REPORT

Union Water Supply System (UWSS)
Asset Management Plan

APRIL 2024

Associated Engineering

GLOBAL PERSPECTIVE.
LOCAL FOCUS.

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

ADD – Average day demand

AMP – Asset management plan

AWWA – American Water Works Association

CAPEX – Capital expenditures

CCP – Critical control point

CCTV – Closed circuit television

CRV – Current replacement value

DAF – Dissolved air filtration

DBP – Disinfection by-products

DWQMS – Drinking water quality management standard

ET – Elevated tower

GHG – Green-house gas

GIS – Geographical information system

HABs – Harmful algal blooms

HVAC – Heating ventilation and air conditioning

ICI – Industrial, commercial and institutional

ISO – International Standards Organization

L/s – Litres per second

LOS – Level of service

MDD – Maximum day demand

MECP – Ontario Ministry of Environment, Conservation and Parks

MG – Million gallons

MG/d – Million gallons per day

ML – Mega litres / Million litres

MLD – Mega litres per day

O.Reg – Ontario regulation –

OCWA – Ontario Clean Water Agency – The organization responsible for the day-to-day operations of the UWSS

OPEX – Operational expenditures

PFAS - Perfluoroalkyl and polyfluoroalkyl substances

PSAB – Public Sector Accounting Board

PTTW – Permit to take water

QEMS – Quality and environmental management system

SCADA – Supervisory control and data acquisition system

TCA – Tangible capital assets

Tmax – Maximum temperature

UV – Ultra-violet

UWSS – Union Water Supply System - refers to the physical supply system of pipes, towers, plants etc.,

UWSS Inc. – Refers to the administrative organization that manages the system

WQMP – Water quality master plan

WTP – Water treatment plant

1 INTRODUCTION

1.1 Purpose

This Asset Management Plan (AMP) is an integral part of effective utility management for the Union Water Supply System (UWSS). The primary goal of Union Water is to manage the assets efficiently, ensuring the provision of water supply to meet established service levels at acceptable cost and risk.

The purpose of the AMP is to document the investment required in the system from abstraction, through treatment, and storage, to supply of potable water. It details the investment to maintain the provision of services, accommodate the needs of growth, meet new regulatory requirements and changing service expectations and build resilience in the face of a changing climate and other risks. It includes consideration of all supporting activities necessary for the lifecycle management of assets.

The AMP has been developed in alignment with Ontario Regulation 588/17 (O-Reg 588/17). This regulation requires the strategic management of drinking water infrastructure to ensure reliability, quality, and sustainability.

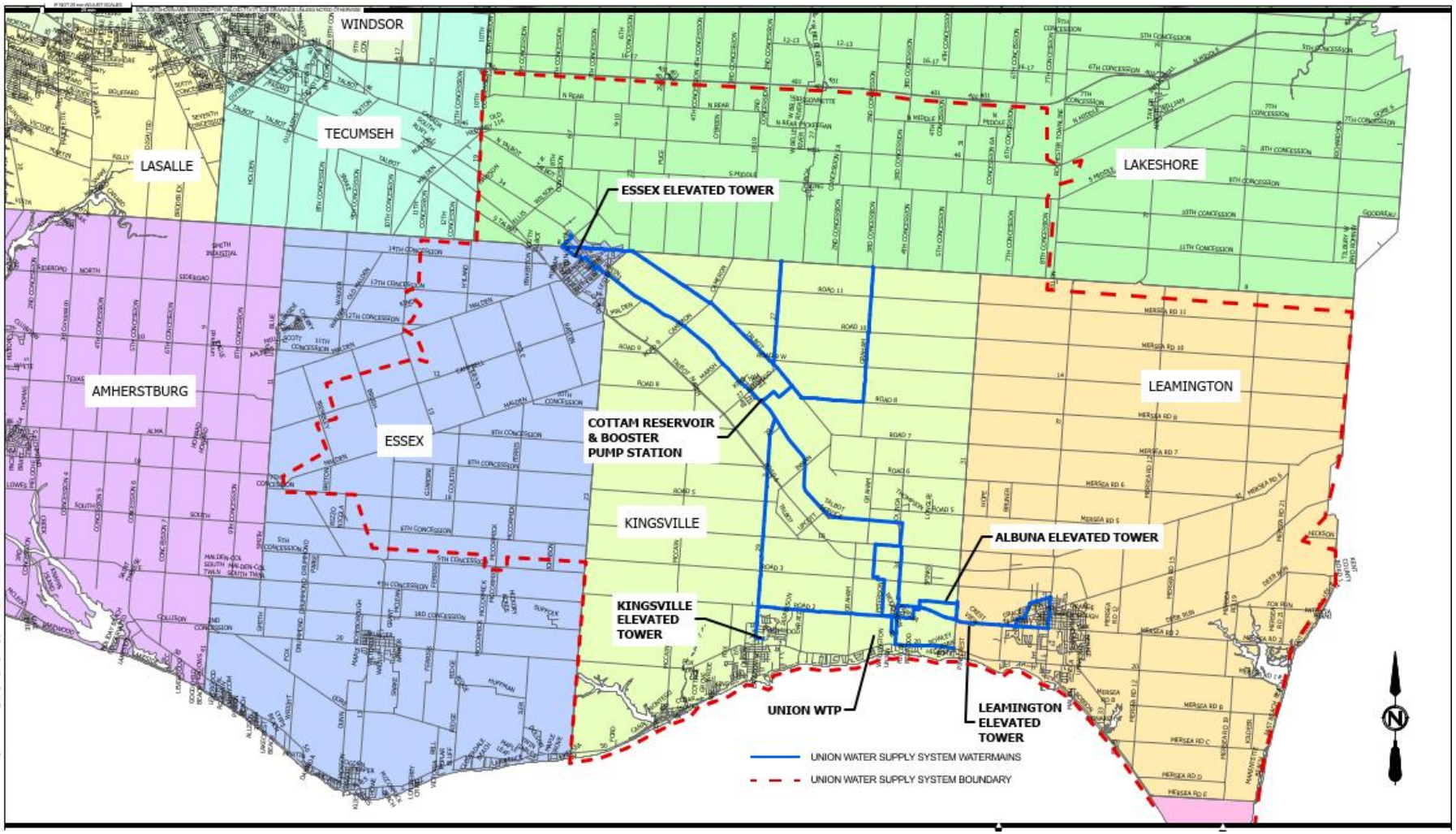
1.2 Background

The Union Water Supply System (UWSS), situated in the southeastern area of Essex County, Ontario, provides treated water to Leamington, Kingsville, parts of Essex and Lakeshore. The system provides bulk water to the municipal counties serving a population of approximately 66,800, along with many commercial, industrial, and agricultural clients. The system has significant business users, including major food processing companies and many hydroponic greenhouses. The core water treatment, storage and transmission assets are owned by UWSS Inc., while the local distribution systems are owned and operated by the individual municipalities of Leamington, Kingsville, Essex, and Lakeshore. **Figure 1-1** shows an overview of the supply system boundary, water treatment plant, elevated towers (reservoirs), booster pump station and watermains under UWSS Inc.

Operational services for the UWSS, including maintenance of its infrastructure and ensuring regulatory compliance, are contracted to the Ontario Clean Water Agency (OCWA). OCWA dedicates about 14 staff members to the UWSS, utilizing all necessary resources to keep the system functioning optimally. The UWSS Inc. General Manager and CEO is responsible for overseeing adherence to the operating agreement and provides monthly updates to the board.

The UWSS operates a single water treatment plant located in Ruthven, Town of Kingsville. This plant draws raw water from Lake Erie's western basin through two offshore intakes and has a capacity of processing 124,590 cubic meters of potable water daily (27.4 million Imperial Gallons). The system includes a booster pumping station and an underground reservoir in Cottam, Kingsville, as well as elevated towers in Leamington, Essex, and Kingsville. The Ontario Clean Water Agency (OCWA) is also contracted for managing the operation of this plant and its related facilities.

Figure 1-1 Union Water Supply System Infrastructure and Boundary



1.3 Asset Management Plan Structure

This asset management plan is set out in 8 main sections as described below:

1. ***Introduction*** (this section): Sets out the purpose of the AMP and context of the UWSS.
2. ***Objectives:*** Describes the key stakeholders in the system, their service expectations and UWSS objectives where available.
3. ***Current Status:*** Provides the current status of the existing infrastructure, and services provided.
4. ***Risk:*** Describes the key infrastructure and organizational risks to achieving objectives given the current state.
5. ***Lifecycle Management:*** Sets out the strategies and actions required to mitigate risks, maintain serviceability, accommodate the needs of growth, and meet new regulatory requirements and service expectations.
6. ***Financial Summary:*** Provides the high-level summary of expenditure needs to deliver the strategies and actions over the next 10 years.
7. ***Assumptions and Uncertainties:*** Describes some of the assumptions made in the development of this plan and uncertainties associated with the projections made.
8. ***Plan Execution, Monitoring and Control:*** Sets out a provisional framework for the governance and monitoring of the implementation of this plan.

1.4 Guiding Documents and Inputs

The development of this inaugural AMP has been primarily guided by Ontario Regulation 588/17 (O. Reg. 588/17) and other supporting documents relevant to Ontario's water management sector (see the References section at the end of this document).

It also draws on information, and is in alignment with, a variety of studies, plans and guidance documents including:

- surrounding municipality official plans and asset management plans (Kingsville, Essex, Lakeshore, and Leamington)
- UWSS 2024 10-year capital plan
- UWSS Financial Plan
- UWSS Energy Conservation and Demand Management Plan
- UWSS Operational Plan (OCWA)

UWSS has not yet developed a strategic plan but has developed a draft strategic asset management policy. This asset management plan is in alignment with the commitments in the draft policy.

2 OBJECTIVES

2.1 Interested Parties and Expectations

UWSS Inc. customers include residential, commercial and industrial end-users within the identified UWSS service boundaries. However, there are many other interested parties in the activities of UWSS and the services provided.

