



Alberni-Clayoquot Regional District

Millstream Water System Asset Management Plan

Version 1.0

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1 EXECUTIVE SUMMARY

1.1 Purpose of the Plan

The Millstream Water System (MWS) Asset Management Plan (AMP) is part of the ACRD Asset Management program to facilitate informed decision-making and effective allocation of resources for infrastructure. The purpose of an AMP is to deliver sustainable, cost effective services to ACRD communities in a socially, economically, and environmentally responsible manner, while providing the Level of Service (LOS) agreed upon by the Board.

1.2 Asset Description

The Millstream Water System network includes:

- A water treatment building
- A 650 m³ reservoir
- 989 m of A/C Piping
- 96 m of PVC Piping
- 19 m of corrugated metal piping
- 2 fire hydrants
- 43 service connections

1.3 Levels of Service

The present funding levels are insufficient to continue to provide the existing services at current levels in the medium-term. The main service consequences will be more frequent service interruptions, a decline in water quality or loss of service.

1.4 Future Demand

The main demands for new services are created by:

- Growth rate (requests for new connections)
- Board of Directors and resident level of service expectations
- Legislative regulations including Island Health operating permit

These will be managed through a combination of managing existing assets, upgrading of existing assets and providing new assets to meet demand and demand management. Demand management practices include non-asset solutions, insuring against risks and mitigating failures.

1.5 Lifecycle Management Plan

Asset Management assists in conscious and calculated decisions for all assets covered in Plans from acquisition, operation, maintenance, disposal and renewal or upgrade. During the course of an assets life, the replacement value is known along with an estimated date of replacement based on age and condition. Annual contributions required are calculated for each component in each service so we can measure the funding gap between current and future Levels of Service in order to align funding and



service expectations. The AM Program achieves responsible and reliable lifecycle management practices.

The Asset Management Coordinator has created the Millstream Water System AMP with the assistance of McGill & Associates Engineering Ltd. and operations staff. Asset Management systems will continue to be maintained once this position expires by ACRD staff. Estimated service life (ESL) and replacement cost of the water system infrastructure were determined using comparable data in the Beaver Creek Water System Asset Management Plan version 1.0. Management staff provided risk assessments and goals.

1.6 Financial Summary

The MWS has a total current replacement value of \$1.21 million in 2019 dollars. This does not include a contingency for construction, engineering, financial, legal or administration costs. With an estimated inflation rate of 1.5%, estimated future replacement costs are \$1.95 million for current infrastructure at the end of the components estimated service life. Not included in the estimates are projections for future demand and projected capital upgrades. The community hasn't grown since the water system was first established so future growth is not expected. The current system does not meet the fire flow and fire hydrant requirements per the Fire Underwriters Survey (FUS). Total "All-In" project costs for pipe replacement are generally 200-215% of the cost of pipe materials. Total current project costs for upgrading the necessary pipes to meet fire flow requirements would cost approximately \$586,000. Upgrading the necessary pipes at their expiration will cost approximately \$789,000, with timelines aligning for both linear and reservoir replacements.

Renewals vs Upgrades?

Renewals: Returning infrastructure to the expected level of service with no added efficiency or benefit.

Upgrades: to improve quality, efficiency and level of service of infrastructure.

There are 43 water parcels within the Millstream Water System but they are not currently charged a parcel tax. The only fees paid by the users are quarterly water fees of \$181.25. The annual operating costs exhaust the revenue generated by water fees and, as a result, no funding is available for the long-term needs of the system. Based on the projected future renewal costs and the current reserve level, funding of the water system for the next 20 years will require annual investments of approximately \$36,200 or \$841 per parcel annually. In reality, renewal of system components will occur in cycles based on asset life, completion of major improvements and according to their condition and use.

The first suggested significant capital renewal project is in 2039 at \$400,000 for components or approximately \$840,000 All-In, based on current asset lifecycles.



