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REPORT

City of Port Alberni

Stage 2/3 Liquid Waste Management Plan

JULY 2020

ASSOCIATED ENGINEERING
QUALITY MANAGEMENT SIGN-OFF
Signature.....
Date.....

EXECUTIVE SUMMARY

The Old City Lagoon discharges treated effluent into the Somass River, which flows to the Alberni Inlet. The Alberni Inlet and Somass Estuary is a highly-valued ecological resource to the region, notably providing habitat for salmonids (sockeye, chinook, coho, pink, chum, and steelhead) and other forms of aquatic life, and is an important recreational water body for boating and fishing activities. The capacity of the Old City Lagoon is no longer sufficient to provide adequate treatment to wastewater prior to discharge. As a result, the City is often out of compliance with its current discharge permit. The Wastewater Treatment Facility (WWTF) site and discharge location in the receiving environment lie within the traditional territories of the Tseshaht and Hupačasath Nations.

The City has been actively working to establish a technically feasible and affordable solution for upgrades to the City's wastewater treatment facilities, which are needed to comply with provincial and federal wastewater regulations. The City's Stage 1 Liquid Waste Management Plan (LWMP) was approved by the BC Ministry of Environment in 2001. The Stage 2 LWMP was initiated in 2003; however, the options identified were financially prohibitive for the City and were not shared with the public. The Stage 2 LWMP was reinitiated in 2013, and extensive work was undertaken, and a Draft Report was completed in 2017. At this time, the City decided to pursue registration under the Municipal Wastewater Regulation (MWR), in conjunction with design progression and construction of the upgrades to the City's wastewater treatment facility upgrades. Recently, the City has elected to also continue with the LWMP and benefit from the holistic framework embedded in the LWMP process for ongoing management of municipal wastewater and stormwater. Once the combined Stage 2/3 LWMP is approved by City Council, the plan will then be submitted for approval by the British Columbia Ministry of Environment and Climate Change Strategy (BC MOE). Once approved, the City will be registered under the MWR, and also have an approved Stage 2/3 LWMP.

To meet the Stage 1 LWMP recommendations and address the liquid waste challenges for the community, the City's Combined Stage 2/3 LWMP includes the following key objectives:

- Update and document the previous Stage 2 LWMP work that occurred between 2013 and 2017.
- Re-establish the Wastewater Advisory Committee (WAC) as the Plan Monitoring Committee (PMC) to obtain technical, regulatory, and public input into the City's Implementation plan through workshops.
- Consult the public in engagement activities, document feedback, and integrate this feedback into development and selection of the City's preferred wastewater management strategy.
- Develop strategies for key issues presented in the Stage 1 LWMP and provide updates on the various commitments the City has made from the LWMP to date. These includes issues relating to wastewater treatment and effluent integration, and management and eventual elimination of Combined Sewer Overflows (CSOs) within the collection and conveyance system.
- Identify opportunities for integrating sustainability practices and resource recovery into the City's wastewater management strategy.

As an integral component of developing the City's long-term wastewater management strategy, the City carried out public and agency consultation activities from 2013-2017, during the previous Stage 2 LWMP work. These included the following key activities:

- Regular meetings with the City and the LWMP WAC, comprised of members from local government agencies, industry, and non-governmental organizations.
- Consultation with First Nations, including Tseshaht First Nation and Hupačasath First Nation.
- Engagement with the general public via website resources and a Public Open House.

The City has undertaken additional engagement activities in 2020, further building on the previous consultation undertaken as part of the Stage 2 LWMP work.

Input solicited through these public and agency engagement activities has been integrated into the community's long-term wastewater management strategy.

1 WASTEWATER MANAGEMENT

The City's wastewater will undergo secondary treatment at the upgraded Port Alberni Wastewater Treatment Facility (WWTF). The secondary treatment system will consist of a screening system, biological treatment in a two-cell aerated lagoon, operated in parallel (repurposed catalyst lagoon), ultraviolet (UV) disinfection, and pumping. The Carbonaceous Biochemical Oxygen Demand ($cBOD_5$) and Total Suspended Solids (TSS) regulatory limits at end of pipe will be met, in addition to fecal coliform limits and dilution requirements at the edge of the Initial Dilution Zone (IDZ).

Detailed design of upgrades to the WWTF began in 2017, with construction starting in 2018. The new WWTF is nearing construction completion, with commissioning expected in the autumn of 2020.

The treated effluent will be released back into the environment through an engineered outfall and diffuser system, with a final discharge into the Alberni Inlet. The City's wastewater treatment system will meet all applicable regulatory requirements (both federal and provincial). The City submitted an MWR registration package in October 2019. With this registration, the City requested two substitutions. The first, a substitution to reduce the minimum depth required by an outfall in an estuary requested to provide additional protection for adult salmon in the Alberni Inlet returning to spawn in the Somass River. The second, a substitution to increase the effluent phosphorus limits in an estuary, after considering the impacts to the receiving environment.

2 SOURCE CONTROL AND VOLUME REDUCTION

Source control serves to protect sewer and wastewater treatment infrastructure and the public from discharges that may pose risks to safety and proper operation of these elements. The City will undertake updates to the existing sewer use bylaw that align with community make-up and development over time. Updates to the sewer use bylaw may include adoption of additional discharge limits for selected constituents, implementation of City-specific "Codes of Practice" for commercial and industrial sectors and septage management, and development of public information campaigns. The City has water metering as a means of promoting volume reduction and water sustainability among residents. Residents pay for water consumption and sewer use based on the water metering program.

3 COMBINED SEWER OVERFLOWS

The City will continue its sewer separation program for combined sewers. This program includes twinning of sanitary and storm sewer systems and implementing collection and conveyance system upgrades to reduce and eventually eliminate CSO events, as feasible, within the planning horizon of the City's LWMP (to 2050). It is the City's intent to revisit the progress of the sewer separation program on CSO reduction and elimination as part of future updates to the City's LWMP.

4 SUSTAINABILITY AND RESOURCE RECOVERY

Sustainability and resource recovery considerations are important elements of a community's wastewater management strategy. The Old City Lagoon will no longer be required following commissioning of the upgraded WWTF and will be decommissioned to meet best management practices. Currently, resource recovery opportunities such as wastewater effluent reuse and heat recovery, are not viable for the City. However, the City will continue to beneficially reuse biosolids that are periodically removed from the wastewater treatment system. As part of long-term sustainability initiatives, the City will continue to reassess feasible opportunities for resource recovery.

5 URBAN STORMWATER

The City's Stage 1 LWMP identified urban stormwater runoff as a potentially significant source of non-point pollution. The City will continue to assess feasible approaches for controlling stormwater runoff in the community. These approaches currently include the City's sewer separation program and the City's incentive-based policies that encourage developers to implement low impact developments within the community. The City will work towards developing a strategic urban stormwater management plan at the five-year LWMP review period.

ACKNOWLEDGEMENTS

This report was prepared by Associated Engineering for the City of Port Alberni. Associated Engineering thanks City of Port Alberni staff for their assistance and dedication to this long-term and visionary project.

The City of Port Alberni and Associated Engineering would also like to thank the members of the Wastewater Advisory Committee and Plan Monitoring Committee for their time and valuable contributions over the years to the successful development of the City's Stage 1 Liquid Waste Management Plan, and Combined Stage 2/3 Liquid Waste Management Plan, and identification of a long-term path forward for the community.

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GLOSSARY

- ADWF = Average Dry Weather Flow
- BC MOE = British Columbia Ministry of Environment and Climate Change Strategy
- $cBOD_5$ = 5-day Biochemical Oxygen Demand
- CCME = Canadian Council of Ministers of the Environment
- COD = Chemical Oxygen Demand
- CSO = Combined Sewer Overflow
- DFO = Fisheries and Oceans Canada
- DO = Dissolved Oxygen
- EIS = Environmental Impact Study
- GHG = Greenhouse Gases
- I&I = Inflow and Infiltration
- IDZ = Initial Dilution Zone (as defined by the MWR)
- LAC = Local Advisory Committee
- LID = Low Impact Developments
- LWMP = Liquid Waste Management Plan
- MDF = Maximum Daily Flow
- MWF = Maximum Monthly Flow
- MWR = Municipal Wastewater Regulation
- NH_3-N = Unionized Ammonia
- O&M = Operations and Maintenance
- OC = Operational Certificate
- OCP = Official Community Plan
- OMRR = BC Organic Matter Recycling Regulation
- PHF = Peak Hourly Flow
- PIF = Peak Instantaneous Flow
- PMC = Plan Monitoring Committee
- RF = Risk Factor
- SED = Surplus Effluent Discharge
- SSO = Sanitary Sewer Overflow
- TAC = Technical Advisory Committee
- TBL = Triple Bottom Line
- TBL + R = Triple Bottom Line + Risk
- TP = Total Phosphorus
- TSS = Total Suspended Solids
- WAC = Wastewater Advisory Committee
- WSER = Wastewater Systems Effluent Regulation
- WWTF = Wastewater Treatment Facility
- USWCP = Urban Storm Water Control Plan
- UV = Ultraviolet

1 INTRODUCTION

1.1 Background and History

Port Alberni is a picturesque waterfront community located adjacent to the Somass River at the head of the Alberni Inlet on Vancouver Island. Port Alberni's economy has historically been largely dependent on the natural resource sector, especially forestry. With changes in BC's forestry and fisheries sectors in recent years, Port Alberni's population has declined somewhat, but is currently stable at approximately 18,000 people. To supplement the natural resource-based economy, the community is diversifying into other areas including tourism, including opportunities such as recreational boating, fishing, hiking and ecotourism, and as a gateway to nearby Pacific Rim National Park.

The City's centralized wastewater treatment system has been in place since the 1950s. The City's wastewater collection system includes separate sanitary and stormwater sewer systems, combined sanitary and stormwater sewer systems, and pump stations. Wastewater in a small portion of the City is managed by on-site septic systems. Hauled septage collected within the region is discharged to a manhole at the City's Wallace Street Pump Station and conveyed to the Old City Lagoon for treatment. A 5-hectare aerated earthen lagoon (Figure 1-1) discharges treated effluent to the Somass River.

The City currently discharges treated municipal wastewater under a discharge permit (PE-297) issued by British Columbia Ministry of Environment and Climate Change Strategy (BC MOE). In recent years, the City's discharge has routinely been out of compliance with this permit due to flows, effluent quality, and discharge location.

Figure 1-1
City of Port Alberni's Old Earthen Aerated Wastewater Lagoon

1.1.1 Ecological, Historical and Socio-Community Context

The Alberni Inlet and Somass Estuary is a highly valued ecological resource to the region. The Inlet notably provides habitat for salmonids (sockeye, chinook, coho, pink, chum, and steelhead). In addition, the area supports many other forms of aquatic life and marine and migrating birds.

The WWTF site and discharge location in the receiving environment lie within the traditional territories of the Tseshaht (cɪ̓šaaʔatḥ) and Hupačasath First Nations. These Nations have historically inhabited the lands within the Alberni Valley and Inlet and have utilized the land and resources in a sustainable way for thousands of years. Domestic wastewater generated on the adjacent inhabited reserves of the Tseshaht and Hupačasath people is treated by the City's wastewater treated facility under cost-sharing agreements.

1.2 LWMP Overview

The City is undertaking a Liquid Waste Management Plan (LWMP) to define a feasible and affordable solution for bringing the City's wastewater management into compliance with provincial and federal wastewater regulations.

The objective of a LWMP is to provide long-term wastewater management that meets required regulatory and environmental outcomes at sustainable and manageable cost for the community. LWMPs are typically completed in three stages and require consensus building with community stakeholders, First Nations, and the general public:

Stage 1 LWMP involves high-level investigations of the City's wastewater management, identification of key issues and identification of potential alternatives for consideration in greater detail in Stage 2. The City's Stage 1 LWMP was completed in May 2001 and subsequently approved by the BC MOE.

Stage 2 LWMP, develops alternatives identified in the Stage 1 LWMP, and undertakes additional studies needed, and works with First Nations, stakeholders and the public to select the City's preferred long-term wastewater management strategy.

Stage 3 LWMP is an implementation schedule and financial plan that commits the City to implementation of the preferred wastewater management strategy selected in the Stage 2 LWMP. Implementation of the LWMP will ensure the City's effluent discharges satisfy requirements of provincial and federal regulations for continued long-term protection of public health and the environment.