- **Service Customers:** UWSS Inc. provides a water treatment and transmission service to customers within the UWSS boundaries and bills the end users based on volume.
- **Municipalities:** The UWSS feeds into the municipal distribution systems (Essex, Kingsville, Lakeshore, and Leamington). UWSS Inc. collaborates with the municipalities through collaboration agreements, to establish service expectations and responsibilities.
- **Developers:** Understanding growth expectations, development needs and where that development is likely to occur is critical for UWSS Inc. such that it can plan and respond appropriately. There needs to be a two-way communication and level of transparency between UWSS, the development community, and municipalities.
- **Commercial and Industrial Customers:** This category includes large users of water supply and includes for example the commercial greenhouse farms. Their needs and expectations in terms of water quantity and quality may be different from those of residential service customers.
- **Service Providers**: This includes OCWA and UWSS Inc. staff and other entities who may be involved in supporting, the provision of services through the supply system.
- **Regulators:** These are governmental bodies at the provincial or federal level, influencing service provision through laws, regulations, and higher-level planning.
- **Emergency Services:** The water supply system commonly forms an integral part of emergency response, in particular for fire fighting. The various emergency services departments in the region are recognized as an important interested party in the UWSS.

Table 2-1 provides a summary of the expectations of these groups. This provides an indication of the important dimensions of service that UWSS Inc. uses as the basis for setting objectives.

Table 2-1 Customer Expectations

Customer Group	Expectations of UWSS
Municipalities	Quality and reliability of water supply. Transparency and awareness of service issues.
Service Customers	Quality and reliability of supply and affordability of ultimate service.
Developers	Transparency of availability and capacity in different locations and engagement on development needs.
Commercial and Industrial Customers	Quality and reliability of supply. Efficiency and affordability of services Ability for engagement in relation to needs.
Service Providers	Health and safety of work environment. Awareness and transparency of performance.
Regulators	Regulatory compliance including environmental, water quality, and other compliance factors and transparency, accuracy and timeliness of reporting.
Emergency Services	Reliability, pressure and capacity of supply. Transparency and awareness of supply limitations or restrictions.

2.2 Objectives and Regulatory Requirements

The following stated objectives of UWSS Inc. have been compiled from existing documentation, including plans and regulatory requirements.

Outcome related objectives:

- Achieve 100% compliance with water quality standards with the Province of Ontario's Drinking Water Quality Management Standard (DWQMS) to align with the vision of providing safe and reliable water services.
- Reduce operational carbon emissions by 50% by 2030 to meet the goal of sustainable environmental management.[1]
- Enhance customer satisfaction, aiming for over 90% of customers to be very satisfied with services by 2027.
- Decrease the number of properties affected by service outages by 50%, enhancing service reliability and resilience.
- Implement technical measures like reducing water losses (specific volume to be determined) by 2030 and cutting down taste and odour complaints by 50%.

While these objectives don't fully cover the level of service expectations of the identified interested parties in the activities of UWSS Inc. they do provide a preliminary framework to inform decision making for the development of strategies and actions.

In addition to the above, it is a given that UWSS Inc. also seeks to comply with wider regulatory requirements. Key elements of these are outlined here.

Regulatory compliance maintenance objectives:

- Adherence to relevant federal and provincial legislation and municipal by-laws, including standards and procedures for the safe operation of water systems.
- Compliance with standards for microbiological, chemical, and operational parameters as mandated by the regulation.
- Follow the requirements of the Safe Drinking Water Act, including the provision of notices and reporting to the Spills Action Centre and other relevant authorities in case of incidents or non-compliance.
- Ontario Regulation 453/07, which details the financial planning requirements for municipal water providers, including approval processes and the content of financial plans.
- Infrastructure for Jobs and Prosperity Act, 2015, mandating municipalities to prepare and implement asset management plans, with specific phases and deadlines for compliance.
- Ensure all operations and maintenance activities adhere to the Drinking Water Systems Regulation O. Reg. 170/03.
- Ontario Regulation 397/11, under the Green Energy Act, 2009 requires public agencies including municipalities, universities, colleges of applied arts and technology, school boards, municipal service boards (for water and sewage treatment and pumping operations) and hospitals to report their annual energy use and greenhouse gas emissions in designated facilities by July 1st, beginning in 2013.

[1] Energy Conservation and Demand Management Plan

2.3 Growth and Future Demand

2.3.1 Growth Projections

Projected population growth and growth areas were provided by each of the municipalities as part of this analysis. The projected growth for each is outlined in the sections below. 20-year growth data is not currently available for the region. As an alternative, a second 7-year scenario was created, which considers the possibility of higher demand projections in the same time period. 2 and 7-year growth projections were considered as part of the initial AMP.

The following factors were used to predict future water demands:

For 2 and 7-year demands:

- A per capita demand of 265 L/cap-day;
- A maximum day factor of 2.0 for residential and ICI;
- An average day demand of 0.0787 L/s per acre for greenhouse growth;
- A maximum day factor of 2.4 for greenhouse demand; and
- A non-revenue water adder of 50 L/cap-day.

For 10-year higher demand:

- An increased residential demand in Essex of 15% to account for the second dwelling unit policy;
- An increased maximum day demand of 0.316 L/s for greenhouse growth; and,
- An increased maximum day factor of 3.5 for traditional agriculture to account for climate change.

Leamington: The Leamington demands associated with growth are summarized in **Table 2-2**. Growth is as per a study completed by C3 Water reviewing growth and system needs in Leamington.

Kingsville: The Kingsville demands associated with growth are summarized in **Table 2-3**. The amount and location of growth was provided by the Kingsville Planning Department.

Table 2-2 Leamington Growth

Description	2-Year (2026)	7-Year (2031)
Residential Population Growth	4,717	6,492
ICI/Employment Population Growth (Equivalent Population)	772	1,544
Greenhouse Growth (Acres)	1,206	1,957
Greenhouse Growth (Equivalent Population)	30,945	50,215
Total Equivalent Population	36,434	58,251
Total Average Daily Demand (ADD)	132.8 L/s	212.4 L/s
Total Maximum Daily Demand (MDD)	282.5 L/s	452.6 L/s

Table 2-3 Kingsville Growth

Description	2-Year (2026)	7-Year (2031)
Residential Population Growth	1,531	3,061
ICI/Employment Population Growth (Equivalent Population)	900	1,800
Greenhouse Growth (Acres)	300	600
Greenhouse Growth (Equivalent Population)	7,698	15,396
Total Equivalent Population	10,129	20,257
Total ADD	37.4 L/s	73.9 L/s
Total MDD	68.4 L/s	154.9 L/s

Essex: The Essex demands associated with growth areas are summarized in **Table 2-4**. The amount of growth is as per the Development Charges Background Study (Watson & Associates Economists Ltd., 2019), with the locations provided by the Essex Planning Department.

Impact of second dwelling policy in Essex

Additionally, Essex identified that they will be implementing a new policy that will allow for second dwelling units in detached structures to be added in agricultural and residential districts (separate independent housekeeping units). The number of properties that will make use of this policy to add a second dwelling, and the corresponding impact on water demands for these properties, is unknown and, as such, has been excluded form the base 2- and 7-year growth scenarios; however, it is recommended that some additional demand be included in the 7-year higher usage scenario to account for this potential future source of water demand.

It is assumed that the addition of a second dwelling unit would, at most, double the water usage of that property. It is unlikely that 100% of the eligible properties will use this new policy within the next 7-years. If 50% of the eligible properties added a second dwelling unit, and each second dwelling unit doubled the water usage of that property, that would correspond to an overall demand increase in the eligible area of 25%, whereas if 25% of the properties use this new policy, that could correspond to an overall demand increase in the eligible areas of 12.5%.

Given the uncertainty and recognizing that significant over estimation of demands could lead to recommendations that could pose water quality concerns, it is recommended that an additional 15% demand be assumed in Essex and applied to agricultural and residential districts for the 7-year higher usage scenario to account for this potential future source of water demands.

Table 2-4 Essex Growth

Description	2-Year (2026)	7-Year (2031)
Residential Population Growth	576	1,152
ICI/Employment Population Growth (Equivalent Population)	280	559
Total Equivalent Population	856	1,711
Total ADD	3.1 L/s	6.2 L/s
Total MDD	5.7 L/s	11.5 L/s

Lakeshore: The Lakeshore demands associated with growth areas are summarized in **Table 2-5**. Note that, although the amount of growth was identified in the latest Growth Analysis Study (Watson & Associates Economists Ltd., 2015), the precise location of the Lakeshore growth within North and South Woodsley areas was not identified and has been assumed.

Table 2-5 Lakeshore Growth

Description	2-Year (2026)	7-Year (2031)
Residential Population Growth	116	231
Total ADD	0.4 L/s	0.8 L/s
Total MDD	0.8 L/s	1.6 L/s

2.3.2 Future Demand

Table 2-6 summarizes the overall future system demand, by pressure zone, including both the 7-year and the higher usage 7-year scenarios. As noted above, the 7-year Higher Usage scenario includes a 3.5 maximum day peaking factor for agricultural use due to climate change, and an additional 15% demand in Essex to account for the second dwelling unit policy.

The storage requirements for the UWSS system were reviewed in accordance with the criteria identified in the Ministry of Conservation and Parks (MECP) Design Guidelines for Drinking Water Systems (2008), as follows:

- Equalization Storage (A) = 25% of Maximum Day Demand
- Fire Storage (B) = Varies Based on Equivalent Population (Max of 378 L/s (7.2 MG/d) for 6 hours)
- Emergency Storage (C) = 25% of (A+B)

Individual storage requirements are typically considered for each pressure zone within a system. This is particularly important for systems where the storage is floating (i.e., elevated tank) as there are additional criteria that floating storage must meet, which are unique to each pressure zone. These criteria are:

- Maximum top water level of all storage components: must maintain zone pressure less than 700 kPa (100 psi).
- Minimum low water level of equalization storage (low water level during non-emergency operation): must provide 275 kPa (40 psi) to the majority (>99%) of the pressure zone.
- Minimum low water level of fire and emergency storage (low water level during emergency events): must provide 140 kPa (20 psi) to the entire pressure zone.

In the case of the UWSS system, a large portion of the system storage is pumped storage located at the water treatment plant (WTP), with additional pumped storage located at the Cottam Reservoir. Additionally, there are interconnections between pressure zones that allow for storage to be easily shared between zones.