1.7 Asset Management Practices

Our current systems to manage assets include:

- Vadim
- AutoCAD
- Microsoft Office

1.8 Monitoring and Improvement Program

The next steps resulting from this AMP to improve asset management practices are:

- Increase documented and regimented condition assessments
- Update and monitor asset conditions and rankings on an ongoing basis
- Update and monitor operation and maintenance costs on an ongoing basis
- Update inventory for disposals, additions and changes in useful life
- Implement a system-wide asset ID system for specific components and link with GPS
- Identify funding sources for capital water projects
- Implement ArcGIS using the newly acquired data
- Create a risk framework and assist in ranking priorities



2 INTRODUCTION

2.1 Background

This AMP encompasses all Millstream Water System assets, excluding maintenance vehicles. The purpose of the plan is to facilitate the strategic management of the water system infrastructure and the services provided by it, giving guidance on new and existing infrastructure to maximize use of financial resources long term, reduce risk and provide a prioritized view for service continuity and improvements over a 20 year planning period.

The ACRD AM Program follows the advice of the Asset Management BC Framework; Plans are designed to be living documents that change with the organization to reflect progress made while continuously striving for sustainable service delivery. Consideration of community priorities and an understanding of trade-offs between resources and desired services is the foundation of sound AM practices.



The AMBC Roadmap guides organizations through basic, intermediate and advanced Asset Management Practices. It is the goal of the ACRD to achieve a basic to intermediate level of understanding.

This AMP should be read in the context of the ACRD's Asset Management Policy and Strategy. The Millstream Water System AMP is a living document and will develop with AM practices and with the influence of the following corporate documents:

- Annual strategic priorities
- Short-term and long-term financial plans
- Water utility maintenance policies
- User rates and fees bylaw
- Grant applications and funding

Asset Management Plans are designed for several reasons. First, to guide Management and the board in planning and decision-making. Second, to aid in the creation of short term and long term financial plans as well as operational plans. Last, to spark community engagement for the service.

It is important to note that this is one of the first plans created under the AM Program. As the ACRD moves through the implementation process, knowledge and understanding of the AM program increases and it is expected that this plan evolve further, solidifying assumptions made and filling in any present information gaps where further research or information is required.

2.2 Asset Inventory

The Millstream Water System consists of linear and non-linear components including:

- Over 1,100 meters of water mains
- 43 service connections
- 2 hydrants
- A pump station
- A reservoir adequate for fire flows
- A series of line valves

Current replacement costs were estimated by Koers & Associates Engineering firm using unit costs from recent water main projects completed in Beaver Creek Water System. Unit costs include excavation, backfill, and surface restoration. Remaining useful life estimates were based on installation dates and expected service life provided by Koers & Associates Engineering based on knowledge and experience with water infrastructure and materials in place.

Any land associated with the MWS is not included in this AM Plan as there are no future plans for expansion, revival or rejuvenation of the current land.

2.3 Water Source & Emergency Preparedness

The MWS pulls water from two shallow wells and disinfects with chlorine. No other treatment methods are used.



The water is sampled on a weekly basis in the water system. Sample results show that there is no presence of total coliforms or E. coli found in the water. The most recent raw water testing, completed in December 2013, shows that there is surface water influence on the shallow wells; however, the presence of bacteria was limited. 2013 was also the last time that the treated water was tested to confirm that it meets the Canadian Drinking Water Quality Guidelines (CDWQG). Due to the size of the water system, MWS has not yet been ordered to comply with Island Health's 4321 regulations but it is expected that future compliance will be necessary.

In 2014, the MWS connected to the Ucluelet water system for emergency purposes only.

The Millstream Water System maintains updated emergency response procedures and has redundancy and back-up systems at the treatment and pump station. An official Water Emergency Response Plan, created in 2012 by McGill & Associates Engineering Ltd., outlines steps to respond to a catastrophic event.



2.4 Levels of Service

Levels of Service (LOS) are defined using two terms, customer levels of service and technical levels of service.