The Stage 1 LWMP was completed and approved by the BC MOE in 2001. A Stage 2 LWMP was initiated in 2003; however, the options identified at the time were financially prohibitive for the City. The Stage 2 LWMP was reinitiated in 2013 following the City's acquiring of the Catalyst Lagoon. Extensive work was completed up until 2017, when a Draft Stage 2 Report was completed. The City then opted to pursue registration under the Municipal Wastewater Regulation (MWR) of the *Environmental Management Act* in 2017, in conjunction with design progression and construction of the upgrades to the WWTF. Recently, the City has elected to also continue with the LWMP and benefit from the holistic framework embedded in the LWMP process for ongoing management of municipal wastewater and stormwater. Once the combined Stage 2/3 LWMP is approved by City Council, it will be submitted for review/approval by the BC MOE. Ultimately, the City's authorization to discharge will be under its MWR Registration, and the City will also have an approved Stage 2/3 LWMP.

1.3 LWMP Boundary

The City of Port Alberni is located in south-central Vancouver Island, at the head of Alberni Inlet and at the mouth of the Somass River. The LWMP study area receives significant annual precipitation due to the moderate climate of the area. Due to its location, the City experienced a tsunami in 1964. The LWMP boundary encompasses the City of Port Alberni, as shown in **Figure 1-2**.

1.3.1 Outcomes of Stage 1 LWMP Approval

As part of the Stage 1 LWMP approval, BC MOE highlighted the following recommendations for inclusion with further stages:

- Complete a comprehensive study to determine impacts on the receiving environment from existing sanitary sewer overflows (SSOs), combined sewer overflows (CSOs), and lagoon discharges.
- Implement modeling of the sewer system as part of the strategy to eliminate SSOs and eventually eliminate CSOs.
- Develop cost estimates for the Stage 1 LWMP options.

The following section summarizes how the Stage 1 LWMP recommendations were integrated into the overall scope and objectives of the Combined Stage 2/3 LWMP.

1.4 Updates and Upgrades Since Stage 1 LWMP Approval and Previous Stage 2 LWMP work (2013-2017)

1.4.1 Acquisition of Catalyst's Lagoon System

In 2013, after several years of discussions, Catalyst Paper and the City reached an agreement for the City to purchase Catalyst's surplus wastewater treatment lagoon system. Acquiring and repurposing the former Catalyst lagoon system was one of three wastewater treatment options that had been identified in Stage 1 of the LWMP; however, Catalyst Paper was not amenable to disposing of the lagoon system at that time. The lagoon acquisition enabled the City to resume its LWMP process and proceed with design modifications based on the Catalyst lagoon. The new infrastructure required for treatment and discharge from the upgraded WWTF was a major focus of the previous Stage 2 LWMP (2013-2017) process.

The City's effluent management and wastewater treatment are discussed in further detail in Section 5 of this report.

1.4.2 Adjusted Community Population Projections

During the Stage 1 LWMP process, future population growth was based on an estimated growth rate of 1% per year. Since that time, the population was estimated in 2009 to be 17,878 and 588, for Port Alberni and local First Nations, respectively (Koers & Associates Engineering Ltd., 2010). This corresponded to growth of approximately 0.5% to 0.75% per year for Port Alberni and First Nation communities.

Population growth estimates for the purposes of planning will be further discussed in Section 4.

1.4.3 Reduced Impact of Non-Domestic Wastewater Discharges

The Stage 1 LWMP identified two non-domestic wastewater sources: a fish processing factory and leachate from the Alberni Valley Landfill. The fish processing factory is no longer in operation. As a result, the Alberni Valley Landfill is the only non-domestic wastewater source.

The City's non-domestic wastewater discharges will be further discussed in Section 4 of this report.

1.4.4 City Eliminated SSO in Collection and Conveyance System

Inflow and infiltration (I&I) were identified in Stage 1 as a large flow contributor in the Alberni sewerage system. Since that time, the City has made significant efforts to reduce I&I by separating selected storm sewers and sanitary sewers. The City has also worked to reduce/eliminate CSOs and SSOs. The Pemberton SSO (the only SSO for the City) was eliminated in 2006. A stormwater interceptor was installed at the Argyle Street CSO in 2011. The City has also prioritized separation of the combined sewer upstream of the Bruce Street CSO due to localized flooding events.

Collection and conveyance system improvements, CSO management, and urban stormwater management strategies will be further discussed in Section 3, Section 7, and Section 8 of this report, respectively.

1.4.5 Design and Construction of WWTF following previous Stage 2 Work

The developed wastewater treatment strategy builds upon the alternatives identified in the Stage 1 LWMP and subsequently selected when the City acquired the former Catalyst lagoon in 2013.

The previous Stage 2 LWMP work (2013-2017) focused on the following:

1. Completion of an Environmental Impact Study (EIS) to support the design of the upgraded WWTF and to confirm the effluent discharge criteria.
2. Strategy for returning treated effluent into the Alberni Inlet.

Following the previous Stage 2 LWMP work completed in 2017, the City was successful in securing an additional grant under the Clean Water and Waste Fund (CWWF). Combined with the previous Gas Tax grant, the City was able to progress with the detailed design and construction for the upgrades to the WWTF. These upgrades include a new screening facility, a new diffused aeration system and new effluent pump stations, new UV disinfection system and a new engineered outfall and diffuser system. Construction of the facility is now nearing completion, with commissioning planned for Fall 2020. Additional details regarding the upgraded WWTF and outfall is provided in Section 5.

1.5 Combined Stage 2/3 LWMP Scope and Objectives

This Combined Stage 2/3 LWMP focuses on the following key objectives:

- Update and document the previous Stage 2 LWMP work that occurred between 2013 and 2017.
- Re-establish the Waste Advisory Committee (WAC) as the Plan Monitoring Committee (PMC) to obtain technical, regulatory, and public input into the City's Implementation plan.
- Consultation with First Nations, and engagement with key stakeholders and the public. Document feedback received and integrate this feedback into development of the preferred wastewater management strategy.

HUPACASATH FIRST NATION BOUNDARY (IR1 AHAHSWINIS)

LIMITS OF THE CITY OF PORT ALBERNI

TSESHAHT FIRST NATION BOUNDARY (IR1 TSAHAHEH)

BRITISH COLUMBIA

PORT ALBERNI

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CITY OF PORT ALBERNI
STAGE 2/3 LIQUID WASTE MANAGEMENT
PLAN BOUNDARY AREA

Dwg. No.: FIGURE 1-2
Date: July 2020

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- Develop strategies for key issues presented in the Stage 1 LWMP and provide updates on the various commitments the City has made from the LWMP to date. These includes issues relating to wastewater treatment and effluent integration, and management and eventual elimination of Combined Sewer Overflows (CSOs) within the collection and conveyance system.
- Identify opportunities for integrating sustainability practices and resource recovery into the City's preferred wastewater management strategy, where practical.

1.6 Report Overview

As presented in Section 1.4, references to City's Stage 1 LWMP are outlined throughout various sections of this report. Table 1-1 is an additional guide for the reader.

Table 1-1
Summary of the Key Wastewater Issues

Wastewater Management Issue Identified in Stage 1 LWMP	Report Section(s) that Addresses Wastewater Issue in Stage 2 LWMP
Compliance with the applicable provincial and federal regulations	Section 2: Regulatory Framework
Existing and Projected Community Development	Section 4: Basis for Planning
Wastewater Treatment and Effluent Integration	Section 3: Existing Wastewater Management Section 5: Wastewater Management
Non-Domestic (Commercial / Institutional) Wastewater Discharges	Section 4: Basis for Planning
Source Control	Section 6: Source Control and Volume Reduction
Effluent and Biosolids Reuse Possibilities	Section 9: Other Wastewater Components
Wet Weather Flow Management	Section 7: Combined Sewer Overflows Section 8: Inflow and Infiltration Section 9: Other Wastewater Components

2 REGULATORY FRAMEWORK

2.1 Overview

The following sections provide an overview of the applicable regulatory framework that forms the basis for the Combined Stage 2/3 LWMP, with specific focus on regulations enacted since the City's Stage 1 LWMP was approved in 2001.

2.2 Provincial Municipal Wastewater Regulation

2.2.1 Overview of Regulation

Presently, the City's existing wastewater collection and treatment system is regulated by the BC MOE under waste discharge permit PE-297. The permit stipulates the following performance criteria:

- Maximum allowable daily effluent discharge volume is 34,100 m^3/d.
- Maximum effluent 5-day biochemical oxygen demand ($cBOD_5$) concentration is 70 mg/L.
- Maximum effluent total suspended solids (TSS) concentration is 70 mg/L.

BC MOE no longer issues waste discharge permits. Under the 2012 Municipal Wastewater Regulation (MWR), wastewater treatment and discharge must be registered under the MWR, or alternatively, under an approved LWMP. The MWR applies to all discharges of domestic wastewater greater than 22.7 m^3/d except those regulated under the Sewerage System Regulation (under the Health Act), which generally applies to smaller domestic sewer systems and discharges from individual single-family or duplex dwellings.

Compliance with the MWR provides local governments with authorization for treatment, reuse, and discharge of treated effluent. The MWR prescribes the minimum standards for effluent quality, including lagoon discharge limits of 45 mg/L $cBOD_5$ and 60 mg/L TSS. In addition, the following sections of the MWR apply:

- Part 2, Division 3 – Environmental Impact Studies;
- Part 3 – General Design and Construction Requirements; and
- Part 6 – Specific Requirements for Discharge to Water.

Specific sections of the MWR are referenced throughout the Combined Stage 2/3 LWMP, as applicable.

The MWR prescribes an environmental impact study of the receiving environment to identify whether additional measures above the MWR discharge requirements are needed to protect human health and the environment.

In April 2018, the City began the registration process under the MWR, and submitted a final registration package in October 2019. During this process, it was determined that the City would request two formal substitutions in its application for registration. In addition, the City submitted two separate Section 40 (b) approval requests to BC MOE to initiate construction of the outfall and the WWTF prior to receiving approval on the MWR registration. Further details regarding the registration and substitutions can be found in Section 5.3.

2.3 Vancouver Island Phosphorus Objective

Phosphorus is an important nutrient for primary production or algal growth; however, excessive levels of algal growth can be harmful to aquatic ecosystems. Surface waters on Vancouver Island are characterized by low nutrient levels and are typically phosphorus limited. To address phosphorus loadings to freshwater streams on Vancouver Island, the BC MOE implemented the Vancouver Island Phosphorus Objective in 2012. This objective restricts phosphorus discharge and limits *in-stream phosphorus concentrations* as follows:

May 1 to September 30 total phosphorus average, with samples collected monthly to not exceed 5 µg/L, and maximum total phosphorus should not exceed 10 µg/L in any one sample.

Note that this objective does not apply to estuarine or marine discharges.

2.4 Federal Wastewater Systems Effluent Regulations

The Canadian Council of Ministers of the Environment (CCME) developed a national "Strategy for the Management of Municipal Wastewater Effluent" which requires that all wastewater treatment facilities provide a minimum of secondary wastewater treatment, or equivalent. The Wastewater Systems Effluent Regulation (WSER) was promulgated under the Canada *Fisheries Act* in July 2012.

WSER applies to any wastewater system that discharges an average daily volume of 100 m^3/d or more to surface water. Regulated substances include 5-day carbonaceous biochemical oxygen demand ($cBOD_5$), suspended solids (TSS), total residual chlorine, un-ionized ammonia, and acute lethality. Table 2-1 provides a summary of the WSER "end-of-pipe" effluent quality requirements.

Table 2-1
WSER Municipal Effluent Quality Requirements for Discharge to Surface Water[1]

Parameter	Value
5-day Carbonaceous Biochemical Oxygen Demand ($cBOD_5$), Average (mg/L)	25
Suspended Solids (TSS), Average (mg/L)[2]	25
Total Residual Chlorine, Average (mg/L)	0.02
Unionized Ammonia, Maximum (NH3-N mg/L)	1.25
Acute lethality	Not Acutely lethal

[1] If Maximum Daily Flow ≥ 100 m^3/d, taken from Part 1, Section 6 of the WSER.

[2] For intermittent wastewater system or continuous wastewater system with a hydraulic retention time of five or more days, the average concentration of suspended solids in the effluent is not to take into account the concentration of suspended solids in effluent sample that was taken during the month of July, August, September, or October if that result is greater than 25 mg/L.

The City is currently registered under the WSER and reports effluent quality on a quarterly basis.

3 EXISTING WASTEWATER MANAGEMENT

3.1 Overview

This section provides an overview of the City's existing wastewater management system, and highlights significant modifications completed since the Stage 1 LWMP in 2001.

