTP’s generally **lowest** condition rating
 - WTP’s generally **Fair** or **Good**.

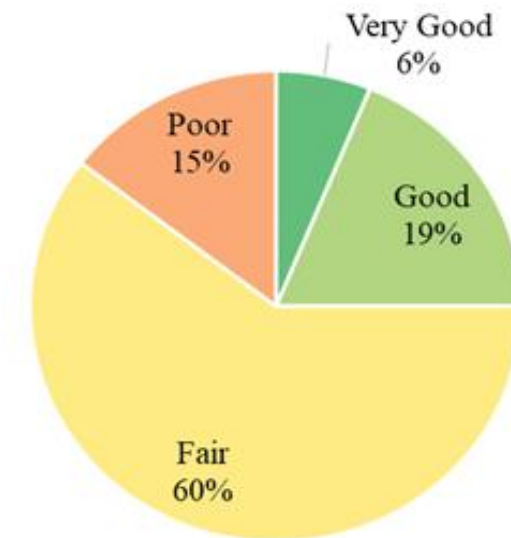


Figure 13 – Overall Complex Infrastructure Condition

Capital Investment Estimates

All assets require routine maintenance

- To meet the average level of service recommended
 - Budget minimum: **\$10.3 Million Per Year for capital improvements**
 - Larger investments → Improvement of asset condition
 - Trend overall condition towards **maintaining an acceptable level of service.**
 - Smaller investments → Slow improvement
 - Trend towards an **unacceptable** overall condition.
- Approximately **37% for linear** infrastructure and **63% for complex.**
- Significantly higher than the National Average
 - Due to: Infrastructure age and condition

Capital Investment by Community

Table 5 – Estimated Breakdown by Community

Community	Estimated Asset Replacement Value	Estimated 10 year Investment Cost	% of Total 10 Year Estimated Investment
Inverness	\$48.5 M	\$42.6 M	41.3%
Cheticamp	\$19.8 M	\$16.0 M	15.5%
Whycocomagh	\$28.0 M	\$7.7 M	7.5%
Port Hood	\$30.4 M	\$16.4 M	15.9%
Mabou	\$28.0 M	\$6.0 M	5.8%
Port Hastings	\$19.2 M	\$10.3 M	10.0%
Judique	\$12.0 M	\$4.1 M	4.0%
Total	<u>\$185.9 M</u>	<u>\$103.1 M</u>	<u>100%</u>

Capital Investment by Community

Table 6 – Estimated Breakdown by Community

Community	Total 10 Year Wastewater Cost	Total 10 Year Water Cost	Total 10 Year Estimated Investment Cost
Inverness	\$19.3 M	\$29.2 M	\$48.5 M
Cheticamp	\$12.6 M	\$7.2 M	\$19.8 M
Whycocomagh	\$9.6 M	\$18.4 M	\$28.0 M
Port Hood	\$14.8 M	\$15.6 M	\$30.4 M
Mabou	\$15.9 M	\$12.1 M	\$28.0 M
Port Hastings	\$12.3 M	\$6.9 M	\$19.2 M
Judique	\$5.7 M	\$6.3 M	\$12.0 M
Total	<u>\$90.2 M</u>	<u>\$95.7 M</u>	<u>\$185.9 M</u>

Risk Management

Risk = Probability x Consequence

- **Probability** → Asset's current condition
- **Consequence** → “Triple Bottom Line” > Hazard
 - (i.e., Public Health, Environmental Damages and Financial Costs)

Assets may also be “high value” or “core”

- Failure → Significant disruptions to the community served
- **Example: Judique Water Treatment Plant, or a collector lift station**



Risk Management Cont'd

Risk = Probability x Consequence

- **“Points”** assigned for each triple bottom hazard
 - Additional point for high value/core assets
- **Risk** calculated and used to prioritize upgrades



Table 7 – High Priority Upgrades (Complex Infrastructure)