Customer LOS: measure how the customer receives the service and measure of value we provide.

Technical LOS: technical measures of performance relating to the allocation of resources to service activities to best achieve the desired outcomes and demonstrate effective performance.

- Operations – ongoing activities, day-to-day operations
- Maintenance – activities enabling an asset to provide service for its planned life
- Renewal – activities that return the service capability to near original capacity
- Upgrade – activities that provide a higher level of service



For the purposes of this report, customer’s level of service expectations are set upon the annual adoption of the financial plan and strategic priorities as it is a reflection of the values, policies, and priorities of the Board of Directors with input from committees and public engagement sessions. This will assist the ACRD’s Board of Directors and stakeholders in matching the level of service required, service risks and consequences with the community’s ability and willingness to pay for the service.

The current and expected customer Levels of Service detailed in Tables 2.1 and 2.2 shows the expected levels of service based on resource levels in the current financial plan. Organizational measures are measures of fact related to the service delivery outcome e.g. number of occasions when service is not available, condition percentages of Very Poor/Poor/Fair/Good/Very Good.

Table 2.1 - Customer Level of Service Objectives

| Values | Expectation | Performance/Organizational Measure Used | Current Performance | Forecast in 2038 with current budget. |
|-------------------------|--|---|---|--|
| Quality | Access to clean, safe potable water | Performance: Service calls relating to water quality Organizational: Quality samples meeting or exceeding Island Health and Canadian Guidelines for drinking water quality | <1 annual average 100% of samples exceed the Canadian guidelines for drinking water quality and no positive results for Coliform and E.coli. | It is reasonable to expect that this will stay the same as long as the wells and catchment area stay protected |
| Function | Reliable, consistent water services without interruption of services | Performance: Number of service interruption calls for water main breaks | <1 calls received annually for water disruptions | Likely to increase if renewals and upgrades requirements are not met |
| Capacity and Use | Access to potable water at the lowest possible rate | Well water levels are adequate to support demand. Reservoir has capacity for fire flows but distribution lines are undersized for fire flows | Well water levels and system operations are checked on a weekly basis. Linear assets do not have fire flow capacity | Well water levels could be depleted from excessive use or drought conditions if not monitored and conserved. No current budget for upgrades. |



Table 2.2 - Technical Levels of Service

| Service | Service Objective | Objective Measure | Current Performance | Desired Outcome |
|--------------------------------|---|--|---|---|
| Operations | Access to clean, safe, potable water | Water quality testing required by VIHA | Samples sent weekly to Island Health that all meet required standards | Add annual testing to confirm CDWQG are being met |
| Operations Budget | | | \$24,000 average annual operations/labour budget. Budget is insufficient to complete all operations and maintenance activities | Budget will increase with renewals and upgrades to the water system |
| Maintenance | Reliable, consistent water services without interruption | 1) Water main flushing 2) Regular maintenance 3) Condition assessments | 1) No current flushing program 2) Pipe repair is reactive 3) Condition assessments are not performed currently | 1) Annual flushing program 2) Replacements are proactive vs reactive 3) Regular assessments performed |
| Maintenance Budget | | | \$3,495 for 2018; \$4,000 average for subsequent years not including wages. Budget is insufficient to complete all operations and maintenance activities. | Budget will increase with the implementation of the flushing program |
| Renewal | Reliable, consistent water services without interruption | Infrastructure renewal needs are identified by operations staff and ESL | Using ESL and condition assessment rankings, 17% of MWS infrastructure is in either poor or very poor condition | Risk and priority frameworks identify required renewals before failures occur. Proactive vs reactive replacements. |
| Renewal Budget | | | No budget for renewals | \$651,000 over 20 years to meet renewal needs based on asset life cycles |
| Upgrade/ New | Upgrade remaining areas to meet fire flow requirements per FUS and user demands | Upgrade piping diameter in applicable areas within project budget amounts | 70% of MWS system piping does not meet fire flow requirements. | Fire flow upgrades prioritized in conjunction with current piping upgrade requirements based on ESL and pipe material |
| Upgrade/ New Budget | | | \$100,000 for 2018 for increased pump house reliability and redundancy. No upgrades budgeted for subsequent years | \$188,000 over 20 years to meet piping fire flow requirements |



It is important to monitor the service levels provided regularly as these will change as regulations and expectations change. The current performance is influenced by work efficiencies, technology, and Island Health regulations that will change over time. Review and establishment of the agreed position that achieves the best balance between service, risk and cost is essential.