3.2 Collection and Conveyance

The City's centralized wastewater collection, conveyance, treatment, and effluent disposal system has been in place since the 1950s. It is comprised of six sewer catchments including combined sewers, separated sanitary and storm sewers, and pump stations within the City boundary, Tsahaheh Indian Reserve No. 1, and Ahahswinis Indian Reserve No. 1. The six catchment basins are:

- Josephine (the Tseshaht First Nation Sanitary Sewer System feeds into this system)
- Wallace
- Upper Johnston
- Margaret
- 4th Avenue
- Argyle

The City's collection and conveyance system also includes a network of over 100 km of stormwater pipelines and 107 stormwater outfalls. An overview of the City's existing collection and conveyance system is provided in **Figure 3-1**. Further details of the upgrades implemented since 2001 within these catchment basins are described in the sections below.

3.2.1 Combined Sewer Overflow Mitigations

Combined sewer systems are sewers that convey both domestic wastewater and stormwater. Combined sewer systems currently service approximately 41% of the sewered areas in Port Alberni. These systems experience CSOs during some precipitation events, resulting in the discharge of untreated wastewater mixed with stormwater directly to the receiving environment. The City's four CSOs are regulated under BC MOE waste discharge permits and remain in operation during specific precipitation events.

The City previously had a single SSO that discharged untreated wastewater to Roger Creek during storm events. In 2004, the City's $2 million North Port Sewer Abatement project constructed a new gravity force main from the upper Johnston Road sewer catchment area to divert flows from the Margaret Street Pump Station. In addition, a new river crossing was built to convey this wastewater directly to the Old City Lagoon. Completion of this project in 2006 eliminated the occurrence of SSOs from the Pemberton Road manhole.

A summary of catchment basin locations, receiving environment, and waste discharge permit numbers for Port Alberni's CSOs and SSOs are summarized in Table 3-1.

Table 3-1
Summary of the City of Port Alberni's CSO and SSOs

CSO or SSO	Catchment Basin Location (Latitude / Longitude)	Receiving Environment	BC MOE Waste Discharge Permit
Bruce Street CSO	Argyle (49.2265^{0}N / 124.8136^{0}W)	Alberni Inlet	PE-331
Argyle Street CSO	Argyle (49.2347^{0}N / 124.8164^{0}W)	Alberni Inlet	PE-332
Tahsis Street CSO	Argyle (49.2298^{0}N / 124.8135^{0}W)	Alberni Inlet	PE-333
Maitland Street CSO	4th Avenue (49.2489^{0}N / 124.8137^{0}W)	Lupsi Cupsi Creek	PE-334
Pemberton Road SSO	SSO eliminated in 2006 via North Port Sewer Abatement Project		

Since 2001, the City's sewer separation program implemented over $5 million in capital projects to separate approximately 8.5 km of combined sewers into new storm and sanitary sewer systems.

Further details of the City's continued commitments to reduce and eliminate CSOs as part of the LWMP are outlined in Section 8.

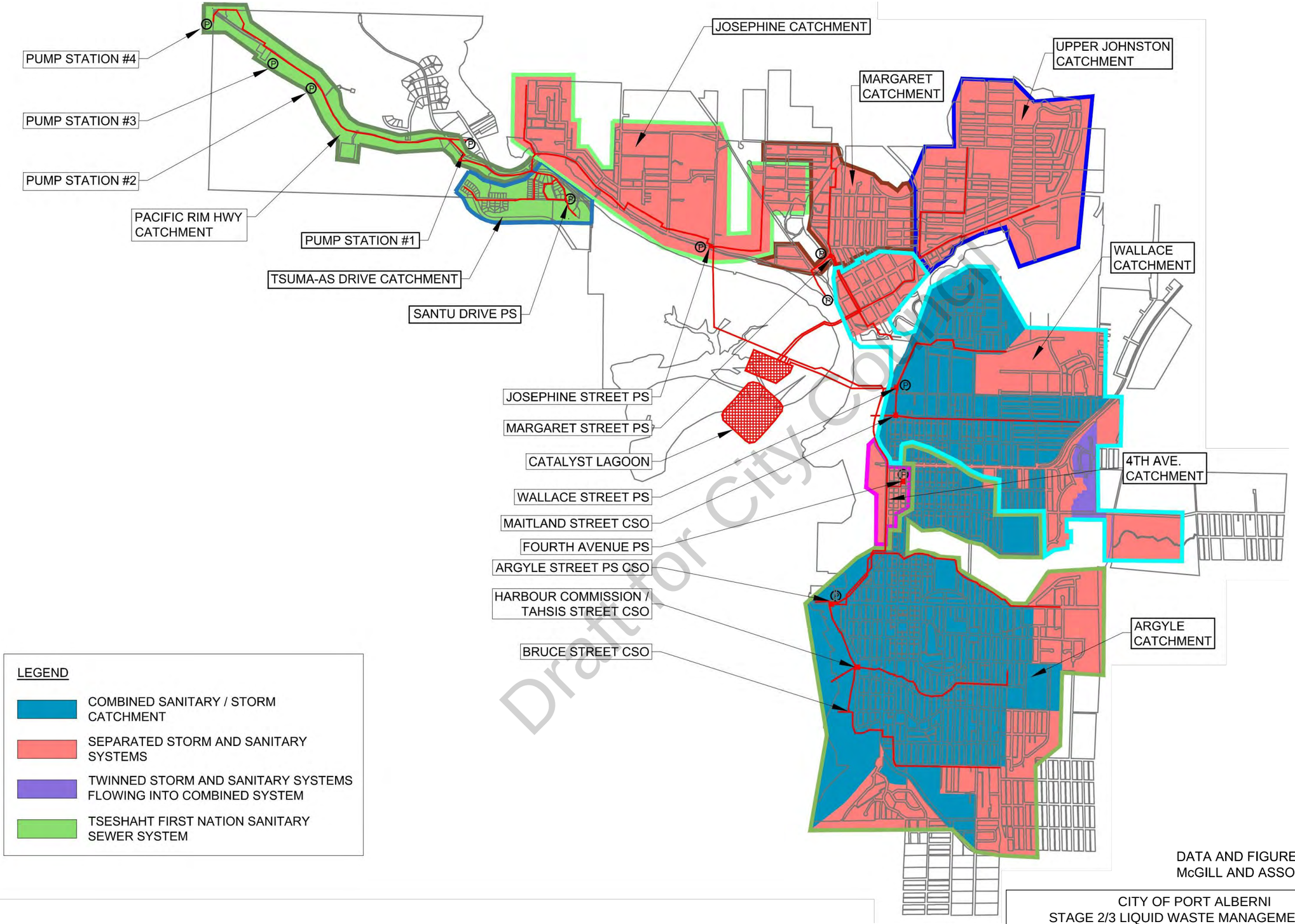
3.2.2 Pump Station, Interceptor and Force Main Upgrades

A total of six pipelines convey wastewater to the Old City Lagoon, as illustrated in Figure 3-1:

- **Wallace:** A force main from the Wallace Street Pump Station, which conveys wastewater from upper sector south of Roger Creek across the Somass River.
- **Argyle / 4th:** A force main from the 4th Avenue Pump Station and a force main from the Argyle Street Pump Station combine into a single force main which crosses the Somass River.
- **Josephine:** A force main that conveys wastewater from the Josephine Street Pump Station.
- **Margaret:** A force main from the Margaret Street Pump Station via a river crossing at Southgate and Victoria Quay.
- **Upper Johnston Gravity Force Main:** A gravity pipeline that conveys wastewater from the Upper Johnston catchment basin under the Somass River at Southgate and Victoria Quay.
- **Landfill Gravity Force Main:** A gravity pipeline that conveys partially-treated leachate from the Alberni Valley Landfill.

Since 2001, the City has implemented approximately $2 million in capital projects to upgrade the pump stations. In 2016, the City has undertaken seismic upgrades to the Wallace Street and 4th Avenue Pump Stations.

A summary of details on the City's existing pump stations, including upgrades completed since 2001 is provided in Table 3-2.



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CITY OF PORT ALBERNI
STAGE 2/3 LIQUID WASTE MANAGEMENT PLAN
OVERVIEW OF PORT ALBERNI EXISTING COLLECTION AND CONVEYANCE SYSTEM

Dwg. No.: FIGURE 3-1
Date: July 2020

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Table 3-2
City of Port Alberni Existing Pump Stations

Pump Station	System Type	No. of Pumps	Maximum Pumping Capacity	Facility Upgrades Completed Since 2001
Josephine Pump Station	Wastewater	2 Flygt CP 3152 MT pumps; Only one pump runs at a time	5,875 m^3/d	
Wallace Street Pump Station	Combined	2 Flygt NT 3300.181 LT pumps and 1 Flygt NT 3127 LT.422 jockey pump; All three pumps can run at once	17,712 m^3/d	Pump House Upgrade (2001) Seismic Upgrade (2016)
Argyle Street Pump Station	Combined	2 Flygt NP 3306/665 pumps; Only one pump runs at a time	21,600 m^3/d	Pump House Emergency Bypass Connection (2008) Pump House Upgrade (2009) Argyle St. – Kingsway to Outfall (2011)
Margaret Street Pump Station	Wastewater	2 Flygt NP 3171.180 pumps; Both pumps can run at once	15,725 m^3/d	Pump Station Upgrade (2005)
4^{th} Avenue Pump Station	Wastewater	2 Flygt CP 3127 HT 484 pumps; Only on pump runs at a time	1901 m^3/d if Argyle PS is operating or 2851 m^3/d if Argyle PS is not operating	Seismic Upgrade (2016)

3.3 Wastewater Treatment and Effluent Return to Environment

This section provides a brief overview of the City's existing wastewater treatment and effluent discharge system.

3.3.1 Old City Lagoon

The City's existing wastewater treatment facility consists of a 5-ha earthen lagoon which was constructed in 1955 (NovaTec, 1995). As wastewater flows and loads increased, the lagoon was converted from a facultative system to a partially-mixed aerobic system through the addition of nine surface mechanical aerators. The lagoon was also partitioned into three cells using flexible plastic curtains. The three cells are operated in series, and include a primary settling cell, an aeration cell, and a final settling cell. The primary cell has three surface mechanical mixers – one 40 hp aerator and two 30 hp aerators; the aeration cell has six – four 40 hp aerators and two 75 hp aerators; the final settling cell is not aerated.

3.3.1.1 Effluent Integration

The lagoon discharges treated effluent via a surface weir and a 580 m long swale that discharges into the Somass River approximately 640 m upstream of its mouth. The Somass River at this location is influenced by tidal activity. The swale is vegetated with cattails and other aquatic plants, as shown in Figure 3-2.

Figure 3-2
Outlet from Old City Lagoon

The City's existing effluent discharge does not meet the MWR requirements for discharges to a river, estuary, or marine waters.

3.4 Residuals Management

The accumulation of settled solids in the Old City Lagoon occurs predominantly in the primary and aeration cells. Accumulated solids within the City's wastewater treatment lagoon have typically been removed every six to eight years, for example:

- 2,600 dry tonnes of solids were removed in 1997
- 1,000 dry tonnes of solids were removed in 2004
- 240 dry tonnes of solids were removed from the primary cell in 2016

During these operations, the solids were dewatered on-site and transported to the Alberni-Clayoquot Regional District's Alberni Valley Landfill where they were composted with wood chips and beneficially reused as cover material.

4 BASIS FOR PLANNING

4.1 Overview

The following section outlines the key assumptions and parameters used in developing the City's wastewater management options for the Stage 2 LWMP.

4.2 Planning Horizon

The City's wastewater management strategy was developed based on a planning horizon to year 2050, for purposes of infrastructure sizing and economic analyses.

Economic analyses for elements such as sewer pipes and building structures were based on a 40-year planning horizon. Ancillary systems, such as mechanical and electrical elements, were based on a 20-year planning horizon.

4.3 Community Make-Up

Port Alberni is committed to sustainable growth, as outlined in the City's 2007 Official Community Plan (OCP). The OCP lays out the community's vision for the future. Developed through an extensive collaborative process with people that live and work in the community, the OCP guides the City's planning initiatives related to residential, commercial, and industrial development; parks and recreation amenities; transportation infrastructure and the provision of utilities, including wastewater management.

The OCP recognizes that the economic contribution from fishing and forestry industries will be smaller in the future. This economic shift has led to a population decline of 0.6% between 1981 and 2003. The commercial sector, specifically retail and tourism, have also been negatively impacted in recent years. The potential development of industrial parks anticipated in the Stage 1 LWMP (such as Dundalk Industrial Park and Devil's Den Industrial Park) have yet to be advanced.

The City's wastewater management strategy was developed based on a population growth rate of 0.5% per year, based on a 2010 study conducted by Koers & Associates Engineering Ltd. (Section 1.4.2). Similar growth has been assumed for the First Nations communities that are and will continue to be serviced by the City's wastewater system (i.e. Tseshaht Reserve Tsahaheh 1 and Hupačasath Reserve Ahahswinis 1). A population growth rate of 0.5% per year has been assumed for the LWMP planning horizon to 2050.