Given this system specific configuration, it is recommended to group certain pressure zones together when determining storage requirements, as follows:

- UWSS SE and Kingsville Pressure Zones
- Cottam and Essex Pressure Zones

UWSS SE and Kingsville were grouped together, since Kingsville is surrounded by and directly interconnected to UWSS SE. Cottam and Essex were grouped together since both these pressure zones receive water from the Cottam Reservoir and Booster Pumping Station, with the Cottam Reservoir pumping into the Cottam pressure zone and to the Essex Elevated Tank.

Table 2-7 summarizes the storage requirements for these pressure zone groupings for existing, 2-Year (2026), 7-Year (2031), and 7-Year (2031+) higher usage demand conditions.

There is existing system wide capacity of approximately 3.4 ML (0.9 MG), and a 7-Year (2031) system wide shortfall of 13.0 ML (3.4 MG), however when looked at by pressure zone, this shortfall is increased.

2.3.3 20-Year Water Demands

To improve the forecasting of demands over the longer term, 20-year demands were simulated by linearly extrapolating the 7-year growth pattern over 20 years (**Figure 2-1**). While it is understandable that growth is not linear and that this is unlikely to be an accurate representation of actual growth into the future, it does provide some insight into potential future growth based on current information.

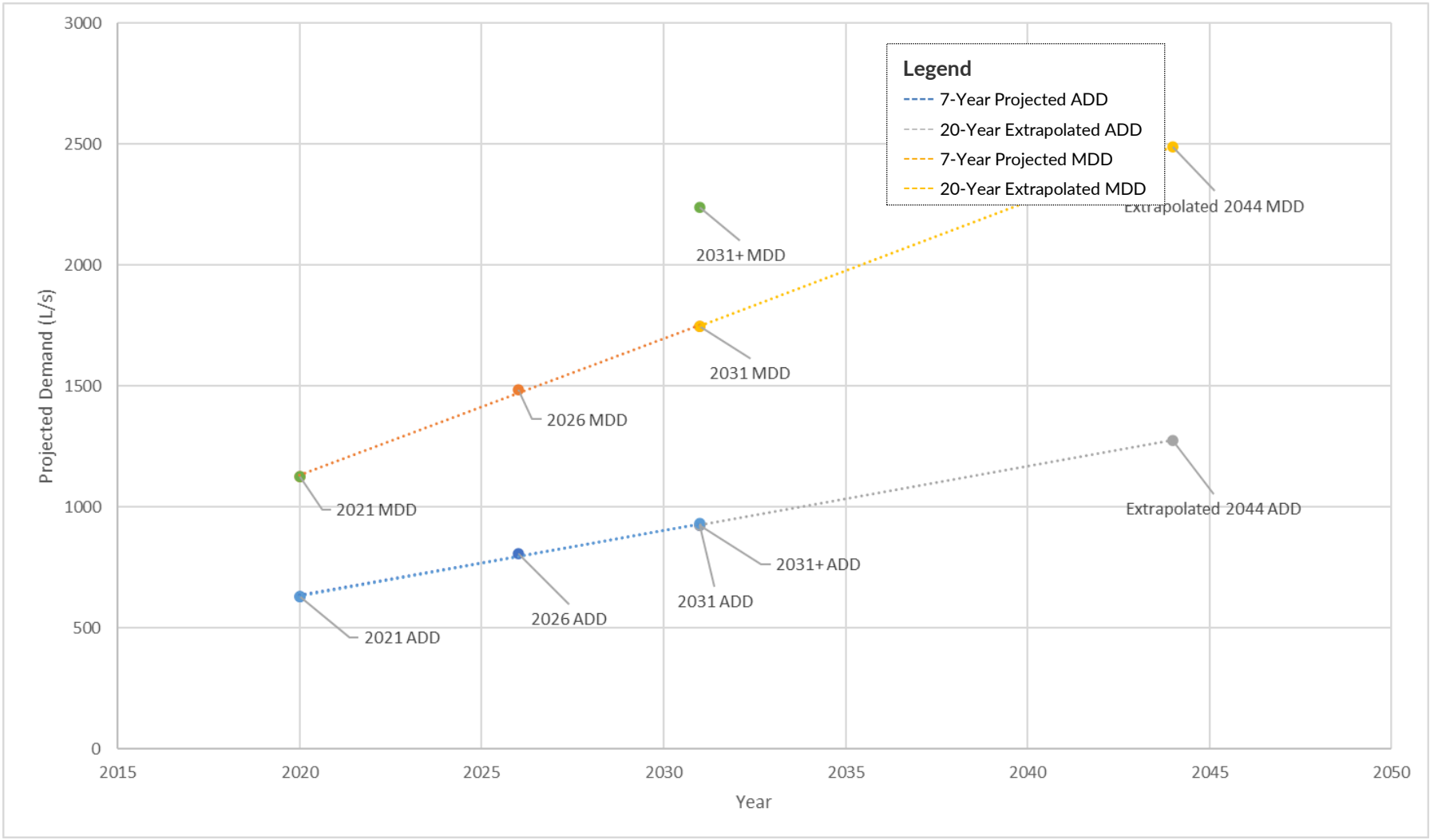
Table 2-6 Total Future UWSS Demand by Pressure Zone

Pressure Zone	2-Year (2026)		7-Year (2031)		7-Year Higher Usage (2031)	
	ADD (L/s)	MDD (L/s)	ADD (L/s)	MDD (L/s)	ADD (L/s)	MDD (L/s)
UWSS SE	693.5	1284.3	808.4	1538.7	808.4	1965.9
Cottam	42.8	76.5	44.3	79.2	44.3	118.5
Essex	36.6	65.5	39.8	71.3	45.7	94.5
Kingsville	32.2	57.7	32.3	57.8	32.3	57.8
Total	805.2	1483.9	924.8	1747.0	930.7	2236.7

Table 2-7 UWSS System Storage Requirements

Storage Component	UWSS SE + Kingsville				Cottam + Essex			
	Existing	2-Year 2026	7-Year 2031	7-Year Higher Usage 2031	Existing	2-Year 2026	7-Year 2031	7-Year Higher Usage 2031
Equalization Storage	21.4 ML	29.0 ML	34.5 ML	43.7 ML	2.9 ML	3.1 ML	3.3 ML	4.6 ML
Fire Storage[1]	8.2 ML	8.2 ML	8.2 ML	8.2 ML	5.7 ML	5.7 ML	5.7 ML	5.7 ML
Emergency Storage	7.4 ML	9.3 ML	10.7 ML	13.0 ML	2.2 ML	2.2 ML	2.2 ML	2.6 ML
Total Required[4]	37.0 ML	46.4 ML	53.3 ML	64.8 ML	10.8 ML	11.0 ML	11.2 ML	12.9 ML
Available Storage[2,3]	26.7 ML				10.6 ML			

Figure 2-1 Linear Demand Extrapolation to 20-Years (2044)

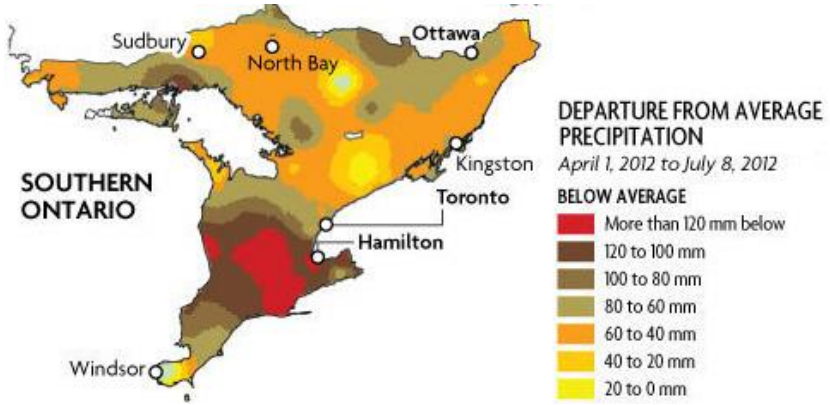


2.4 Climate Change Resilience and Sustainability

A key expectation and objectives for the UWSS is to be resilient in the face of climate change.

Climate projections indicate a significant increase in average annual temperatures, with expected rises between 3.3°C and 5.4°C by 2050. This warming is likely to alter precipitation patterns and extend the frequency and severity of extreme weather events such as droughts, floods, and storms. These changes will directly affect water demand and management strategies in several ways.

The impacts of climate change on UWSS necessitate a strategic approach to enhance resilience and ensure sustainable management. Section 4.3 provides a summary of the climate hazards and associated implications and risks for the UWSS and Section 5.5 provides an indication of adaptation and risk mitigation actions that will require to be implemented over the short and long term.



3 CURRENT STATUS

3.1 Asset Inventory and Hierarchy

The asset information for this AMP has been primarily derived from tangible capital asset (TCA) reporting records. The UWSS TCA register includes 425 asset records covering the asset base. These have been broken down further into 456 records to take account of betterments and additions previously captured as a single record. While the OCWA uses an asset register comprising some 2000 records in a Maximo database, these have not been used for this iteration of the AMP. It has been noted that the available inventory is not complete, therefore the AMP may not describe the full extent of what UWSS owns and operates.

For the purposes of this AMP assets have been attributed to eight sites or locations with one of those representing the entire pipe network as indicated in **Table 3-1**.

3.2 System Summary and Installation Profile

The system comprises abstraction from Lake Erie and low lift pumping to the Ruthven WTP. Approximately 100 kms of pipe including associated ancillaries (valves, hydrants, chambers and meters) convey the potable water to five towers and reservoirs, associated boosters and meters to the local distribution systems. This system is valued at over $195 million (2023 $). This value represents what it would cost to replace these assets with a modern equivalent asset portfolio.