2.5 Fire Flows and Required Improvements

The majority of MWS does not meet fire flow regulations stipulated by the Fire Underwriters Survey in “Water Supply for Public Fire Protection” and MMCD Design Guidelines. In order to meet regulations, we will need to improve the pipe diameter and/or material. The required fire flows are shown in Figure 2.3 – Fire Flow Requirements.

Table 2.3 – Fire Flow Requirements

| Land Use | Assumed Minimum Required Fire Flow | |
|---------------------------|------------------------------------|----------------|
| | Demand (L/s) | Duration (hrs) |
| Single Family Residential | 60 | 1.75 |
| Commercial/Institutional | 150 | 2 |
| Industrial | 225 | 4 |

It is recommended that the 989m of 100mm AC pipe be replaced with 150mm PVC in order to comply with the guidelines as the budget allows; however, there is currently no budget for upgrades.

Future updates and revisions to this plan will incorporate conversations amongst key stakeholders regarding aligning the level of service needed by the community, risks and consequences associated with these assets, the taxpayers’ ability and willingness to pay for various levels of service and the ACRD’s resource capacity. It is most likely that upgrades will occur as assets fail.

3 CURRENT STATE OF MWS LINEAR WATER INFRASTRUCTURE

3.1 Inventory

Table 3.1 - Assets covered by this Plan

| Asset Category | Qty | 2019 Replacement Value |
|-----------------------------|--------------|------------------------|
| Pump stations and buildings | 1 | \$421,000 |
| Piping | 1,085 meters | \$309,000 |
| Culvert | 19 meters | \$1,200 |
| Reservoirs | 1 | \$444,500 |
| Hydrants | 2 | \$12,600 |
| Valves | 54 | \$68,000 |
| TOTAL | | \$1,256,200 |



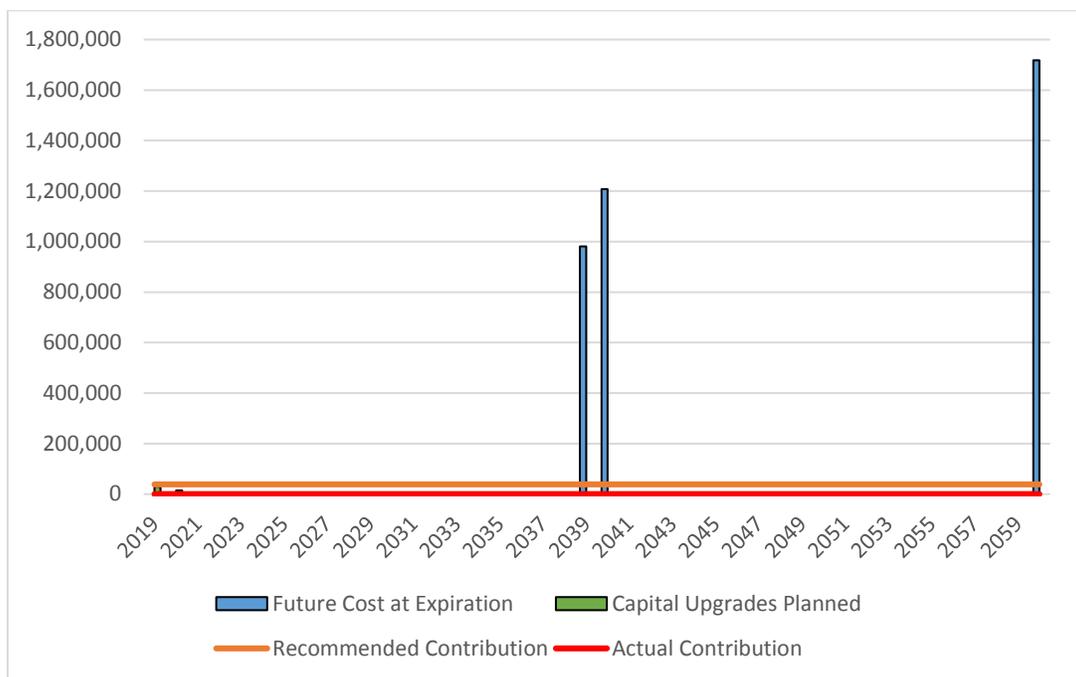
Costs are for supplies only; labour, engineering, financial, and administration costs are not included. Estimated total project costs use an “All-In” rate based on number of linear meters of pipe. Depending on the diameter of pipe, All-In rates typically range from 200-215% of the cost of pipe.