4.4 Wastewater Flows

Flows collected from 2010 to 2012, and from 2014, have been studied to develop the design basis for the City's wastewater treatment upgrades, which is based on year 2015. The City's long-term commitment to separation of stormwater and wastewater collection/conveyance is expected to gradually reduce wastewater flows and is the rationale for 2015 flows as the design basis.

Using the peaking factors from the historical data, the projected flows for 2015 are summarized in Table 4-1.

Table 4-1
Projected Year 2015 Flow Rates

Parameter	Value	Unit
Design horizon	2015	year
Sewered residential population	19,027	p
Unit wastewater generation rate (ADWF basis)[1, 2]	0.53	m^3/d-p
Flow rates[3]		
ADWF[4]	10,100	m^3/d
MWF[5]	56,600	m^3/d
MDF[6]	68,700	m^3/d
Wet-weather PHF[7]	74,200	m^3/d
PIF[8]	79,400	m^3/d
Flow peaking factors[9]		
MWF / ADWF	5.6	
MDF / ADWF	6.8	
Wet-weather PHF / MDF	1.08	
PIF / Wet-weather PHF	1.07	

Notes:
[1] Based on sewered residential population.
[2,3,9] Includes pre-treated landfill leachate. Excludes CSO overflow volumes.
[4] ADWF refers to the average day flow for the period of July 1 to August 31 inclusive
[5] MWF refers to a maximum average day flow over a 7-day period and is not related to a calendar week
[6] MDF refers to the maximum cumulative flow volume over a midnight-to-midnight 24-hr period
[7] PHF refers to the peak hourly flow during a wet weather event
[8] PIF refers to the peak instantaneous flow during a wet weather event

4.5 Wastewater Loadings

Total loading projections were developed based on the annual generation rates for $cBOD_5$, TSS, and Total Kjeldahl Nitrogen (TKN) using the flow and loading data from 2010 to 2012. These values were compared and verified against typical unit generation rates exhibited by facilities of similar size. The total loading values is the sum of the municipal wastewater loading, a stormwater load allowance, and a pre-treated leachate allowance.

Table 4-2 summarizes the expected total loading rates.

Table 4-2
Projected Loading Rates

	Total Loading (Year 2015)	Total Loading (Year 2050)	Units
$cBOD_5$			
Average annual load	1477	1749	kg/d
Maximum month load	1762	2089	kg/d
Maximum day load	2191	2599	kg/d
TSS			
Average annual load	1622	1912	kg/d
Maximum month load	2078	2441	kg/d
Maximum day load	2533	2969	kg/d
TKN			
Average annual load	385	440	kg N/d
Maximum month load	428	491	kg N/d
Maximum day load	471	542	kg N/d

5 WASTEWATER MANAGEMENT

5.1 Overview

Stage 1 LWMP investigations identified that acquiring and repurposing Catalyst Paper's industrial lagoon was the preferred wastewater treatment management alternative. Lagoons are effective for wastewater treatment, particularly for small communities because they provide simple, low-cost wastewater treatment that meets regulatory standards. Historically, the new lagoon was used to treat wastewater produced by the mill. In 2017, after receiving federal and provincial funding support, the City began detailed design of upgrades to the wastewater treatment system to meet compliance with the federal and provincial regulations. In 2018, construction of the upgrades began at the WWTF, with completion scheduled for Fall 2020. Appendix A provides a historical summary of the City's wastewater treatment options.

A key element in wastewater management is integrating treated effluent back into the natural environment. In the City's case, "integration" is more aptly "re-integration", since the effluent is ultimately part of the broader hydrologic system that includes Alberni Inlet and the Pacific Ocean.

Section 3.3 described the existing effluent discharge into a ditch that connects to the Somass River. At low tide, the ditch is a well-defined outlet on the riverbank. At higher tides the ditch is flooded and thus there is no distinct point(s) of release into the river. The Stage 1 LWMP document identified this discharge as a priority for further study during subsequent stages of the LWMP.

The previous Stage 2 LWMP work completed from 2013-2017 focused on identifying and evaluating options for effluent integration into the receiving environment. Many potential effluent discharge options were identified. These options were subjected to a "screening" process and a comparative evaluation of options, which considered various environmental, social, and economic attributes as a means of comparing various wastewater management scenarios. Each scenario consisted of a wastewater management strategy and an effluent integration method. A detailed review of the evaluation work conducted for effluent integration can be found in Appendix B.

Reuse of reclaimed water is also a possibility for the future and is discussed in Section 9.1.3.

5.2 Wastewater Treatment Strategy

The various elements of the preferred wastewater management strategy are shown in Figure 5-1. The preferred wastewater management strategy includes the following:

- Conveyance of the raw wastewater from the Old City Lagoon through a screening facility and into the upgraded WWRF. The screening system will use perforated plates (6 mm opening), followed by a washer and compactor to remove, clean and dewater the screened material.
- Secondary wastewater treatment will be achieved in the upgraded lagoon system (former Catalyst lagoon). The lagoon will be aerated with a new fine bubble diffusers system. Aeration will be provided using blowers.
- The upgraded lagoon will be divided into two equal cells, which will operate in parallel. A splitter box at the inlet at the inlet of the two cells will direct all the flow to one cell in the event that the effluent pumping system in the other cell is not operational.
- A building will house the electrical power distribution equipment and the ultraviolet (UV) disinfection system.

- A pump station at the outlet of each treatment cell will draw treated effluent and direct it through an in-pipe UV disinfection system prior to being conveyed to the effluent diffuser system.
- The outfall system is an 800 mm (32”) DR21 HDPE pipe extending 800 m into Alberni Inlet. Five (5) diffusers at the end of the pipe, to provide efficient dilution and dispersion of the treated effluent into the receiving environment.
- The Old City Lagoon will be decommissioned. The first process in restoring the lagoon is to decommission the existing wastewater treatment facility. This will involve removing mechanical equipment, removing baffles, draining the lagoon, and removing the accumulated stabilized sludge. Refer to Section 9.1.2 for further details regarding lagoon restoration.

In August and early September will be possible for the City to manage the release of treated effluent to reduce impact on the returning salmon in Alberni Inlet. The large area of the lagoon provides storage capacity that can be used to discharge treated effluent only during a falling tide. This may be a significant benefit during sensitive time periods in the late summer, when adult salmon are holding in the upper Alberni Inlet waiting to enter the Somass River. It is known that low DO concentrations may adversely affect the health of spawning salmon and reduce reproductive fitness. In the past, mortalities of adult sockeye salmon in Alberni Inlet have has been attributed to low dissolved oxygen levels in Alberni Inlet where salmon congregate waiting for the Somass River to cool. Therefore, managing the discharge of treated effluent strategically during this time would help mitigate against any additional, incremental decrease in dissolved oxygen in the Alberni Inlet.

Investigations to date have illustrated the ability of varying the level within the lagoon system, to store wastewater in the lagoon enable intermittent release.

The O&M requirements for the WWTF can be described as follows:

- Labour (Operations staff)
- Electricity (including aeration)
- UV lamp replacement
- Biosolids management
- Maintenance
- Administration

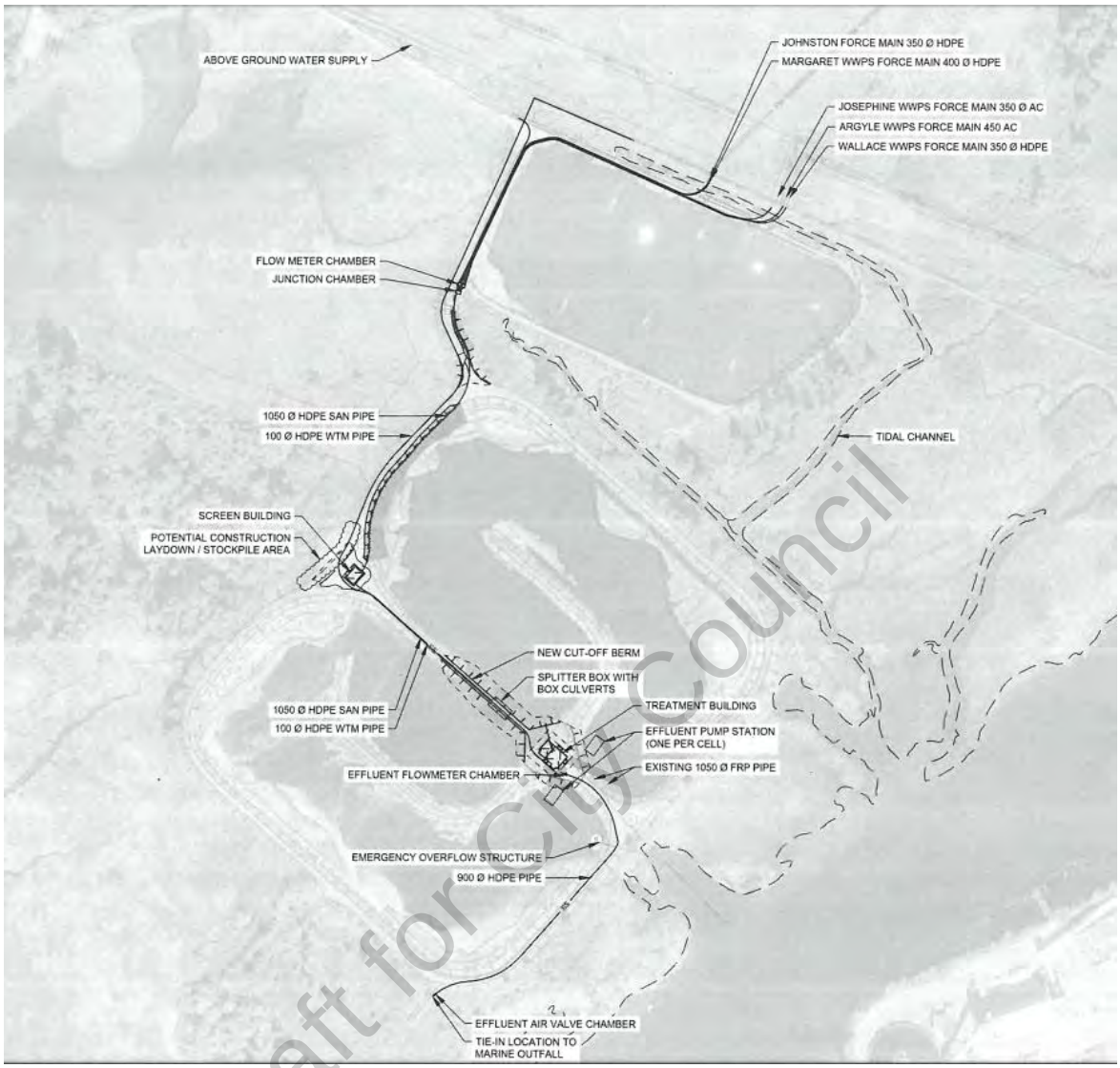

Figure 5-1
Site Layout

5.3 Compliance with the MWR and WSER

As discussed in Section 2, the WWTF is already registered under the WSER, and the upgrades will not change the applicable treatment requirements.

In April 2018, the City began the registration process under the MWR. At this time, detailed design of upgrades to the lagoon system was underway. During the Pre-Registration phase, it was identified that the City would need to submit three requests for substitution:

1. Section 40 (b) Request – Construction of WWTF and outfall/diffuser prior to MWR Approval
    a. With detailed design and tender underway, the City requested that the Director allow for the construction of the WWTF and outfall prior to MWR registration approval. The request was granted for both components.
2. Section 95(5) Substitution – Modified Phosphorus Effluent Limits
    a. With the effluent discharge being into the Alberni Estuary, the regulation called for phosphorus limits of 1 mg/L and 0.5 mg/L for total phosphorus, and orthophosphate, respectively, unless a substitution could be granted. Following an assessment of potential phosphorus effects in the receiving environment, new limits of 6 mg/L and 4 mg/L were proposed for total phosphorus and ortho-phosphate.
3. Section 99(3) Substitution – Outfall Depth
    a. As identified in the previous Stage 2 LWMP work, the default MWR requirement for outfall depth of at least 10 m would pose an unacceptable risk to returning salmon given the unique biophysical characteristics of the Somass Estuary and the history of industrial activity (notably the presence of the fibre mat on the bottom). As a result, a substitution request was submitted to change the minimum depth from 10 m below mean low water to 2.5 -3 m below mean low water (7 m below high water).

In October 2019, the City submitted the final registration package for the Municipal Wastewater Regulation (MWR) to the BC MOE.