Figure 3-1 shows significant proportion of assets were installed in the 1950's and are reaching their end of life with other major installation periods in the 1990's. A process flow diagram demonstrating the extent of the asset base is shown in **Figure 3-2**. A summary of the condition of the asset inventory is included in **Table 3-2.**

Table 3-1 Asset Records

Asset	Number of Records
Abstraction and Low Lift Pumping	36
Ruthven Water Treatment Plant	231
Cottam Reservoir and Booster Pumping Station	17
Essex Elevated Tower	10
Kingsville Elevated Tower	15
Albuna Elevated Tower	26
Leamington Elevated Tower	9
Transmission System Watermain (roughly 100 km)	112

Figure 3-1 Installation Profile for UWSS Assets

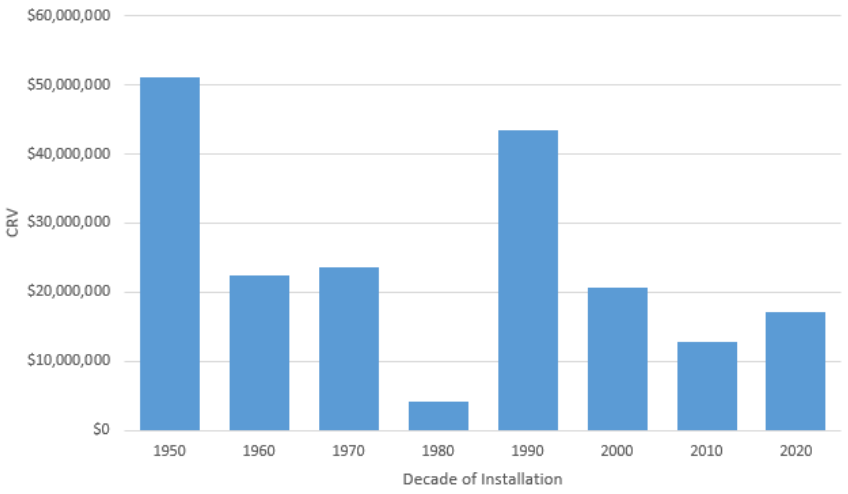
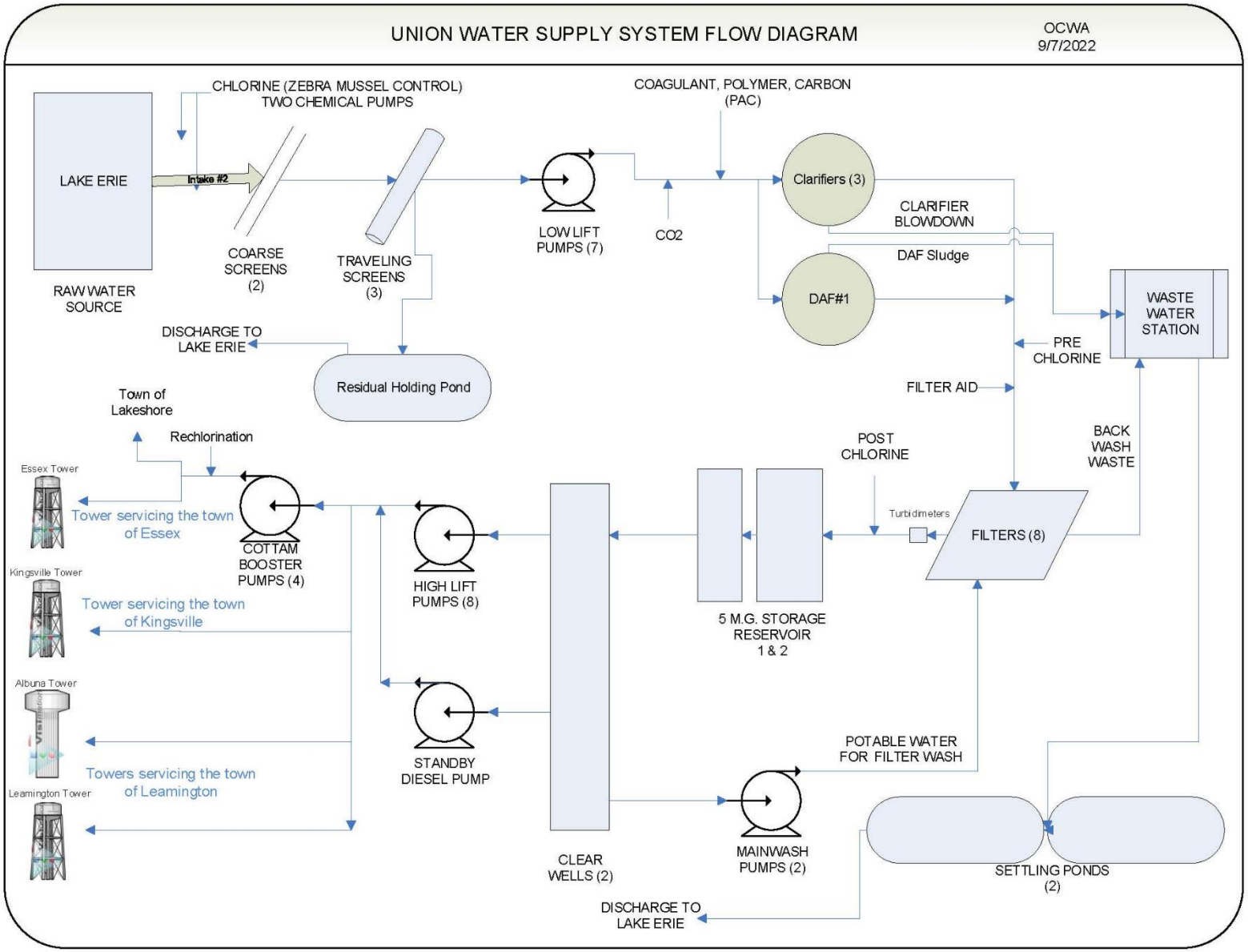


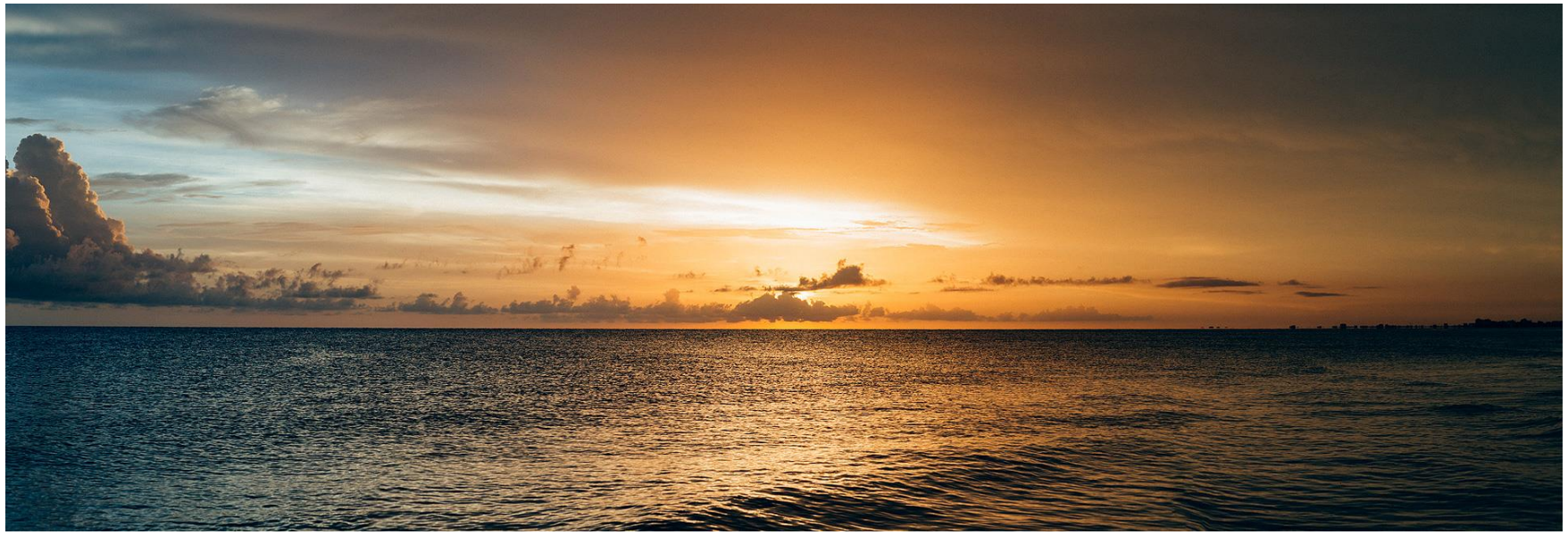
Figure 3-2 UWSS Flow Diagram[2]



[2] UWSS Treatment Process https://www.unionwater.ca/treatment-process/

Table 3-2 Asset Summary

Asset	Number of Asset Records Available	Average Weighted Age	CRV	Average Weighted Condition
Abstraction and Low Lift Pumping	36	39.5	$14.82 M	3.46
Ruthven Water Treatment Plant	231	33.3	$75.96 M	3.44
Cottam Reservoir and Booster Pumping Station	17	24.4	$4.64 M	2.91
Essex Elevated Tower	10	64.6	$12.28 M	4.99
Kingsville Elevated Tower	15	64.0	$14.75 M	4.95
Albuna Elevated Tower	26	12.0	$6.66 M	2.14
Leamington Elevated Tower	9	64.9	$12.1 M	4.99
Transmission System Watermain (roughly 100 km)	112	40.2	$54.14 M	3.17



3.3 State of Infrastructure

OCWA currently conducts condition assessments of critical assets, employing methods such as closed-circuit television (CCTV) and vibration monitoring. The findings from these conditions assessments were not available to be incorporated into this iteration of the AMP but will be considered in all future iterations. Therefore, the current AMP has been completed based on an age-based assessment in conjunction with estimated service lives.

Table 3-2 above shows the condition for each asset. Within each asset there may be records ranging from very good to very poor condition. The profile of asset condition for each asset is shown in Figure 3-3.

Figure 3-4 shows the overall condition profile for the asset portfolio. The average weighted condition rating of the entire inventory is 3.64, demonstrating a *fair* to *poor* overall condition. Approximately 44% of assets, or over $85 million of assets, are in very poor condition. These very poor condition assets are beyond their expected service lives and represent a liability for the UWSS potentially resulting in reliability and service issues. These assets include water mains, buildings and fencing, and some instrumentation. This category of very poor condition assets therefore also includes a number of critical assets.