3.2 Replacement Costs and Dates

Asset management changes the financial focus from historical cost and annual amortization included in the ACRD’s financial statements to estimated replacement value, estimated service life, and annual capital investment required.

Almost half of the MWS assets are due for replacement within 20 years. Table 3.2 summarizes suggested infrastructure replacement dates and estimated costs by year until 2060. Renewals in years 2039 and 2040 make up over \$1 million in component renewal costs alone, stressing the need for a capital renewal plan now to meet future financial gaps. Collecting the recommended annual contribution from users shown below of \$37 thousand, or \$862 per parcel, will alleviate these spikes in capital expense.

Table 3.2 - Projected Timing for Capital Renewal



3.3 Condition Assessments

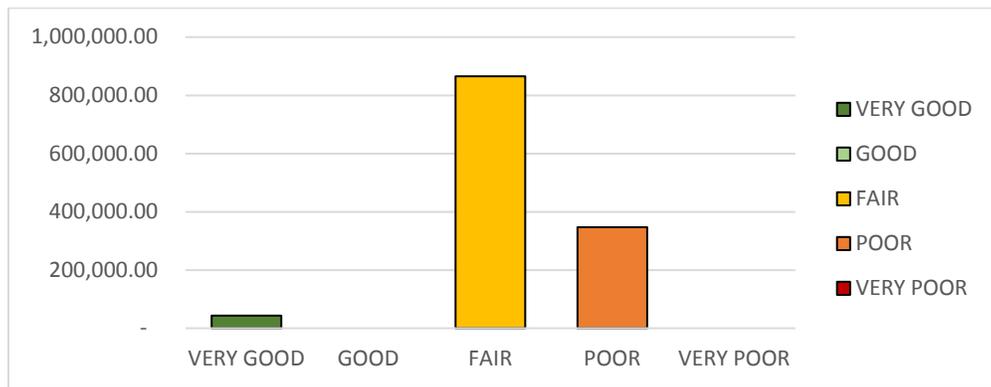
Regular condition assessments are not performed on components. In other ACRD water systems, the condition assessment is calculated along with the estimated service life remaining to determine the overall condition rating of the asset. This data is not available for Millstream Water System. Regular



condition assessments are part of the improvement works outlined in this Plan. For the purposes of this Plan, estimated remaining service life was the only basis for our condition assessments. Based on estimated service life, 82% of the MWS assets assessed have a fair to very poor physical condition.

Table 3.3 shows the current cost to replace assets based on the percentage of estimated useful service life remaining.