Notwithstanding the substitution requests presented above, the preferred wastewater management strategy will achieve the MWR and WSER requirements as follows:

- Redundancy of the main wastewater treatment system is provided by operating the lagoon system using two cells, in parallel. Standby power will be available in the event of a power failure.
- As per Section 1.2.2 of the Combined EIS Report (See Section 5.5 below for further details), the new outfall location constitutes a discharge to an estuary according to the definition in Section 1 of the MWR.
- Both the MWR (Table 11 of the MWR for 'estuaries') and WSER $cBOD_5$ and TSS limits will be met at the end of pipe (not to exceed a maximum monthly concentration of 45 mg/L, and an average monthly concentration of 25 mg/L, respectively).
- As per Section 5.4 of the Combined EIS Report, effluent dispersion modelling was undertaken to establish the dilution at the edge of the Initial Dilution Zone (IDZ) of 100 m. The modelling work confirmed the dilution at the edge of the IDZ ranges from 16:1 to 140:1 in summer and 20:1 to 401:1 in the winter, based on a range in flows. The lower end of these ranges represents "worst case" conditions that would occur relatively infrequently. During the flood and ebb tides, which account for about 75% of the time in summer, the dilutions range from 61:1 to 106:1.
- Even under the worst-case conditions, there is adequate dilution to achieve the MWR requirement of meeting the applicable water quality guidelines at the edge of the IDZ.

The fecal coliform limit of 200 CFU/100 mL will be met at the edge of the IDZ using UV disinfection. Effluent monitoring and reporting will continue to occur using an automated sampler to collected composite samples on a weekly basis. The monitored parameters include $cBOD_5$, TSS, ammonia, nitrate, nitrite, UVT, pH, total phosphorus, temperature, pH, fecal coliforms, total coliforms)

5.4 Implementation to Date

Construction began on the WWTF upgrades in 2018. Table 5-1 is a summary of the capital costs for elements of the project that have been tendered and/or completed.

The Wastewater Management Implementation Strategy for components that have not been implemented yet are presented in Section 10.2.1.

Table 5-1
Cost Estimate for Preferred Wastewater Management Strategy

Item	Description	Cost ($CAD)	Status of Construction
DIRECT COSTS			
1	**Lagoon Infrastructure Acquisition ($2012)**		**Complete**
	Purchase Former Catalyst Lagoon	4,010,000	
	Sludge Disposal Agreement	1,270,000	
	Desludging Contract	1,891,000	
	Subtotal	**7,171,000**	
2	**Lagoon Upgrade ($2018)**		**Tendered, Construction underway**
	Screening Facility	3,481,000	
	Treatment Building and Lagoon Upgrades	10,825,000	
	Aeration and UV Equipment	2,673,000	
	Effluent Pumping	3,618,000	
	Construction Contingency	1,744,000	
	Subtotal	**22,341,000**	
3	**Outfall Construction ($2019)**		**Complete**
	Outfall Construction	2,930,000	
	Construction Contingency	293,000	
	Subtotal	**3,223,000**	
INDIRECT COSTS			
5	**Engineering & Administration Costs**		
	Engineering: Design and Construction	3,650,000	**Nearly Complete**
	Archeological Site Investigations	175,000	**Nearly Complete**
	City Administration Costs	60,000	**Nearly Complete**
	Subtotal	**3,885,000**	
	TOTAL PROJECT COSTS (DIRECT AND INDIRECT)	**36,620,000**	

5.5 Results from the Environmental Impact Study (EIS)

An Environmental Impact Study (EIS) was undertaken by the City in two parts. In Part 1 (completed in 2014), the objective was to collect data on the baseline conditions for the receiving environment, conduct a desktop review, and establish the necessary scope for Part 2 of the EIS. Part 1 included field reconnaissance, water sampling, preliminary dilution modelling, dissolved oxygen modelling, and recommendations on the scope of Part 2. It was submitted to the BC MOE and the WAC in spring 2015 for review and comment. Following their review, the WAC expressed concern about the potential risks to salmon if the treated wastewater was discharged at ≥10 m depth, as specified in the MWR. This prompted additional investigation and modelling to evaluate the environmental feasibility of a shallower discharge. The outcome indicated that the shallower discharge would reduce the potential for adverse effects on adult salmon, leading to the subsequent "request for substitution" to the minimum 10 m depth for discharge in an estuarine receiving environment.

The field studies for Part 2 of the EIS (completed in 2016) included measurements of tides and currents (using drogues and acoustic current meters), sediment sampling, and additional water quality measurements including DO-salinity-temperature profiling. These data were used as inputs for detailed effluent plume dispersion modelling that investigated multiple scenarios incorporating seasonal variations in biophysical condition and in the flow from the new WWTF. The EIS Part 2 also included additional dissolved oxygen modelling, and an assessment of the potential effects of changes in water quality on aquatic life and public health. The EIS report also included recommendations on mitigation strategies and for the receiving environment monitoring program that includes pre-discharge (baseline) and operational monitoring. The monitoring program included sampling for water quality, sediment quality, and benthic invertebrates.

The EIS modelling demonstrated that the applicable water quality guidelines would be met at the edge of the IDZ. The projected worst-case dilutions were then used to establish the design treatment levels for fecal coliform bacteria and ammonia. The EIS concluded that the projected changes in DO and water quality are likely to be small outside the IDZ and there is a low probability of adverse effects on adult and juvenile fish. However, more frequent warm conditions warrant caution and monitoring. The model also predicts that the effluent plume will always trap below the surface, thereby minimizing risk to human health. This is a significant improvement over the baseline situation where the effluent discharges at the water surface.

Part 1 and Part 2 of the EIS reports were subsequently combined into a Combined EIS in 2018, per BC MOE's request.

The City has completed a pre-discharge (baseline) monitoring program, as required by the MWR. In October 2018, April 2019 and August 2019, samples were taken at the locations recommended in the EIS and through subsequent discussions with BC MOE. Receiving environment sampling occurs at five "downstream" sites potentially affected by the discharge and at two reference sites outside the area likely to be influenced by the plume. The purpose of the program is to obtain an understanding of the background concentrations and conditions in the area surrounding the new diffuser system, prior to it being put into operation.

Based on feedback from discussions with the First Nations, the City has expanded the monitoring program to include additional sampling sites. The rationale for the additional sites is included in Section 11.2.2. With the new sites, the final pre-discharge sampling program is planned for August 2020.

Once the WWTF is commissioned, a post-discharge monitoring program will be conducted, as described in Section 10.3.1.

6 SOURCE CONTROL AND VOLUME REDUCTION

6.1 Overview

An effective source control and volume reduction program serves to protect sewer and wastewater treatment infrastructure, as well as the public, from discharges that may pose risks to the safety and proper operation of these elements. Specifically, source control can help prevent the following:

- Corrosion, blockage, fire or explosion in collection systems and pump stations.
- Short or long-term health risks for wastewater workers or the general public.
- Disruption of treatment processes.
- Contamination of the receiving environment, including water and sediments.
- Contamination of biosolids that may otherwise be reclaimed as a soils amendment product or low strength fertilizer.
- Water wastage.

The City's 1974 Sewer Connection and Regulation By-Law No. 3224 (amended last in 2018) has been reviewed in the context of the LWMP.

6.2 Volume Reduction Elements

The City's Water Conservation Plan was adopted in June 2013. One of the major discussion points of the plan was related to the resulting outcome on water demand following implementation of the universal water metering program. At present, water metering is used for both sewer use and water consumption rates. These rates are administered through the Sewer Use Bylaw (No. 3224), and the Waterworks Bylaw (No. 4494), respectively.

The rates are updated annually and the latest rates (as of June 2019) are summarized in Table 6-1 and Table 6-2, for sewer use and water consumption, respectively.

Table 6-1
Metered Sewer Use Rates (By Law No. 3224)

Customer Category	Description	Volume Rate
Residential	Single Family Dwelling	$0.41 per m^3
Non-Residential (low-volume)	Not a Single-Family Dwelling and consuming less than 35,000 m^3 per year	$0.58 per m^3
Non-Residential (high-volume)	Not a Single-Family Dwelling and consuming more than 35,000 m^3 per year	$0.51 per m^3

Table 6-2
Metered Water Consumption Rates (By Law No. 4494)

Customer Category	Description	Volume Rate
Single Family Residential	Single family dwelling unit	First 60 m^3: $0.61 per m^3 Over 60 m^3: $0.81 per m^3
Multifamily Residential	Shared by two or more single family units, including duplexes, apartment and condominiums	$0.61 per m^3
Commercial	Commercial and light industrial units	$0.53 per m^3
Industrial	Service to specific high-volume customers	$0.36 per m^3
Outside City Residential	Single family residential outside City boundaries	First 60 m^3: $0.83 per m^3 Over 60 m^3: $1.10 per m^3
Special Service Agreement	Bulk provision to Hupačasath First Nation, Tseshaht First Nation; Beaver Creek	$0.46 per m^3

In addition to the metered consumption charges, each user pays a monthly fixed system charges (for both sewer use and water consumption) based on the size of the water meter.

With meter infrastructure in place, the City is able to monitor water use, and promote water sustainability amongst users through the rate programs.

6.3 Source Control Elements

The benefits of a source control program as part of overall wastewater management are noteworthy. Managing the discharge of waste at the place of origin rather than at the WWTF reduces the volume of wastewater that must be treated, and protects the collection and conveyance system infrastructure, receiving environment, WWTF operations, and health and safety of workers and the public.

A community source control program can include the following tools:

- Public education campaigns;
- Information, guidelines, or requirements on “Best Practices” for management of wastes generated by specific commercial and industrial operations; and/or
- Enforceable regulations under a sewer use or source control bylaw.

Table 6-3 summarizes and compares the City’s Sewer Connection and Regulation By-Law to other relevant source control bylaws. These bylaws include Greater Vancouver Sewerage and Drainage District (now Metro Vancouver)) discharge limits, based on By-Law No. 299, 2007 and the Canadian Council of Ministers of the Environment (CCME) discharge limits, based on the Model Sewer Use By-Law, which was developed in 2009 to assist municipalities, utilities, and communities with development of sewer use bylaws.

Table 6-3
Summary of Source Control Parameter Discharge Limits

Parameter	Rationale	Port Alberni Discharge Limits (Bylaw No. 3224)[1]	Metro Vancouver Discharge Limits (Bylaw No. 299)[2]	CCME Discharge Limits (Model Bylaw)[3]
Low pH	Typically, pH 5.5-6. Minimize corrosion potential at lower pH. Minimize impacts to biological and chemical treatment processes.	5.5	5.5	6.0
High pH	Typically, pH 9.5-12. Corrosion potential at high pH. Minimize impacts to biological and chemical treatment processes.	< 9.5	10.5	10.5
$cBOD_5$ (5-day biochemical oxygen demand)	Minimize potential impacts to WWTF efficacy for capacity or collection system issues.	300 mg/L (COD = 400 mg/L)	500 mg/L	300 mg/L (COD = 600 mg/L)
TSS (Total suspended solids)	Minimize potential impacts to WWTF efficacy for capacity or collection system issues.	500 mg/L	600 mg/L	300 mg/L
Sulphate	Minimize corrosion potential for concrete. Minimize formation of hydrogen sulphide (H_2S) production, odours, and corrosion impacts.	-	1500 mg/L	1500 mg/L
Sulphide	Minimize impacts of H2S corrosion on collection system. Protect worker health and safety.	-	1 mg/L	1-10 mg/L
Oil & Grease (Total)	Minimize impacts to sewer operations and WWTF treatment processes.	100 mg/L	150 mg/L	150 mg/L
Oil & Grease (Hydrocarbon)	Minimize impacts to WWTF treatment processes. Protect worker health and safety.	-	15 mg/L	15 mg/L
Cyanide	Protect worker health and safety.	2 mg/L	1 mg/L	1.2 mg/L
Ammonia	Protect worker health and safety. Minimize toxicity impacts to aquatic organisms.	-	-	24 mg/L
Temperature	Protect worker health and safety. Minimize impacts to equipment operations. Minimize impacts to chemical and biological treatment.	< 65°C	< 65°C	< 60°C

Notes:

[1] (City of Port Alberni, 2019)

[2] (Greater Vancouver Sewerage and Drainage District, 2012)

[3] (Canadian Council of Ministers of the Environment, 2009)

Table 6-3 illustrates that the City's current sewer discharge limits are similar to other jurisdictions. However, the City's bylaw does not include monitoring of parameters such as sulphate, sulphide, hydrocarbon fraction of oil and grease, and ammonia which can increase the potential for corrosion impacts, toxicity to aquatic organisms, and health and safety impacts to operators.