Asset	Recommended Upgrade	Estimated Cost
Judique WWTP	Replace plant	\$2,900,400
Judique WTP	Complete detailed structural assessment of Judique dam	\$57,500
Judique WTP	Operational improvements to DAF ✓	\$60,000
Judique WTP	Program filters to automatically backwash ✓	\$12,000
Judique WTP	Install plant ventilation	\$90,000
Judique WTP	Water exploration/well setup	\$350,000
Inverness WWTP	Replace plant	\$4,700,000
Inverness WTP	Fix leaking storage tank	\$60,000
Inverness WTP	Water exploration/well setup	\$350,000
Whycocomagh WWTP	Replace plant	\$5,100,000
Whycocomagh WTP	Identify and repair major leaks in distribution system	\$70,800
Cheticamp LS4	Replace 40 HP generator and diesel fuel tank	\$97,750
Cheticamp LS5	Replace one submersible pump	\$18,000
Mabou WTP	Water exploration/well setup	\$350,000
Port Hood	Water exploration/well setup	\$350,000
Port Hood LS3	Replace one submersible pump	\$17,250

Recommended Upgrades

Table 8 – High Priority Upgrades (Watermains)




Region	Estimated Cost
Inverness	\$9,726,000
Judique	\$1,135,000
Mabou	\$50,000
Port Hood	\$373,000

Recommended Upgrades

Table 9 – High Priority Upgrades (Gravity Sewer)

Region	Estimated Cost
Inverness	\$7,185,000
Mabou	\$710,000
Port Hastings	\$20,000

Table 10 – Poor Performing Infrastructure

Region	Recommended Upgrade	Estimated Cost
Cheticamp	One or more pumps out of service (LS1-LS3, LS6)	\$74,750
Whycocomagh	Re-route wet well vents at LS1, LS2 and LS4 	\$4,500
Whycocomagh	Replace panel at LS4 	\$11,500
Whycocomagh	One or more pumps out of service (LS3)	\$23,000
Judique	Possibly replace or rehabilitate dam	Requires further assessment
Mabou	Decommission old WTP	\$200,000
Mabou	Install new station (LS1-LS2)	\$230,000
Port Hastings	One or more pumps out of service (LS2) 	\$17,250
Port Hood	Expose and Heat Trace line to Pressure Transducer (Water Storage Tank)	\$17,250
Port Hood	One or more pumps out of service (LS1, LS2, LS5, LS6)	\$70,000
Port Hood	Replace station (LS4)	\$230,000
All Communities	Fire Hydrant Replacement	\$8,500/hydrant ¹

¹ Assumes projects completed as standalone replacements (full mobilization/excavation)

Table 12 - Recommended Further Investigations

Asset	Rationale
Judique Dam	<ul style="list-style-type: none"> • Dam is in poor condition • Major risk to the downstream environment and community's water supply • Completion of detailed structural and condition assessment
Inverness and Port Hastings water storage reservoirs	<ul style="list-style-type: none"> • Reservoirs appeared to have been leaking out of their seams • Significant risk (adjacent environment and the community's water supply) • Investigate and repair immediately
Cheticamp wellheads	<ul style="list-style-type: none"> • Inaccessible during field visit, should be investigated
Cheticamp water reservoir ✓	<ul style="list-style-type: none"> • Reported that the roof on the tower experiences repetitive failures • Wind is assumed to be the cause of failure • Investigate to implement a permanent solution
Pre-purchased lift stations	<ul style="list-style-type: none"> • Reported that 2 purchased self-priming WW LS's are currently in storage (Truro, NS) • Current age and condition of these units is unknown • Investigate option of replacing certain lift stations

Going Forward

- Ongoing maintenance of asset management tool
- Annual capital investment/major maintenance programs
- Monitoring of long-term asset conditions
- Adjusting intervention points to reflect comfort with asset performance and level of service
- Development of ongoing maintenance plans for fire hydrants, valves, lift stations, pumps, ground water wells, facilities and plants

Questions/Discussion