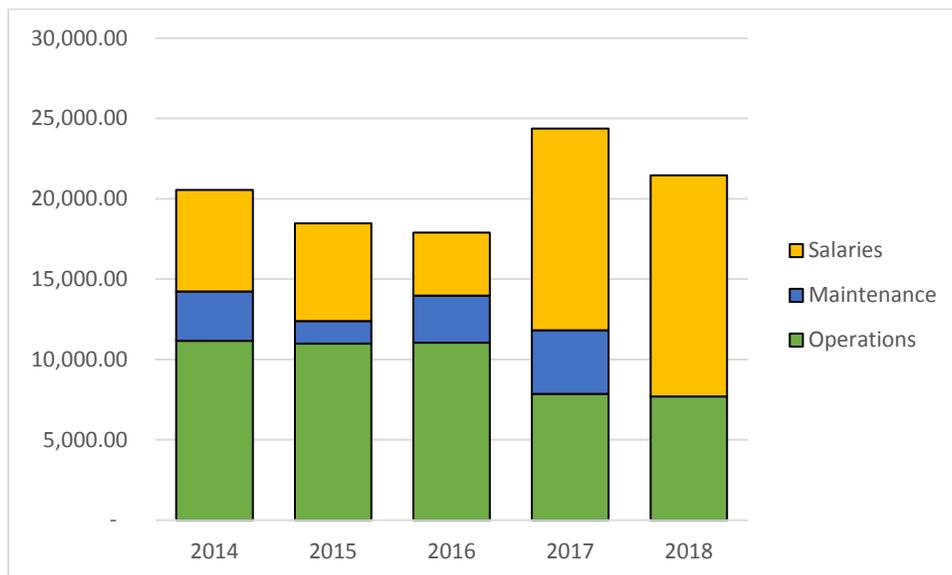
Table 3.3 – Current Replacement Cost by Percentage of ESL Remaining



3.4 Current Operations and Maintenance Costs

A key function of Asset Management is to track maintenance costs separate from operations costs to identify areas that are requiring more repairs as an indication of failing infrastructure. Table 3.4 shows the trend in combined operations and maintenance costs since 2014.

Table 3.4 – Operations and Maintenance Cost Trends





Average operation and maintenance costs total \$20,550 per year, including salaries and benefits. Historically, operations costs were for operations contract costs only. Going forward, operations and maintenance costs will be tracked separately in our accounting software as a part of the improvement plan in order to identify spikes in maintenance costs, indicating a failure of infrastructure. Operations costs will be cost associated with day-to-day expenses.

Within the Beaver Creek Water System, there is the ability to track the water in versus water out. The difference between these amounts is Non-Revenue Water (NRW). NRW is an indication of leaks within the system. Since MWS does not have metered service connections, it is impossible to know if there are any leaks between the pump station and residences. Leaks are repaired as residents or maintenance workers note them.

3.5 Risk Management Plan



Risk management is a key objective set out in our Asset Management Policy. With acceptable Levels of Service in mind, we have adopted a risk management framework to assess and rank criticality of the ACRD's infrastructure assets. One of the outcomes of implementing risk management is the ability to prioritize required capital expenditure based on criticality for the MWS.

The goal in adopting a framework is to have a consistent accurate understanding of the state of the MWS's infrastructure. The framework includes a standardized grading system that is easily repeatable, enables comparison of the status of infrastructure condition over time and across municipalities for comparison.

A risk matrix has been prepared and will be used for risk ratings throughout the ACRD. This matrix will also be used in conjunction with regular condition assessments to properly

evaluate new and existing risks.

The risk assessment process identifies credible risks, the likelihood of the risk event occurring, the consequences should the event occur, develops a risk rating, evaluates the risk and develops a risk treatment plan for non-acceptable risks. Critical risks are those assessed with 'Very High' (requiring immediate corrective action) and 'High' (requiring corrective action) risk ratings identified in the assessment process.