Metals are often included in source control bylaws. Commercial and industrial facilities that discharge metals include hospitals and clinics, dental offices, metal plating operations, and photo processors. Although metals are not typically found at high levels in the water fraction, metals concentration limits are necessary for management of biosolids, as this is where the levels of metals are most prevalent. The City's current bylaw does not include monitoring of metals in the solids fraction. Table 6-4 details the metal concentration limits for Class B biosolids, based on the British Columbia Organic Matter Recycling Regulation (OMRR). Using these limits, the allowable concentration in the sewer discharge location could be back calculated based on the solids production rate.

Table 6-4
Summary of Metals Concentration Limits for Class B Biosolids

Metal	Class B Biosolids Concentration Limits (µg/g dry biosolids)[1]
Arsenic	75
Cadmium	20
Chromium	1060
Cobalt	150
Copper	2200
Lead	500
Mercury	15
Molybdenum	20
Nickel	180
Selenium	14
Zinc	1850

[1](BC Ministry of the Environment, 2008)

The City currently accepts septage, which is waste pumped directly from domestic septic tanks. The City's current approach includes discharge of hauled septage to a manhole located at the Wallace Street Pump Station. Haulers have card access for discharge, which assists the City with estimating volumes and tipping fees. The City is considering additional practices for management of hauled septage as part of its source control strategy.

The Source Control and Volume Reduction Implementation Strategy is presented in Section 10.2.2.

7 COMBINED SEWER OVERFLOWS

7.1 Overview

In alignment with the BC MOE's goal to eliminate CSOs, the City's LWMP includes measures to gradually reduce and eventually eliminate these overflows. As outlined in Section 3, the City currently has four permitted CSOs within the collection and conveyance system, with CSOs occurring at these sites during high precipitation events. In 2006, the City eliminated its only SSO located at Margaret Street and Pemberton Road, through collection and conveyance system upgrades. In the mid-1990s, the City installed system for monitoring at each of its four CSOs (City of Port Alberni, 1995). This study investigated the frequency and volumes of CSOs during rainfall events. In 2015, the City implemented a CSO monitoring program, which developed a relationship between rainfall and CSO overflow volume.

To this end, the City's OCP outlines commitments to the long-term and sustainable management of wastewater to accommodate future growth within the community. The OCP specifically outlines the community's commitment to replace combined sewers with separated storm and sanitary sewers and upgrade the Old City Lagoon. Upgrading the City's wastewater treatment by acquiring and repurposing the industrial lagoon are a significant demonstration of the City's commitment.

The objective of this section is to provide an overview of option development for CSO mitigations, including a summary of the Hydraulic Model Analysis of Combined Sewer Overflows completed in 2003 (Associated Engineering, 2003).

7.2 Option Development and Descriptions

The Stage 1 LWMP identified CSOs as a priority for the City. As such, future wastewater management options must include implementation of CSO mitigation options within the collection system, in addition to adoption of an improved wastewater treatment and disposal system (as discussed in previous sections of this report).

As part of the City's on-going work to reduce and eventually eliminate CSOs, the City initiated a study in 2003 to investigate the occurrence of CSOs from the City's four overflow structures. The study titled "Hydraulic Model Analysis of CSOs" is included in Appendix C (Associated Engineering, 2003). The study estimated the magnitude of overflows during severe rainfall events and identified mitigation measures to eliminate CSOs during wet weather events up to a five-year return period, i.e., such that a CSO will occur only once every 5 years, on average.

Four CSO mitigation options and one SSO mitigation option were developed for the City, shown in Table 7-1. Based on the findings of the hydraulic modeling study, the City implemented upgrades to eliminate the SSO located at Margaret Street and Pemberton Road.

Given the magnitude and significance of CSOs, reducing their occurrence and magnitude is a priority.

Table 7-1
Summary of CSO Mitigation Options for the City of Port Alberni

Option	Description
Conveyance Upgrades	Upgrade gravity sewers to convey 100% of 5-year return period wet weather flows to the pump station. Upgrade Argyle and Wallace Pump Stations and force mains to convey 100% of 5-year return period flows to the WWTF.
Off-line Storage	Provide new off-line equalization tanks to provide storage of 5-year return period peak wet weather flows.
Off-Line Storage and Conveyance Upgrades	Provide combination of off-line storage (to attenuate peak wet weather flows) and lower level of conveyance system upgrades to increase removal of stored peak wet weather flow volumes.
Off-Line Treatment	Provide off-line treatment process, such as vortex solids separators, to treat CSOs prior to discharge to the receiving environment.
Separate Combined Sewers	Convert existing combined sewers into storm sewers. Construct new sanitary sewer adjacent to the existing collection system.

In 2003, cost estimates for each proposed CSO mitigation option, including order of magnitude capital and operation and maintenance costs, were developed as part of the "Hydraulic Model Analysis of CSOs" (Associated Engineering, 2003). The cost estimates were based on published costing curves for reservoir installations; published unit costs for gravity sewer and force main installations; equipment manufacturer budgetary estimates; and engineering experience from similar projects. Further details of the cost estimates for each CSO mitigation option are provided in Appendix C.

Implementation of CSO mitigations represents a significant capital cost. Sewer separation programs are the most direct method to reduce and eliminate CSO events; however, also the most capital (and time) intensive of the options. The City is currently undertaking separation of combined sewers and implementing conveyance system upgrades within the City boundary on an opportunistic basis, as discussed in Section 3 of this report. Off-line treatment of CSO flows would be the lowest cost option for the City but does not reduce or eliminate the occurrence of CSOs and would be considered an interim CSO management strategy.

The City has thus far eliminated the Pemberton SSO and made significant conveyance system improvements including separation or twinning of the combined sewer system upstream of the City's four permitted CSOs located at Argyle Street, Maitland Street, Tahsis Street, and Bruce Street (see Table 7-2 for further details). A stormwater interceptor was placed at the Argyle Street CSO in 2011. In order to mitigate historical flooding events at the Bruce Street CSO, the upstream sewer system was separated over the last 15 years.

Table 7-2
Summary of the City of Port Alberni's Storm Drainage Improvements

Year	Location	Length (m)	Cost ($2020)
NEW STORM DRAINAGE INSTALLATIONS (Separation)			
2000	6th Avenue - Strathern to Dunbar Outfall (300 mm)	180	
2001	2nd Avenue - Mar to Montrose (250 mm)	160	$72,000
2001	8th Avenue North Crescent to 6th Avenue Outfall		$127,000
2001	Strathern 3rd to Kingsway		$32,000
2002	Hilton Center Lane (200 mm)	85	$35,000
2003	Arrowsmith from Elizabeth to East (200 mm)	60	$33,000
2004	5th Avenue - Montrose to Bruce		$110,000
2006	Mar Street - 1st Avenue to 2nd Avenue	170	$30,000
2007	Dobie Subdivision Storm Service	50	$13,000
2007	Lane East of 9th Avenue - Neill South (200 mm)	162	$91,000
2007	10th Avenue – 2407 to 2501 (200 mm)	170	$102,000
2007	Hilton Avenue - 2401 North (200 mm)	122	$78,000
2007	Hilton Avenue - 2553 South (200 mm)	140	$89,000
2008	Bruce Street - 10th Avenue to Anderson Avenue (450 mm)	300	$217,000
2008	8th Avenue - China Creek to Montrose Street	225	$44,000
2009	Argyle Street - 1st Avenue to Kingsway	100	$97,000
2009	15th Avenue - Burde to Redford	380	$118,000
2009	10th Avenue- 2525 to Neill Street (250 mm)	75	$67,000
2012	11th Avenue - Dunbar to Argyle Street to 10th Avenue (450 mm)	255	$233,000
2013	10th Avenue - Argyle Street to China Creek (300 mm)	250	$141,000
2013	Co-Op on Beaver Creek (50 mm sanitary)	189	$110,000
2013	8th Ave - Roger to Wallace (200 mm and 300 mm storm). (200 mm sanitary).	113	$216,000
2013	Bruce St - 1st Ave to 3rd Ave (600 mm)	101	$62,000
2013	7th Ave - Bute to Burde (250 mm)	179	$83,000
2013	Lane East of 2579 10th Ave (250 mm storm). (150 mm sanitary.)	47	$13,000
2014	Enex Fuel on Dundar- Harbour Rd to 3rd Ave (300 mm)	172	$63,000
2014	4410 Glenwood Drive (250 mm)	43	$44,000
2014	16TH Ave - Redford to Bute (300 mm & 250 mm)	160	$12,000

Year	Location	Length (m)	Cost ($2020)
2014	2nd Ave - Melrose to Stirling (200 mm storm) (150 mm sanitary).	84	$41,000
2015	Dry Creek flood protection (200 mm).	120	$161,000
2015	Harbour Rd / Kingsway new storm outfall (1200 mm) (900mm & 750mm).	240	$328,000
2015	Haslam Rd - Tebo to Bishop (300 mm)	188	$106,000
2015	9th Ave - China Creek to Montrose (250 mm, 300 mm & 375 mm storm). (250 mm & 300 mm).	189	$176,000
2016	Coal Creek Phase 1 (300mm & 400 mm sanitary)	428	$239,000
2016	Lathom St at Gertrude (900 mm)	14	$26,000
2016	Virginia - Leslie to Gordon (200 mm)	336	$99,000
2017	Compton Rd Ditch Infill at A.W. Neill School (525 mm)	123	$81,000
2017	Bute St - 4th to 5th Ave (300 mm & 525 mm storm). (200 mm sanitary).	108	$123,000
2018	Athol St - 3rd to 4th Ave - (300 mm storm). (300mm sanitary).	90	$124,000
2018	Coal Creek Phase 2 (300 mm, 525 mm, 600 mm & 900 mm storm). (250 mm, 300 mm & 375 mm sanitary)	354	$564,000
2018	North Park Dr - 7th Ave to 10th Ave (375 mm)	328	$361,000
2018	Hilton Ave 2433 (375 mm)	46	$23,000
2018	Montrose St - 5th to 6th Ave - (300mm sanitary). Prevent sewer overflow for recent Coal Creek 2 work.	50	
2018	6th Ave - Melrose to Montrose (200 mm & 250 mm sanitary).	222	$110,000
2019	New Anderson Hill Subdivision on Parkview Cres - (250mm & 375mm storm). (200mm sanitary).	396	$115,000
2019	Anderson Ave 3593 Portview Landing Apartments (450 mm storm) (375 mm drain) (300 mm sanitary).	252	$105,000
2019	Montrose St - 6th Ave to 9th Ave - (300 mm & 375mm storm) (300 mm sanitary).	261	$59,000
2019	6th Ave - Montrose to Angus. - (250mm, 300mm & 375mm storm). (250 mm sanitary).	367	
2019	8th Ave - Dogwood St to Cedarwood St - (250 mm & 300 mm storm) (300 mm sanitary)	223	$85,000
2019	16th Ave - Burde St to North Park Dr (200 mm storm). (200 mm sanitary).	288	$166,000
	TOTAL	8595	**$5,424,000**

Year	Location	Length (m)	Cost ($2020)
MAJOR SANITARY AND STORM SYSTEM UPGRADES			
2001	Wallace Sewage Pump House Upgrade		$492,000
2006	North Port Sewer Abatement Project		$2,944,000
2008	Argyle Pump House Emergency Bypass Connection		$75,000
2009	Argyle Pump House Upgrade		$1,450,000
2011	Argyle Street - Kingsway to Outfall (Outfall & Separator)		$133,000
2011	Wood Avenue Interceptor (600 mm)	600	$349,000
	TOTAL		**$5,443,000**

The CSO Implementation Strategy is presented in Section 10.2.3.

8 INFLOW AND INFILTRATION

In addition to the CSOs described in Section 7, the City's collection system also experiences inflow and infiltration of ground water. In 2018, McGill & Associates Engineering Ltd. estimated the average daily inflow into the different catchment areas, based on an average precipitation value of 4 mm (McGill and Associates Engineering Ltd., 2018). Inflow and Infiltration was estimated by comparing the calculated dry weather flows to the average flows in the different catchment areas. For areas that had combined sewers, the estimated I&I rate was based off of the calculated I&I rates for the non-CSO catchment areas. The results are presented in Table 8-1.

Table 8-1
Estimated Average Inflow and Infiltration Rates (McGill, 2018)

Catchment Area	Average Daily Inflow Rate (average precipitation = 4 mm) (m^3/d)
Argyle and 4th Avenue	2068
Josephine	280
Margaret	332
Upper Johnston	489
Wallace	1426

Through the City's continued strategy of targeting the combined sewer catchment areas, the City is inherently also addressing I&I. The new sewer lines installed will be less prone to leaks, and more capable of diverting storm water away from the wastewater collection system.

The Inflow and Infiltration Implementation Strategy is presented in Section 10.2.3.