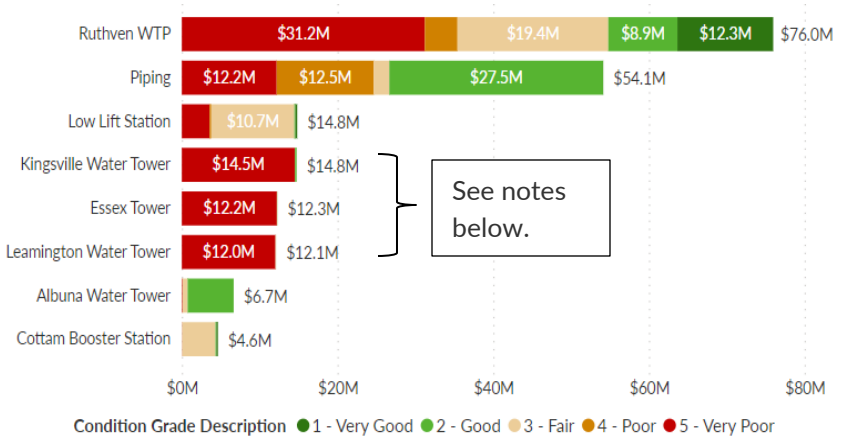
It is recommended to review all poor and very poor assets to confirm their condition rating. If the condition is different than expected, the inventory should be updated to reflect this.

Asset Condition Assessment Methodology

Asset condition has been assessed based on the remaining service life of the asset record using expected service life information and install dates in the TCA asset register.

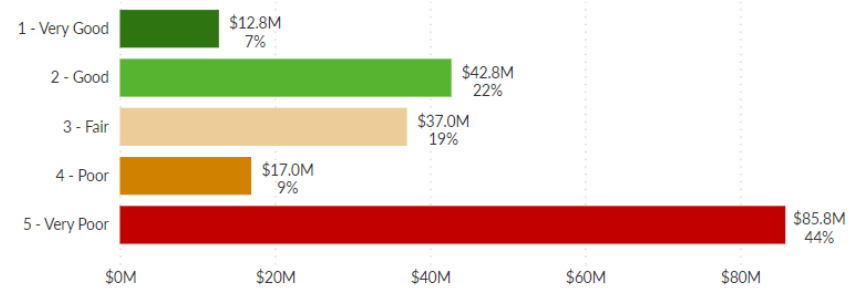
Condition Rating	% RSL
1 - Very Good	*> 90%*
2 - Good	*60 - 90%*
3 - Fair	*30 - 60%*
4 - Poor	*10 - 30%*
5 - Very Poor	*< 10%*

Figure 3-3 Condition Profile by Asset



Notes: The Kingsville, Essex and Leamington Water Towers were all refurbished and recoated (inside and outside) within the last 9-years and the *very poor* condition rating derived from the TCA information is not reflective of the actual condition of these towers which are considered to be in *good* condition.

Figure 3-4 Overall Condition Profile by Condition Band



As stated above in the notes the value of *very poor* condition assets is likely lower than indicated, emphasizing the need for the update of this AMP to take into consideration inspected condition.

3.4 System Capacity

System Storage Capacity: **Table 3-3** summarizes the existing useable system storage at each reservoir and elevated storage tank, as well as the pressure zones those storage units supply. Note that for the Albuna Elevated Tank, since the current system operation is to only fill this tank to the top water level of the Leamington Elevated Tank (250.8 m), the volume above this level is not included in the useable storage volume for this tank, the currently unused portion of the Albuna tank is 1.55 ML (0.34 MG).

Table 3-3 Existing System Storage Capacity

Storage Component	Useable Storage Volume	Pressure Zone
WTP Clearwell	18.93 ML	All
Albuna Elevated Tank	5.27 ML	UWSS SE
Leamington Elevated Tank	1.47 ML	UWSS SE
Kingsville Elevated Tank	1.14 ML	Kingsville
Cottam Reservoir	9.49 ML	Cottam and Essex
Essex Elevated Tank	1.11 ML	Essex
Total	**37.41 ML**	**All**

Treatment Capacity: **Table 3-4** summarizes the existing treatment plant process unit capacities, as evaluated as part of the 2016 UWSS Water Quality Master Plan (WQMP). Note that both total treatment capacity and firm treatment capacity are identified in this table. The overall net treatment plant capacity is rated at 124.5 ML/d as indicated in the Municipal Drinking Water Licence. As evaluated in the WQMP, the current treatment plant net capacity is estimated at 104 ML/d (113 ML/d gross with an 8% in plant water use for clarifier blowdowns and filter backwashes).

Table 3-4 Existing Water Treatment Plant Production Capacity

Process Unit	Total Capacity	Firm Capacity
Intakes	436 ML/d	218 ML/d
Low Lift Pumping Station	177 ML/d	140 ML/d
Clarifiers	113 ML/d	85 ML/d
Upgraded Clarifiers**	196.5 ML/d	126.5 ML/d
Filters	173 ML/d	130 ML/d
High Lift Pumping Station	235 ML/d	187 ML/d

**Note that two clarifiers are slated to be upgraded to DAF units, which would increase the production capacity of this sub-system. Each future DAF unit is designed to treat up to 70 ML/d (15.4 MG/d) of raw water. Once the upgrades are complete, the total and firm capacity of the upgraded system are indicated in the square brackets.

4 RISK

4.1 Summary of Critical Risks

Based on the supply and demand review the following concerns were identified with the existing system:

Inability of the transmission system to balance peak flow: A general rule of thumb is that a water treatment facility should be capable of meeting MDD, with peaking managed by the water transmission and storage system. A review of the existing system shows that this is not currently occurring; peaks are being managed by the WTP due to storage shortages in the system. This indicates a significant risk during peak periods.

Bacterial regrowth in the system: Water age in Cottam Reservoir was identified as a concern, particularly in the summer months when water at the source can be as high as 20°C, and in periods of low demand when Cottam booster pump station does not operate to fill Essex ET. As indicated previously, a mixing system with adequate chlorination levels has previously been recommended to help address these challenges; however, recommendations have not been limited to this option.

Pressure variations: North Leamington is 10 m higher than South Leamington, causing pressure differences of approximately 15 psi across the zone based on elevation alone. This large pressure zone can be hard to service, particularly with large amounts of growth expected in the north.

Treated water storage optimization: The Albuna and Essex towers are not currently used at full capacity due to operational concerns/limitations.

Critical pipe failure: Existing water mains along Seacliff Drive and between the WTP and the Cottam Reservoir are responsible for moving significant volumes of water across the system but are at the end of their service lives and in need of replacement.

Mechanical asset failure: As shown in Section 3, 44% of assets are in very poor condition with a CRV of almost $86 million, and 9% are in poor condition with a CRV of almost $17 million. These assets represent a significant risk. The condition assessment outlined above was not combined with a relative criticality rating, however, it is clear that some critical assets will be in poor condition. These assets will need to be prioritized in the future.

Other risks: There are a variety of other risks that have not been fully evaluated but are flagged for consideration in future iterations of this AMP. These risks include:

- Contamination of raw water supply either through intentional, unintended, or natural processes (algal blooms). Evaluation of potential contamination pathways and barriers will need to be conducted over the short to medium term.
- Security risk to treatment buildings/vandalism/sabotage of SCADA system. Through increasing connectivity and control systems, the security risks associated with the technology employed in the operation of the UWSS will need to be tested and evaluated.
- Depletion of water from drought. Climate change creates a significant risk. The section below explores climate risks in more detail.
- Flooding associated with major storm or snow events. An extreme weather related evaluated could significantly impact the ability of the low lift pumping or treatment plant to operate effectively compromising continuity of supply.

4.2 Climate Change Associated Risks

The changing climate will have significant impact on weather patterns, infrastructure, and the environment in turn impacting services. **Table 4.1** summarizes some of the changes in hazards this part of Ontario may see over the coming years.

Table 4-1 Climate Change Impacts

Climate Hazard	Climate Parameter	Average 2024 Value	Ave 2074 Value (+50 years)	Change in Parameter
Extreme Heat 	Days with T_{max} over 30 °C	50.3	110.0	**+118%**
Drought 	Consecutive dry days	15.6	16.7	**+5%**
River/ Lake Flooding 	Max 5-day precipitation	69.4	79.0	**+14%**
Localized Flooding 	Total precipitation	82.8	118.0	**+43%**

Climate change in expected to, in general, cause the following:

- Changes to normal weather conditions (average temperatures, precipitation, winds).
- More frequent and severe extreme events (droughts, flooding, heat waves, storms).
- Greater variability in weather patterns.

Some of these changes may be beneficial and extend the life of the assets, however, it is important to understand the broader benefits and vulnerabilities of various aspects of climate change to allow proactive management of assets. Some potential impacts include:

- Reduced winter snowpack and earlier snowmelt = reduced summer water supply.
- Increased flood risks in spring = flooding associated with storm events.
- Increased water temperatures = stress on fish and other aquatic animals leading to a potential of toxic algal blooms and changes in nutrients within the water.
- Increase in frequency and/or intensity of weather events.

The increasing prevalence of extreme heat is causing water scarcity to worsen, leading to less water being available when needed. As a result, important assets and infrastructure will have to endure greater strain as they operate in the intense heat. This increased workload significantly raises the likelihood of operational failures and breakdowns due to the heat, adding to the difficulties posed by rising temperatures.

The frequency of localized flooding is also on the rise, with a greater likelihood of extreme rain events occurring. This escalation in intense rainfall events heightens the risk of flooding critical infrastructure.

While some of these impacts may be beyond the direct control of municipal administrations, it is important to maintain awareness of potential effects and consider knock-on impacts.

This section represents only a preliminary evaluation of climate related risks, and an improvement action has been identified to further investigate the impacts of climate change and extreme weather.

4.3 Other Organizational and Corporate Risks

This AMP recognizes that there are other significant risks that impact the ability of UWSS Inc. to achieve its stated and unstated objectives. While the above sections focus on primarily asset related risks, the following provides a summary of other risks for the utility.

- Organizational issues (including capacity/resources, staff succession, skills, competence, and system knowledge). As a new entity UWSS is heavily dependent on OCWA for system knowledge and it is unclear the extent to which this system knowledge has been documented and is readily available for UWSS Inc. if required. This could cause issues in the event of system issues and associated response processes.
- Political (Municipal, Provincial, National, International). The utility has transitioned to a new entity in terms of governance. This creates new opportunities and responsibilities for planning and decision-making, activities which may be poorly understood in terms of process in the short term. Until systematic processes, and responsibility matrices are developed there is the potential for biased decision making impacting the ability of the organization to realize value most effectively from the UWSS.
- Economic environment and funding. The new entity of UWSS Inc. should allow the raising of funding more readily for investment in the system however, this has not been proven and in conjunction with the significant backlog in infrastructure needs, remains a risk.
- Changing service expectations. The growth in the local communities creates the potential for changing demographic or usage profiles including the balance of agricultural use to residential use. This in turn can impact service expectations from the supply system.