According to the General Manager of Environmental Services and Manager of Operations, the following are credible risks that could create a "High" risk rating at this time:



1. A good portion of linear assets are asbestos cement material piping (AC piping) creating added risk and exposure to asbestos, friable material when cutting, removing, adjusting, replacing and wet tapping into AC piping. The asbestos does not pose a public health risk.
2. Water flow restrictions for fighting fires. Currently a good portion of the MWS linear inventory does not meet current fire flow regulations in accordance with the most recent version of the MMCD Design Guidelines and the “Water Supply for Public Fire Protection” by the Fire Underwriters Survey (FUS), making it harder to put out larger fires within Millstream.
3. Natural disaster causing a catastrophic environmental event i.e. earthquake, tsunami, windstorm, drought, etc. This could affect power, water quality, pipe integrity and the ability to service the area.

4 ASSET MANAGEMENT IMPROVEMENT PLAN

4.1 Water Infrastructure Replacement Priority Ranking

Table 4.1 lists the components within the MWS in order of their required estimated replacement. This information can be used to aid in creating a Long-Term Asset Management Financial Plan (LTAMFP) for this class of assets.

When budgeting for future projects, it is recommended that a 30% general contingency and a 30% allowance for construction, engineering, financial, legal and admin costs be added to total project costs.

It is important to note the volatile prices of construction materials. Many factors can change the costs of materials required for projects and while the actual costs may differ, only the most current and available costs are used.

Table 4.1 – Improvement Works

| Component | Length or Quantity | Current Replacement Costs (pre-tax, pre-contingency) | Risk | Estimated Service Life Remaining in Years |
|---|--------------------|--|----------|---|
| AC Piping | 989m | 279,227 | High | 20 |
| Assorted Valves | 54 | 67,760 | High | 20 |
| Replacement Cost – High Risk | | \$ 346,987 | | |
| Treatment building | 1 | 420,886 | Moderate | 21 |
| Reservoir | 1 | 444,413 | Moderate | 41 |
| Replacement Cost – Moderate Risk | | \$ 865,299 | | |
| New Fire Hydrants | 2 | 12,550 | Low | 59 |
| Culvert – connection to Ucluelet | 19m | 1,192 | Low | 65 |
| Miscellaneous PVC Piping | 96m | 29,551 | Low | 65 |
| Replacement Cost – Low Risk | | \$ 43,293 | | |
| Total Current Replacement | | \$ 1,255,579 | | |



While the areas rated “High” for failure have a current total cost of \$346,987, the final project cost will be approximately \$980,000 when considering inflation, engineering and construction costs.

4.2 Improvement Plan

The tasks identified in the Table 4.2 are required to achieve the MWS asset management objectives, manage risks, and close the gap between current and targeted levels to achieve within the AMBC road Map. The table also identifies the integration of these tasks into the organization as recommended by the AMBC Framework.

Table 4.2 – Improvement Plan

| Task# | Task | Responsibility | Resources | Timeline |
|-------|---|--|---|-------------------------------|
| 1 | Implement operations process for documenting condition assessments of water mains, fire hydrants and pumps etc. | Environmental Department | AMP for MWS Canadian infrastructure condition grading system | Spring 2019 |
| 2 | Update and monitor component specific operation and maintenance costs | Asset Management Coordinator | Finance Department | Semi-annually |
| 3 | Update water asset inventory for disposals, additions and changes in useful life - AM fixed asset review | Environmental and Finance Department | MWS Asset Registry and MWS Staff | As projects occur or annually |
| 4 | Regional asset identification system for specific components to record expense at the asset level | Finance Department, Mapping Technician | AM Registry, MWS Staff | In progress |
| 5 | Identification of funding sources for capital water projects | Finance department & Environmental Department | Grants, capital reserves, utility fees, property tax etc. | Ongoing |
| 6 | Implement ArcGIS to gain a better understanding of asset locations and conditions | Mapping Technician/Planning Department | MWS inventory data, AutoCAD data | To be determined |
| 7 | Create a Risk Framework and annual assessment process | AM committee, Financial Department, Environmental Department | Associate Engineering Risk Workshop and NAMS Canada Core Risk Management Registry | In progress/ annually |



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