9 OTHER WASTEWATER COMPONENTS

9.1 Sustainability and Resource Recovery

9.1.1 Overview

Sustainability and resource recovery considerations are important elements of a community's wastewater management strategy. Repurposing the former Catalyst Lagoon was determined to be the City's most significant opportunity to recover value from an existing surplus asset and provide wastewater management upgrades in a sustainable way.

The objective of this section is to discuss sustainability and opportunities for long-term resource recovery initiatives, as part of the City's long-term wastewater management strategy. These potential opportunities include decommissioning of the Old City Lagoon and possible future opportunities for heat recovery, effluent reuse, and beneficial use of biosolids.

The City is committed to reviewing the Sustainability and Resource Recovery opportunities and initiatives at the Five-Year review stage. The Sustainability and Resource Recovery Implementation Strategy is presented in Section 10.2.4.

9.1.2 Reuse of the Former Catalyst Lagoon

The City was able to employ sustainable measures through the acquisition and reuse of the former Catalyst Lagoon for the City's upgraded WWTF. By acquiring and reusing an existing asset, the City was largely able to minimize the impact to the environment and reduce the new footprint disturbance. Other options for wastewater management would have required more resources and development of land and would have therefore had a bigger impact on the environment and would have been more costly to implement.

9.1.3 Restoration of the Decommissioned Old City Lagoon

In May 2015, the City was successful in its application to the National Wetland Conservation Fund for the purpose of restoring the Old City Lagoon back to its natural habitat. Unfortunately, due to time limitations of the grant, the City was unable to make use of the funds, since the Old City Lagoon can only be decommissioned once the new facility has been commissioned. Notwithstanding, the City continues to commit to restoring the lagoon to its natural habitat and will apply for new funding opportunities if and when they become available.

In 2017, a high-level Port Alberni Wastewater Lagoon Decommissioning and Restoration Conceptual Plan was developed. This plan was developed with consultation from the WAC. The targets developed for the plan include but are not limited to increasing the tidal marsh habitat in the Somass estuary, creating permanent tide channels and habitat, and improving access for positive public interaction. A detailed restoration will be developed with further community and First Nations input.

The Implementation Strategy for the Old City Lagoon Restoration work is presented in Section 10.2

9.1.4 Effluent Reuse

The City's preferred wastewater management strategy will produce a secondary treated effluent, which where practical may be reused to augment or replace non-potable water use. However, taking into consideration the City's high annual precipitation levels and the significant financial costs of implementing a separate distribution system for

reclaimed water, opportunities for effluent reuse within Port Alberni are limited. Local industries, including Catalyst Paper, are self-sufficient with their own industrial water supplies.

Currently, effluent reuse is not a viable resource recovery opportunity for the City. As part of long-term sustainability initiatives, the City will continue to reassess feasible opportunities for effluent reuse within Port Alberni in the future.

9.1.5 Heat Recovery

Wastewater contains heat. If recovered, this heat can be used in building heating and domestic hot water heating applications. However, to be effective, the facilities that use the heat must be adjacent or nearby.

Heat recovery from raw wastewater poses operations and maintenance challenges for equipment. Heat recovered from treated effluent, where practical, can be conveyed to off-site users with district energy systems. The WWTF's isolated location makes heat recovery and off-site reuse impractical and unlikely at this time.

As part of long-term community sustainability initiatives, the City will continue to periodically assess feasible opportunities for heat recovery from raw wastewater and/or treated effluent within Port Alberni.

9.1.6 Biosolids Production and Reuse

The City does not have an official biosolids management plan; however, the lagoons within the upgraded WWTF will accumulate solids that require periodic removal. These solids are made up of fine sediments and organic materials that contain nutrients. Historically, the City has transported these dewatered lagoon solids to the Alberni Valley Landfill, where they are blended with wood chips and beneficially reused as cover material. With the addition of screening upstream of the secondary treatment system, the biosolids produced in the upgraded lagoon system are expected to be of higher quality (with less plastics and other debris) than the biosolids from the Old City Lagoon.

At this time, beneficial reuse of biosolids, produced through composting of solids removed at the WWTF with wood chips, is a viable resource recovery opportunity for the City. As part of long-term community sustainability initiatives, the City will continue to reassess feasible opportunities for beneficial biosolids reuse in the future.

9.2 Urban Stormwater and Non-Point Sources of Pollution

9.2.1 Overview

The City's existing collection and conveyance system includes a network of stormwater pipelines and outfalls that discharge stormwater to the receiving environment. The Stage 1 LWMP identified urban stormwater runoff as a potentially significant source of non-point pollution. The Stage 1 LWMP recommended implementation of an Urban Storm Water Control Plan (USWCP) to provide comprehensive stormwater management. This plan would include implementation of strategies that specifically address stormwater, such as a source control bylaw and identification of Best Management Practices. With climate change anticipated to impact wet weather flows within the region, the City continues to proactively explore opportunities to implement sustainable stormwater management solutions.

The objective of this section is to provide an overview of the City's initiatives for long-term management of urban stormwater within the community.

9.2.2 Option Development and Description

The City's current approach to addressing urban stormwater flows in areas having combined sewers, is separation of the combined sewer systems into sanitary and storm sewer systems. Currently, sewer separation projects are carried out concurrently with maintenance upgrades, such as water main or sewer main replacement. Additional capital funding will be needed to complete the sewer separation program within the community.

Incentive-based policies that encourage low impact developments (LIDs) could be implemented by the City to reduce urban stormwater runoff within the community. Examples of LID programs may include opportunities for green roofing in new developments, where practical; on-site control structures that encourage stormwater infiltration to ground, such as permeable pavement and vegetated surfaces; and on-site rainwater harvesting.

The community faces several challenges for implementing such policies, including a climate with an abundance of precipitation. For example, in 2005 the City purchased rain barrels for the purpose of promoting rain harvesting within the community to reduce on-site stormwater and reduce potable water use. Due to poor community participation in the program, the rain barrel program was cancelled.

The City is committed to reviewing the Urban Stormwater opportunities and initiatives at the Five-Year review stage. The Urban Stormwater Implementation Strategy is presented in Section 10.2.5.

10 IMPLEMENTATION AND MONITORING PLAN

10.1 Overview

Following BC MOE's LWMP guidance document, the City has developed a plan to implement the strategies developed for the various liquid waste management components. These strategies require financial commitments from the City, which in some cases, will require the City to obtain grants from senior levels of government and possibly and other means of financial assistance. For example, the City will seek out sources such as corporate environmental grants for the rehabilitation of the Old City Lagoon back into its natural habitat. Section 10.2 outlines the Implementation Plan for the various LWMP components.

Beyond implementation of the LWMP, the City is committed to continued monitoring the progress of the LWMP, after it has been approved by MOE. Monitoring includes continuous data collection, analysis and reporting, and continued participation of the PMC. The PMC is intended to help hold the City accountable through the implementation of a structured monitoring plan. Section 10.3 outlines the proposed Monitoring Plan up to the five-year LWMP review stage.

10.2 Implementation Plan

10.2.1 Wastewater Treatment Implementation Strategy

The City is well underway with implementation of the WWTF upgrades. As previously mentioned, construction of the upgrades began in 2018, and commissioning of the facility is scheduled to begin Fall 2020.

Following commissioning of the facility, the Old City Lagoon will be decommissioned, and eventually restored into natural habitat. Decommissioning includes desludging and draining of the lagoon, and demolition of the structures on site. The sludge from the Old City Lagoon will likely be collected and stored in dewatering bags on-site. Additional details on the restoration and disposal of the dewatered solids are provided in Section 10.2.4.

10.2.2 Source Control and Volume Reduction Implementation Strategy

Implementation of the City's source control strategy will include updates to the City's sewer use bylaw (Bylaw No. 3224) that align with modern best practices. Updates to the sewer use bylaw may include the following:

- Addition of discharge limits for sulphate, sulphide, the hydrocarbon fraction of oil and grease, and ammonia to minimize downstream impacts to collection and conveyance system, WWTF, and health and safety of the public and operators.
- Addition of discharge limits for heavy metals to minimize the concentrations of metals in both the treated effluent and in the solids that accumulate in the lagoon. The solids must have a low metal content to meet the criteria to be classified as biosolids and used beneficially (e.g. as a soil amendment).
- Implementation of "Best Practices" or "Codes of Practice" for commercial and industrial sectors on an as needed basis to control release of parameters other than municipal wastewater.
- Implementation of "Best Practices" for management of hauled septage for disposal and treatment.
- Public education campaigns to promote awareness of source control practices within the community.
- The City is also committed to reviewing the current management practices for hauled septage waste, and implementation of updates to the current practices if warranted.

10.2.3 CSOs and Inflow and Infiltration Implementation Strategy

The City will continue to implement its sewer separation program and upgrade its conveyance system with a goal of reducing and eliminating CSO events in the future.

The City developed a CSO Modification Plan (Appendix D), which was submitted to Environment Canada on June 27, 2014. The plan identified priority areas for sewer system separation and infrastructure upgrades over the long-term.

The City has since updated its budget allocations based on the most recent 5-year Capital Plan which is listed in Table 10-1. Over the next five years, the City has budgeted approximately $6.5 million for separating and upgrading its sanitary and storm sewers, which is expected to fund approximately 1.5 km per year of upgrades.

The City estimates approximately 75 km of storm mains remain to be separated, with a forecasted timeline of 50 years Realistically, CSOs are not expected to be eliminated until the entire combined sewer service area is separated; however, the frequency and duration will decrease with time as the sewer system is further separated and upgraded.

In 2015, the City implemented a CSO monitoring program. The monitoring program included data collection of CSO occurrences and volumes as part of annual reporting requirements. The City acquired ultrasonic monitoring stations for each of the four CSOs, to quantify the frequency of overflow events. Ultrasonic data was collected for the period of a year, and a relationship was made between rainfall and overflow volume. The City will re-install the ultrasonic sensors for the purpose of continued data collection. This information will provide the City with an improved understanding of the CSOs and will be used to prioritize sewer separation plans.

Table 10-1
5-Year Capital Plan for Storm and Sewer Upgrades

	2020	2021	2022	2023	2024
STORM					
4th Ave-Bruce St to Melrose St 240 m	$125,000				
6th Ave -Argyle St to Angus St. 150 m	$100,000				
Relining program Multiple 6th Ave-Montrose to Melrose	$300,000				
6th Ave-Argyle to Angus 145 m	$60,000				
Melrose St. - 6th Ave to 8th Ave	$370,000				
Montrose St. Lane East of 6th Ave 100 m new 250 mm	$60,000				
Sm Capital Storm Replacement	$100,000				
Margaret St Storm Pump Upgrade		$225,000			
6th Ave-Melrose to Bruce 240 m		$150,000			
7th Ave-Redford St to Bute St 180 m		$80,000			
Storm Main Replacements		$100,000			

	2020	2021	2022	2023	2024
Argyle St-1st Ave to 3rd Ave Phase 1		$150,000			
Maitland St-6th Ave to 8th Ave 100 m			$200,000		
Anderson Ave-Maitland St to Wallace St 200 m			$65,000		
Re-lining Project			$300,000		
Anderson Ave-Maitland to Wallace 200 m				$65,000	
Bute St-4th Ave to 10th Ave 500m 600mm				$500,000	
Maitland St-Wood Ave to Kendall St 225 m 250 mm PVC				$160,000	
6th Ave-Athol St to Dunbar St 270m				$180,000	
SEWER					
Sewer Main Video Program	$100,000	$100,000	$100,000	$100,000	
Small Capital Main Replacements	$100,000				
Johnston Rd Elizabeth to Gertrude 120 m 300 mm Reline	$95,000				
Harbour Rd/Bruce St Outfall Reline	$100,000				
Melrose St. 6th Ave to 8th Ave	$560,000				
6th Ave Argyle St. To Angus St 150m	$90,000				
Montrose St Lane east of 6th Ave 100 m 200 mm PVC	$60,000				
4th Ave-Bruce St to Melrose St 240 m	$125,000				
10th Ave-Dry Creek to Argyle St 250 m 250 mm		$200,000			
Harbour Rd Trunk Sewer Replacement Coal Creek to Argyle		$350,000			
6th Ave-Melrose to Bruce 240 m		$50,000			
Maitland St-Wood Ave to Kendall St 225 m 250 mm PVC			$160,000		
Harbour Road Trunk Sewer Replacement			$300,000		
Maitland St-3rd Ave to 6th Ave					$400,000
Small Capital Main Replacements					$250,000
TOTAL ANNUAL BUDGET	**$2,345,000**	**$1,405,000**	**$1,125,000**	**$1,005,000**	**$650,000**

10.2.4 Sustainability and Resource Recovery Implementation Strategy

As described in Section 10.2.1, prior to commencement of the restoration work, the Old City Lagoon will be decommissioned, and sludge will likely be dewatered on-site in dewatering bags. When the biosolids have been sufficiently dewatered (approximately three years), the City will remove the biosolids from site. Lagoon biosolids have been historically composted with wood chips for beneficial reuse as cover material at the Alberni Valley Landfill. Currently, this disposal method remains a viable option for the dredged and dewatered biosolids from the Old City Lagoon.