These and other risks will need to be more fully evaluated in future iterations of this AMP.

5 ACTIONS AND STRATEGIES

5.1 Asset Renewal

The backlog of renewal needs for UWSS is significant with over $73M in deferred work (backlog), with 53% of all assets being in poor to very poor condition. Some key asset records that require renewal are shown in **Table 5-1**. These proposed asset renewals are based on a significant number of assumptions as explained in Section 3. It is recommended that all asset renewal needs be validated through condition assessments as asset renewal is an essential strategy for maintaining service.

A 25-year projection identifies $134.8M of renewal needs including the $73M of backlog. This represents an average of $5.39M per year reinvestment in the system. Tackling the backlog over a 10-year period would result in expenditure needs of approximately $9.21M per year.

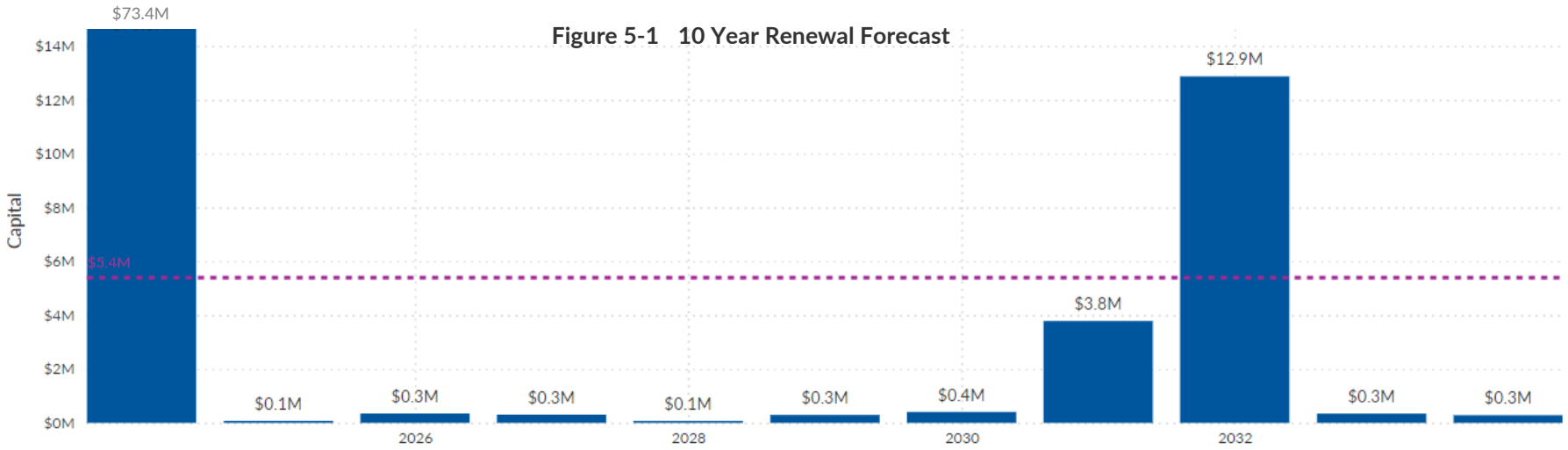
The asset renewal profile will change as asset decisions are made and condition assessments are completed. The review of asset criticality should also be completed to support prioritization of renewal needs.

Table 5-1 Renewal Needs of Key Assets

Asset Name	Install Year	Estimated Service Life	Remaining Service Life	Renewal Cost ($ M)
Ruthven Original WTP Building	1960	50	-14	16.9
Kingsville Tower	1959	50	21*	14.5
Essex Tower	1959	50	19*	12.2
Leamington Tower	1959	50	16*	12.0
DA #1 (formerly Clarifier #2)	1970	50	-4	11.3
Low Lift Station Union Intake #1	1960	20	-44	1.5

* The remaining service lives for the towers have been modified to reflect the refurbishment / re-coating works in those towers having the effect of extending the remaining service life of those assets.

Figure 5-1 10 Year Renewal Forecast



5.2 Action and Strategies to Meet Water Supply and Treatment System Needs

Capacity Enhancement: Expand the Ruthven Water Treatment Plant to increase its capacity from 113 MLD to 193 MLD to address projected growth demand by 2031. This capacity enhancement will involve enhancing the plant's filtration capacity and upgrading (new and upsized) watermains to support regional development, together with addressing the projected 38 ML treated water storage deficit in the system by 2031 by increasing system storage. These improvements will provide adequate storage within the pressure zones, reducing head loss. These strategic enhancements are essential for ensuring continuous water treatment services and enhancing the system's overall resilience and performance.

Infrastructure Upgrades: Replace 30% of the aging pipeline that has surpassed its 50-year service life by 2025 to reduce leakage rates from the current 18% to below 10%, enhancing overall water conservation and system efficiency.

Advanced Monitoring Systems: Invest in advanced SCADA systems for enhanced monitoring and real-time control, improving response times to system anomalies and reducing water loss by 15%.

Demand Management Initiatives: Launch a water conservation program aiming to reduce per capita consumption by 10% over the next five years through public education, incentives for low-flow fixtures, and tiered water pricing structures.

Redundancy and Reliability: Establish additional reservoir capacity (20 ML) to improve system reliability and manage peak demands more effectively. This expanded capacity means that the main plant can periodically be taken offline for necessary maintenance and rehabilitation of its existing components without compromising the overall water supply. Consequently, it can help bolster the resiliency of the water infrastructure and ensure continuous service during upgrades or unforeseen disruptions. Furthermore, the upgrades to filtration and storage capacity will also help maintain necessary fire flow requirements of 1.5 times the average day demand, as specified by MECP guidelines.

5.3 Actions and Strategies to Meet New/Updated Regulatory Requirements

Addressing Algal Blooms and Cyanotoxins:

- **Implementation of DAF Systems:** Upgrade clarifiers to Dissolved Air Flotation (DAF) systems to efficiently remove algae and other floating materials. This method is particularly effective in dealing with the increased prevalence of algae due to climate change.
- **Enhanced Monitoring and Reporting:** Increase the frequency and scope of monitoring from source to tap, including the implementation of new technologies for real-time water quality tracking. Focus on the early detection of harmful algal blooms (HABs) and cyanotoxins.

Zebra Mussel Control:

- **Chlorination Techniques:** Utilize targeted chlorination methods to control and mitigate the risk posed by zebra mussels attaching to infrastructure, which impacts the hydraulic capacity and overall system efficiency.
- **Infrastructure Inspection and Maintenance:** Regularly inspect and maintain water intake and treatment facilities to prevent zebra mussel infestation and ensure unimpeded water flow.

Regulation of Disinfection Byproducts (DBPs):

- **Optimize Disinfection Processes:** Review and optimize disinfection methods to reduce the formation of DBPs, considering stricter future regulations.
- **Advanced Organics Removal:** Implement or enhance pre-treatment processes for organics removal to minimize the formation of DBPs before disinfection stages.

Multi-barrier Approach Incorporating UV Treatment:

- **Installation of UV Systems:** Implement UV treatment systems as part of a multi-barrier approach to water safety, enhancing pathogen removal efficiency and compliance with anticipated regulations.

Lead Management:

- **Lead Line Replacement Program:** Proactively replace lead service lines, especially in older infrastructure, to mitigate risks before tighter regulations come into effect.
- **Corrosion Control:** Utilize corrosion inhibitors like orthophosphate within the system to prevent lead leaching from pipes.
- **Enhanced Lead Monitoring:** Develop a robust lead sampling and monitoring program, ensuring adherence to potentially lower maximum acceptable concentrations (MACs).

Response to PFAS Concerns:

- **Risk Assessment and Monitoring:** Conduct a thorough assessment to identify potential PFAS sources and impacts. Even with currently low risk, prepare for future monitoring and regulation requirements.
- **Treatment Adjustments:** Explore and implement treatment upgrades or modifications necessary to address PFAS contamination effectively, anticipating future regulatory demands.

Proactive Adaptation to Source Water Quality Changes:

- **Increased Resilience of Treatment Processes:** Adjust operational practices such as more frequent backwashing to manage deteriorating source water quality and maintain treatment efficiency.

Regular Policy and Procedure Updates:

- **Stay Informed and Responsive:** Regularly update internal policies and operational procedures based on new scientific findings and regulatory changes.
- **Staff Training and Development:** Ensure that staff are continually trained on new technologies, regulatory requirements, and best practices to maintain compliance and operational excellence.

Ontario Drinking Water Quality Standards:

- **Compliance and Standards**: Ensure all new constructions and upgrades comply with the latest MECP regulations and obtain necessary environmental permits by the third quarter of 2024. This includes meeting enhanced treatment standards for Cryptosporidium and Giardia as specified in the latest ODWQS.

By implementing these actions and strategies, UWSS can not only comply with current regulatory standards but also proactively prepare for future challenges, ensuring sustainable and safe water services for all users.

5.4 Adaptation and Mitigation Actions and Strategies

Increased Water Demand: Warmer temperatures and longer frost-free seasons increase evaporation rates and reduce water availability, particularly during critical summer months. This scenario demands robust water conservation strategies and enhanced water storage capacities to manage periods of scarcity.

Infrastructure Reliability and Redundancy: The anticipated variability in weather patterns, including more intense and frequent extreme events, calls for a reassessment of the reliability and resilience of existing water infrastructure. UWSS must incorporate redundancy in critical components such as pumps, treatment facilities, and pipelines to ensure continuous operation during disasters or system failures.

Climate Adaptation Measures: Design new and retrofitted infrastructure to withstand a 100-year flood event, increasing resilience against predicted increases in rainfall intensity and frequency due to climate change.

Design Standards: Climate change introduces new stresses on infrastructure, demanding potential changes to design standards. For instance, increased precipitation and extended hot periods can strain water treatment processes. Design standards must consider the changing climate's impact on the lifespan and functionality of infrastructure components, ensuring that systems are both robust and flexible enough to cope with new pressures.

Long-term Sustainability Considerations
The sustainability of UWSS under changing climate conditions extends beyond immediate operational concerns to encompass broader environmental and economic aspects:

Energy Efficiency and Greenhouse Gas (GHG) Emissions: Systems must adapt to be more energy-efficient and reduce GHG emissions. This involves optimizing processes and incorporating renewable energy sources where feasible, contributing to a lower carbon footprint and mitigating climate change impacts indirectly.

Materials and Chemical Use: The resilience of water systems is also tied to sustainable material and chemical use. This includes selecting durable materials for infrastructure and minimizing chemical usage in water treatment processes, reducing environmental impact, and ensuring supply chain sustainability.

Strategic Responses and Community Resilience
To address these challenges, UWSS must embrace integrated planning and management approaches that consider long-term climate projections and community-specific vulnerabilities. This involves:

Enhancing System Flexibility: Adapting to more variable climate conditions requires systems to be flexible in operation and management. This might include adjustable operational protocols to respond to fluctuating water supplies and demands dynamically.

Community Engagement and Planning: Building community resilience against climate impacts involves engaging local populations in water conservation efforts and emergency preparedness. Education and involvement in resilience planning increase the community's capacity to respond and recover from water-related challenges.

Prioritizing Resource Allocation: Effective adaptation also requires prioritizing investments in infrastructure upgrades and resilience measures based on detailed risk assessments and climate projections, ensuring that the most critical vulnerabilities are addressed first.

These objectives provide a structured approach to enhancing the resilience and sustainability of UWSS in the face of climate change. By systematically addressing these areas, Union Water systems can better prepare for future challenges, ensuring reliable and efficient service delivery in a changing environment.

5.5 Operational and Maintenance Strategies

The following form general operational and maintenance strategies and actions that will need to be implemented and/or maintained through existing operations and contracts.

- Implement a routine maintenance schedule for critical assets such as pumps, valves, and HVAC systems, which are essential for continuous operation. This includes monthly calibrations of analyzers and pumps, inspection of roofs every 15-20 years, and timely replacement of worn-out components.
- Utilize predictive maintenance tools like vibrational analysis for pumps to pre-emptively identify and address wear and tear, reducing the likelihood of unexpected failures and extending asset lifespan.
- Implement real-time monitoring systems for continuous assessment of asset condition. This includes expanding the use of vibration sensors, thermal imaging, and other diagnostic technologies to detect early signs of wear or malfunction.
- Conduct criticality assessments to prioritize maintenance activities and ensure redundancy for critical valves and systems, enhancing reliability.
- Develop and enhance a GIS system to track asset locations and conditions accurately.
- Expand the use of acoustic leak detection technologies in the system to manage and minimize water losses.
- Maintain regular valve turning schedules and implement flushing programs to ensure water quality and system reliability.
- Schedule regular diagnostic tests such as ultrasonic testing, oil analysis, and infrared thermography to assess the internal condition of machinery and equipment.
- Conduct regular cost-benefit analyses to determine the most economically viable maintenance strategies that do not compromise on service quality or system reliability.
- Implement ongoing training programs for staff on new technologies, maintenance best practices, and regulatory compliance to ensure high operational standards.
- Ensure adequate staffing levels for continuous operation, with specialized roles during the day for maintenance and electricians and minimized staff at night focused on operations.
- Develop and document a comprehensive maintenance protocol based on OCWA's best practices. This should detail the procedures for regular, preventive, and predictive maintenance, including timelines and responsibilities.
- Establish feedback mechanisms that allow for the continual improvement of maintenance strategies based on lessons learned and new advancements in technology.

Regular Compliance Monitoring:

- Conduct routine testing to ensure water quality meets the DWQMS and other regulatory standards.
- Regularly review and update operational procedures to align with current regulations.

Operational Efficiency:

- Continuously monitor and maintain water treatment and transmission system for optimal performance.
- Implement routine maintenance schedules to prevent unexpected breakdowns and outages.

Public Health and Safety:

- Perform consistent monitoring and testing to detect and address contaminants promptly.
- Maintain clear communication channels for public notifications and advisories related to water quality.

Critical Control Point (CCP) Monitoring:

- Regularly check and manage CCPs to prevent system failures and ensure continuous supply of safe drinking water.

Financial Management:

- Efficiently manage budgets to cover operational costs, including maintenance, chemical purchases, and energy consumption.
- Adhere to financial planning requirements under Ontario Regulation 453/07.

5.6 Improvement Actions

Inventory Consolidation and Data Gap Analysis: Merge TCA and OCWA Maximo asset inventories, identifying and addressing data gaps to enhance asset management.

GIS and Maintenance Management Systems: Implement GIS and integrate with maintenance management systems under UWSS control for improved asset tracking and management.

Condition Data Collection: Gather detailed condition data on the asset base to prioritize maintenance and investment planning.

Documentation of Standards and Policies: Document UWSS standards and policies for standardized, compliant water management practices.

Service Performance Metrics: Develop and implement a framework for measuring and reporting service performance metrics to assess and improve service delivery.

Governance for Decision Making: Establish clear governance mechanisms for effective decision making within the new utility structure.

Project Identification and Prioritization: Prioritize projects identified in the infrastructure needs study and use a risk-based approach, focusing on assets that pose the highest risk to service reliability and regulatory compliance.

Staff Capacity Building: Enhance staff capacity through role clarification, strategic hiring, and targeted training programs.

Climate Risk Assessment: Conduct assessments of climate risks and opportunities to prepare for and mitigate environmental impacts on utility operations.

Proposed Energy Conservation Measures:

- Technical upgrades like power meter installation, chlorine system upgrades, and new energy-efficient equipment.
- Organizational improvements, including creating an energy management team.
- Behavioral changes like promoting water and energy conservation practices among staff and users.

Project Implementation: Follow the phased rollout of capital projects as part of the 2024 10-year year capital improvement plan, beginning with the most critical infrastructure identified in the prioritization phase. Employ project management best practices to each project from design through to completion, ensuring projects are delivered on time and within budget.

Other Actions and Strategies:

- **Quality and Environmental Management System (QEMS) Implementation:**
  - Develop and document the QEMS for the UWSS, focusing on effective management, operational control, and risk mitigation.
  - Establish policies and objectives to guide water and wastewater management.
  - Evaluate conformance of the implemented QEMS to the Drinking Water Quality Management Standard (DWQMS).

- **Risk Assessment and Management:**
  - Conduct regular risk assessments to identify and assess potential risks that could impact drinking water safety.
  - Implement control measures and establish critical control points to prevent or mitigate risks to water safety.
- **Continual Improvement:**
  - Aim for continual improvement in the QEMS and the facility's performance.
  - Facilitate the management review process and integrate findings into operational strategies for ongoing enhancement of system reliability and safety.
  - Assess the effectiveness of the QEMS and assist in its continual improvement.
- **Critical Control Point (CCP) Monitoring:**
  - Establish and monitor CCPs as part of the risk management approach to ensure the safety and reliability of the drinking water supply.
- **Operational Excellence:** Allocate funds effectively for operational needs, including OCWA Operations and Maintenance services, and debt service requirements.
- **Public Health and Safety:** Conduct regular monitoring and testing of the water supply to ensure it meets safety and quality standards, with no exceedances of prescribed limits for inorganic and organic parameters.
- **System Reliability and Efficiency:** Implement necessary capital works and major maintenance projects to ensure the reliability and efficiency of the water supply system, including upgrades to pumps, treatment processes, and communication systems.
- **Community Engagement and Transparency:** Make the annual report publicly accessible, providing clear and detailed information about the water system's performance and compliance status.
- **Improve Understanding of Energy Consumption:** Develop a program for collecting and analyzing monthly energy billing information to better understand energy usage patterns and identify conservation opportunities.
- **Increase Staff Awareness and Efficiency:** Motivate staff to use energy more efficiently and increase awareness of energy conservation.
- **Annual Reporting of Energy Performance:** Regularly report on energy performance changes and improvements to monitor progress and drive continuous improvement.
- **Implement Low-Cost Energy Efficiency Measures:** Focus on sound operating and maintenance practices, employee training, a Monitoring and Targeting system, and an Energy Demand Management program.
- **Follow a Continuous Improvement Model:** based on the Plan-Do-Check-Act methodology, aiming for ongoing optimization of energy use and alignment with the broader sustainability goals of UWSS.

6 FINANCIAL SUMMARY

6.1 Financial Projections (Capital Expenditures)

The above strategies and actions have been summarized through the 2024 10-year capital plan and summarized in the table below.

UNION WATER SUPPLY SYSTEM	Ten Year Recommended Capital / Major Maintenance- DRAFT - January 10, 2024										
	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	Total Capital Expenditures 2024-2033
Union Area Water Supply System											
Studies and Programs											
Subtotal Studies and Programs	***$ 490,000***	***$ 250,000***	***$ 250,000***	***$ 250,000***	***$ 250,000***	***$ 250,000***	***$ 250,000***	***$ 250,000***	***$ 250,000***	***$ 250,000***	***$ 2,740,000***
Low Lift	$ 400,000	$ 50,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 450,000
General Building Maintenance & Equipment	$ 250,000	$ -	$ 100,000	$ 300,000	$ 300,000	$ -	$ -	$ -	$ -	$ -	$ 950,000
Clarification System	$ -	$ 350,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 350,000
Chemical System	$ 120,000	$ -	$ 20,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 140,000
Carbon Feed System	$ 50,000	$ -	$ 30,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 80,000
Filtration	$ 120,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 120,000
Pumps	$ 650,000	$ -	$ 290,000	$ 170,000	$ 170,000	$ -	$ -	$ -	$ -	$ -	$ 1,280,000
Main Plant Reservoirs and Clearwells	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Main Plant Electrical	$ 100,000	$ 75,000	$ 75,000	$ 75,000	$ 75,000	$ 75,000	$ 75,000	$ 75,000	$ 75,000	$ 75,000	$ 775,000
Disinfection	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
SCADA /Communication/Security	$ 100,000	$ 70,000	$ 70,000	$ 70,000	$ 70,000	$ 70,000	$ 70,000	$ 70,000	$ 70,000	$ 70,000	$ 730,000
Monitoring Equipment	$ 50,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 50,000
Building Maintenance	$ 150,000	$ 150,000	$ 150,000	$ 150,000	$ 150,000	$ -	$ -	$ -	$ -	$ -	$ 750,000
New Equipment	$ 50,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 50,000
Cottam Reservoir & Booster PS	$ 60,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 60,000
Distribution System	$ 1,000,000	$ 900,000	$ 900,000	$ 1,400,000	$ 900,000	$ -	$ -	$ -	$ -	$ -	$ 5,100,000
Wastewater Treatment System	$ 250,000	$ -	$ -	$ -	$ -	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 5,250,000
Vehicles and Equipment Purchases	$ 75,000	$ 350,000	$ 500,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 925,000
NEW CAPITAL PROJECTS	$ 5,350,000	$ 8,250,000	$ 2,000,000	$ -	$ -	$ 2,000,000	$ 2,000,000	$ 2,000,000	$ 2,000,000	$ 2,000,000	$ 25,600,000
											$ -
Debt Funded Project											**$ -**
New Reservoir #3	$ 10,000,000	$ 25,000,000	$ 10,000,000								**$ 45,000,000**
UV Disinfection - In-reservoir UV vault		$ 3,000,000	$ 3,000,000								**$ 6,000,000**
New Admin Bldg - Maintenance Shop and Yard		$ 500,000	$ 3,500,000	$ 3,000,000							**$ 7,000,000**
Cottam Water Main Upgrades - Construction		$ 3,000,000	$ 10,000,000								**$ 13,000,000**
Water Treatment Plant Capacity Expansion - Detailed		$ 500,000	$ 2,000,000	$ 30,000,000	$ 30,000,000						**$ 62,500,000**
Cottam Booster Expansion						$ 6,000,000	$ 4,000,000				**$ 10,000,000**
Seacliff Water main replacement							$ 3,000,000	$ 2,000,000			**$ 5,000,000**
Low Lift Upgrades / New Raw Water Line to WTP								$ 2,000,000	$ 3,000,000	$ 3,000,000	**$ 8,000,000**
Subtotal Capital and Major Maintenance	*$6,300,000*	*$3,140,000*	*$3,270,000*	*$4,330,000*	*$3,330,000*	*$2,290,000*	*$2,290,000*	*$2,290,000*	*$2,290,000*	*$2,290,000*	*$ 31,820,000*
Total Cash Funded New Capital Projects	$5,425,000	$8,600,000	$2,500,000	$0	$0	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$2,000,000	*$ 26,525,000*
Total Cash Funded New Capital and Major Maintenance	**$11,725,000**	**$11,740,000**	**$5,770,000**	**$4,330,000**	**$3,330,000**	**$4,290,000**	**$4,290,000**	**$4,290,000**	**$4,290,000**	**$4,290,000**	**$ 58,345,000**
Total Debt Funded Capital	**$10,000,000**	**$32,000,000**	**$28,500,000**	**$33,000,000**	**$30,000,000**	**$6,000,000**	**$7,000,000**	**$4,000,000**	**$3,000,000**	**$3,000,000**	**$ 156,500,000**
											$ -
TOTAL CAPITAL, STUDIES AND NEW CAPITAL	***$ 21,725,000***	***$ 43,740,000***	***$ 34,270,000***	***$ 37,330,000***	***$ 33,330,000***	***$ 10,290,000***	***$ 11,290,000***	***$ 8,290,000***	***$ 7,290,000***	***$ 7,290,000***	***$ 214,845,000***

6.2 Operating Implications

Operating cost implications derived from the financial plan indicate a requirement of approximately $4M /year for direct operating expenditures plus additional overhead costs amounting to a total of approximately $8.7M per year. Upgraded or expanded infrastructure will result in additional operating costs unless efficiencies can be achieved through pumping, more automated processes and more proactive or efficient approaches to maintenance.

Operating cost implications will need to be evaluated in further detail in subsequent iterations of this AMP.

6.3 Funding Mechanisms and Sources

Recognizing the significant investment required into the UWSS the funding of the system will need to be carefully evaluated making the most of the following funding sources.

- Commercial Revenues
- Cost transfers from Municipalities
- Grant Funding
- Debt Funding – Borrowing

The Financial Plan completed in February 2024 provides a 10-year outlook of investment and revenue associated with the system. This financial plan will need to be refined as actual expenditure needs evolve with the prioritization of disasset needs.

Key highlights from the financial plan including the following:

- Increase the UWSS Treatment and Transmission Rate to $0.7339 per cubic meter to accommodate projected demand and ensure financial stability.
- Achieve an estimated surplus of $3,674,000 for 2024 through strategic revenue and expenditure management.
- Propose a cash-funded Capital Works, Major Maintenance, and Capital Purchase budget of $8,775,000 for 2024.
- Allocate funds effectively for operational needs, including OCWA Operations and Maintenance services, and debt service requirements.
- Adjust water rates annually by 3% above inflation for the next ten years to fund infrastructure investments, supplemented by pursuing at least two new grants or funding opportunities by 2024. Allocate funds effectively for operational needs, including OCWA Operations and Maintenance services, and debt service requirements.

7 ASSUMPTIONS AND UNCERTAINTIES

This Asset Management Plan will have to be adjusted as conditions change.

This plan has been developed based on assumptions regarding the context of Union Water Supply System. Changes in this context including the economic, environmental, social and political landscape could have a significant impact on the delivery of this plan, expenditure forecasts and funding needs. The plan may need to be updated and adjusted if and when any of the assumptions change. The following table outlines a few of the key assumptions and associated uncertainties that could substantially affect the execution of this plan.

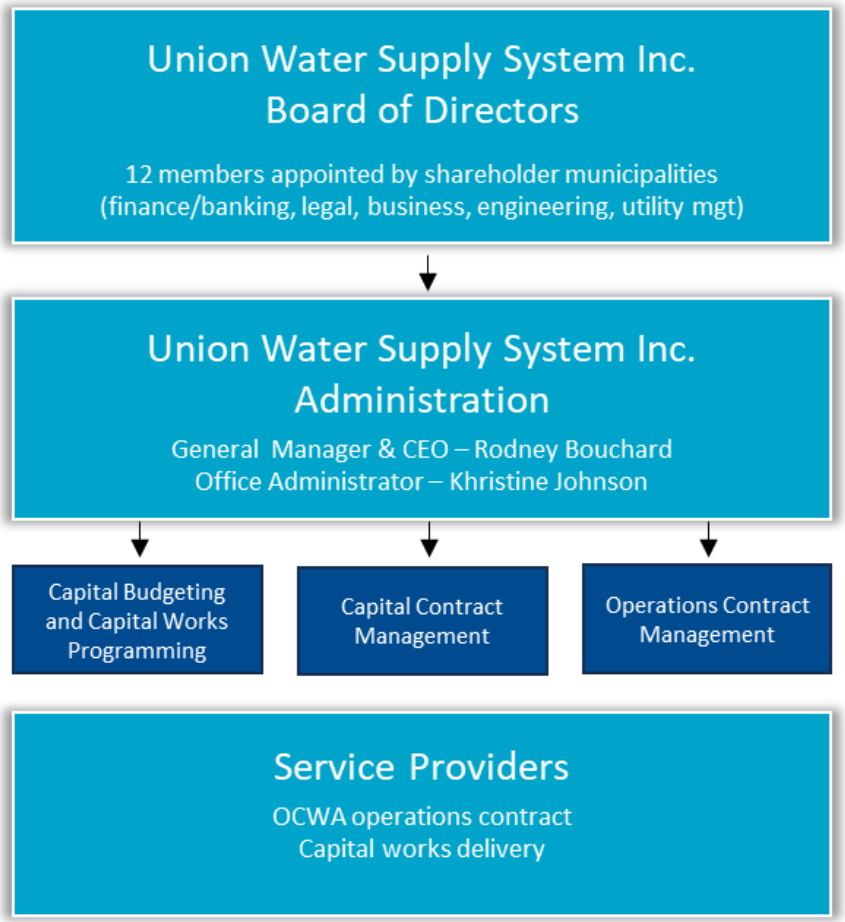
Theme	Description
Growth rates	The area is experiencing rapid population and commercial growth which is driving the need for the demand related investment infrastructure. Expenditures, where indicated in this AMP, are based on those known growth rates. If the growth in the region changes, this could have a significant impact on both the capital and operating cost projections indicated in this plan.
Economic environment stability	Canada has experienced extraordinary inflationary pressures over recent years and the assumption in this plan is that these inflationary changes will begin to return to normal rates. If there are significant global or local economic changes that significantly impact inflation rates, these will also likely influence the priorities outlined in this plan.
Funding	The information contained in this plan has only taken a very limited perspective of funding availability and is more based on an unconstrained environment of funding. As such it reflects more the investment needs of the utility. Further iterations of this plan may make more realistic consideration of funding availability and consideration of affordability will influence priorities and timing of investment.
Climate change	Climate change carries a high degree of uncertainty. While this and future iterations of this asset management plan seek to take into consideration future climate projections, hazards and risks associated with the changing climate, should the climate projections prove to be inaccurate, investment priorities will likely change. In addition, should a significant climate related event take place in the near term, it is anticipated that funds will be diverted to address this and influence the priorities and timing of other investment needs.
Governance and organizational priorities and responsibilities	Union Water Supply System has transitioned through a significant change in the governance of the organization and the full effects of this change will take time to be understood. This first iteration of this plan has not made significant consideration of the governance mechanisms however, it is clear that as the newly formed organization matures, priorities and approaches to utility management and service delivery may change influencing the projections in this plan.
System knowledge	This first iteration of this plan has been based on very limited information. Improvements in corporate knowledge have been identified in the improvement plan section of this document. It is anticipated that as UWSS builds more corporate knowledge about the supply system, condition, risks and opportunities and other factors, it may influence assumptions related to costs or investment needs.

8 PLAN EXECUTION, MONITORING AND CONTROL

This first iteration of the asset management plan for the Union Water Supply System will be implemented, monitored and controlled by the UWSS Administration team and in particular the UWSS General Manager.

Actions identified in this plan will be incorporated into annual budgeting for implementation as they arise and as funding is available. Monitoring and reporting of operational actions are likely to evolve and is reliant on the appropriate monitoring and reporting by OCWA through the current Operations Contract.

Overall performance reporting will be through the UWSS Administration to the Union Water Supply System Joint Board of Management comprising representatives from Leamington, Kingsville, Essex and Lakeshore. This is inline with the reporting of performance under the previous governance framework.



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