Following removal of the residual solids, the Old City Lagoon can be restored into natural habitat. As per the 2017 Lagoon Restoration Conceptual Plan, the restoration and rehabilitation work will include partial removal of dykes, grading, planting with native species, and monitoring. A more detailed plan will be prepared following the decommissioning of the Old City Lagoon. This plan will include consultation with the Tseshaht and Hupačasath Nations, key stakeholders, and public engagement. After restoration, a monitoring program will be implemented to evaluate the restoration efforts, including the uptake of the new vegetation that was planted.

The City is actively pursuing funding for this work. Potential funding sources include the Federal Environmental Damages Fund and Provincial sources that are promoted by BC Wildlife Federation.

10.2.5 Urban Stormwater Management Strategy

Urban stormwater management strategies that reduce runoff within the community of Port Alberni are difficult to execute at this time. As part of long-term community sustainability initiatives, the City will continue with its sewer separation program and incentive-based policies that encourage new developments to implement LID.

The City commits to the development of a stormwater management plan at the Five-Year LWMP review stage. The purpose of the plan will be the following:

- Identify and rank stormwater quality issues.
- Collect and provide stormwater quality data.
- Provide public education and public involvement opportunities.
- Develop a stormwater bylaw together with stakeholders.
- Provide recommendations to council.

Until then, the City will prioritize implementing best practices for new developments in the area.

10.2.6 Summary of Financial Commitments and Schedule

A summary of the Financial Commitments for the Implementation of the LWMP are summarized in Table 10-2.

Table 10-2
Summary of Financial Commitments and Schedule

LWMP Component	Description	Estimate	Schedule	Funding Source
Wastewater Treatment	Commission the New WWTF (as part of the current construction project)	N/A[1]	Fall 2020	Combination of City's Capital Budget, Gas Tax and CWWF
Wastewater Treatment	Old City Lagoon Decommissioning	$1,400,000	Summer 2021	Combination of City's Capital Budget, Gas Tax and CWWF
Source Control and Volume Reduction	Update Bylaw 3224 to include metals and other parameters identified	$10,000	2021	City O&M budget
CSOs & I&I	Reinstate CSO Monitoring Program	$15,000/yr.	2021	City's Annual Budget
CSOs & I&I	Separated storm and sanitary sewers to eliminate the 4 CSOs	$50+ million[2]	Ongoing (50-year timeline)	City O&M budget
Resource Recovery & Sustainability	Beneficial Reuse of Dewatered Solids from Old City Lagoon	TBD	2023-2024	TBD
Resource Recovery & Sustainability	Lagoon Restoration and Rehabilitation	TBD	2023-2024	TBD; Government Grants
Urban Stormwater	Urban Stormwater Plan	$70,000	2025	City O&M budget
Monitoring	Post-Discharge Monitoring	$45,000	2021	City O&M budget
Monitoring	Data Monitoring and Reporting to Regulatory bodies	$30,000/year	Ongoing	City O&M budget
Monitoring	Review and Updating LWMP	$100,000/year	Ongoing	City O&M budget

1. Included in the Wastewater Treatment Facility Upgrade Contract. See Section 5.4 for total WWTF Upgrade project cost.
2. This value was estimated and provides an order of magnitude cost for complete sewer separation (in 2020 $CAD). The City has budgeted $6.5 million between the years 2020-2025. It is not anticipated that full separation will occur in the near future. At the five-year review LWMP review stage, the City will review and provide an update on the estimated budget and progress to date for this work.

10.3 Monitoring Plan

10.3.1 Monitoring of Wastewater System through Data Collection

Components of the LWMP will be monitored through collection and assessment of data. The information that is gathered will help the City make decisions on wastewater management and help inform future planning decisions. The City will collect data for the following:

1. Post-Discharge Receiving Environment Monitoring following commissioning of the WWTF. Monitoring points include:
    a. Seven monitoring sites within the Alberni Inlet, including two reference sites.
    b. Three groundwater sites around the lagoon, for the purpose of monitoring any seepage that may occur through the lagoon bottom. The City will install piezometers for the purpose of sample collection at these locations.
    c. One additional site in the Somass River, at the wharf located on the Ahahswinis Reserve of the Hupačasath Nation, which is used for recreational purposes.
2. WWTF influent flow data, from six new flowmeters on each of the influent forcemain and gravity sewer lines.
3. Final effluent quantity and quality data (as required by regulatory agencies)
4. Daily treatment plant operational monitoring throughout the wastewater treatment facility to evaluate the effectiveness of the treatment.
5. CSO monitoring program to better quantify the flows through the City's active CSOs.

10.3.2 LWMP Monitoring through the Plan Monitoring Committee

10.3.2.1 Overview

The City is committed to reviewing the LWMP on an annual basis, for the next five years, except for the first year, where more frequent meetings are proposed. In June 2020, the City formed the PMC for the purpose of monitoring the LWMP following approval of the Combined Stage 2/3 LWMP. The PMC is comprised of advisory and stakeholder groups, many of whom have participated in the previous WAC from 2013-2017.

The proposed PMC Meetings are summarized in Table 10-3. Further detail regarding the purpose and scope of each of these meetings is provided in the following sections.

Table 10-3
Proposed PMC Meetings (2020-2025)

PMC Meeting	Timeline	Reason for Meeting
PMC Meeting 1	June 2, 2020	Introduce the PMC, define objectives and review the Combined Stage 2/3 LWMP
PMC Meeting 2	June 16, 2020	Solicit Feedback on the Stage 2/3 LWMP, in particular the Implementation and Monitoring Plan

PMC Meeting	Timeline	Reason for Meeting
PMC Meeting 3	Following (or during) commissioning of the WWTF (Fall or Winter 2020)	On-Site tour for members of the PMC to see the new WWTF, as it is being commissioned
PMC Meeting 4	Following Results Received from First Round of Post-Discharge Monitoring. (Spring 2021).	Update the PMC on the Commissioning of the WWTF and the first round of Post-Discharge Monitoring.
PMC Meeting 5	Following Results Received from Second Round of Post-Discharge Monitoring. (Summer 2021).	Update the PMC on the second round of Post-Discharge Monitoring. An additional on-site tour may be carried out.
PMC Meeting 6	Following Results Received from the Third Round of Post-Discharge Monitoring (Fall 2021)	Update the PMC on the third round of Post-Discharge Monitoring.
PMC Meeting 7	Following Results Received from Last Round of Post-Discharge Monitoring (Early 2022)	Update the PMC on the final round of Post-Discharge Monitoring.
PMC Meeting 8	Late June or October 2022[1]	Annual Review of the LWMP
PMC Meeting 9	Late June or October 2023[1]	Annual Review of the LWMP
PMC Meeting 10	Late June or October 2024[1]	Annual Review of the LWMP
PMC Meeting 11	Late June or October 2025[1]	Five-Year Review and Update

1. At the City's discretion depending on early projections from DFO as to whether it could be a bad year requiring implementation of the "hold and release" plan.

10.3.2.2 Pre-Approval Meetings (PMC Meetings 1 and 2)

Prior to approval of the Combined Stage 2/3 LWMP, the City has carried out two PMC meetings. The purpose of these meetings was as follows:

1. Re-familiarize previous members and introduce new members to the PMC and review the purpose of the PMC.
2. Review work that has been undertaken since the previous WAC meetings, including design and construction of upgrades to the WWTF.
3. Seek input and support for the Combined Stage 2/3 LWMP.

10.3.2.3 Commissioning On-Site Tour (Meeting 3)

It is proposed that the PMC meet during the commissioning of the WWTF, to partake in an on-site tour of the WWTF. This will allow the PMC to observe the upgraded system.

10.3.2.4 Post-Discharge Monitoring Meetings (PMC Meetings 4, 5, 6, and 7)

As presented previously, following commissioning of the WWTF, a Post-Discharge Monitoring program will be undertaken in the Alberni Inlet. This program will likely be of interest to many PMC members. Therefore, four PMC meetings are proposed in the first year of commissioning to review the monitoring data.

10.3.2.5 Annual Review Meetings (PMC Meetings 8, 9, 10)

Following the first year of quarterly PMC meetings, the City plans on holding annual PMC meetings thereafter. Scheduling of the annual meetings could either be for the month of June or October, depending on expected conditions in the Inlet that year. Meeting in June would enable the City to discuss the discharge plan with members of the PMC, if it was projected for sensitive conditions in the Somass Estuary were expected in late summer. Conversely, meeting in October would enable the City to provide summary information to the PMC relating to wastewater treatment/discharge operations during that year's spawning season. The scheduling would be at the City's discretion based on the expected conditions for the late-summer.

PMC Meetings would cover the following:

- Review WWTF effluent results and compliance with Provincial and Federal regulations.
- Review summer operations (past or planned), and especially any special operations undertaken based on feedback from First Nations and stakeholders to mitigate fisheries concerns in late summer.
- Review results of quarterly water quality monitoring and annual benthic monitoring (including sampling undertaken in cooperation with Paper Excellence Canada).
- Review City plans, budgets, and progress made with CSOs and sewer separation.
- Review/discuss other LWMP items, as needed.

10.3.2.6 Five-Year Review Stage (PMC Meeting 11)

At the five-year review stage, it will be evaluated whether amendments are required to the LWMP, based on progress, or other factors that may have impacted the LWMP. As per the LWMP guidance documents, amendments would include updates to cost estimates, changes to objectives or outcomes, review of regulations and standards, changes to the Official Community Plan or Regional Growth Strategies, or changes that result from public input.

At present, the City has already committed consideration and review of the following during the five-year LWMP review stage:

1. Development of an Urban Storm Water Management Plan.
2. Resource Recovery and Sustainability, including the development of plans for biosolids management, and reviewing other potential resource recovery initiatives.
3. The City's continued progress of separation of CSOs and reducing inflow and infiltration.

11 PUBLIC AND AGENCY CONSULTATION

Public and agency consultation encourages opportunities for technical review by environment and health officials and a platform for local community members to provide input at all stages of the LWMP. The consultation activities can be separated into two distinct phases:

1. Consultation provided for the Stage 2 LWMP work from 2013-2017.
2. Consultation provided for the Combined Stage 2/3 LWMP work in 2020.

For the City's previous Stage 2 LWMP work, consultation was carried out through the following key activities:

- Regular meetings with the City and the Wastewater Advisory Committee (WAC).
- Consultation with Tseshaht First Nation and Hupačasath First Nation.
- Engagement with the general public via website resources and Public Open Houses.

For the Combined Stage 2/3 LWMP work, the following consultation activities are being carried out:

- Formation of the Plan Monitoring Committee (PMC) and initial PMC meetings.
- Continued consultation with the Tseshaht First Nation and Hupačasath First Nation.
- Continued engagement with the general public through virtual resources and an online survey.

For both phases, input received from First Nation consultation activities and stakeholder engagement on the original WAC has been key to the development of the City's LWMP. During the initial phase, these inputs led to changes in the location and design of the diffuser to reduce the potential for adverse effects on salmon. Following completion of the First Nation consultation and stakeholder engagement activities, the Combined Stage 2/3 LWMP will be provided to City Council for review and comment. Upon acceptance of the Combined Stage 2/3 LWMP by City Council, the City will submit the Combined Stage 2/3 LWMP report to BC MOE for review and approval.

The objective of this section is to provide an overview of the public engagement activities undertaken by the City for both the previous Stage 2 LWMP work (up until 2017), and the recent Combined Stage 2/3 LWMP work (June-July 2020).

11.1 Previous Stage 2 LWMP Consultation (2013-2017)

11.1.1 Wastewater Advisory Committee

The City's LWMP WAC was formed through integration of members from the Technical Advisory Committee (TAC) and Public Advisory committee (PAC). WAC members were formally invited by the City to participate in the Stage 2 LWMP process. Many of the agencies and in some cases, members, also involved with the City's Stage 1 LWMP continued their involvement with the Stage 2 LWMP. Members of the WAC were selected to represent a cross-section of both technical knowledge and the local community to provide opportunities for input throughout all stages of the Stage 2 LWMP process.

WAC member representatives included local government agencies, industry, and non-governmental organizations as follows:

- Alberni Valley Chamber of Commerce
- AV Chamber of Commerce

- Catalyst Paper
- City of Port Alberni
- Fisheries and Oceans Canada (DFO)
- Ducks Unlimited
- Environment Canada
- Hupačasath First Nation
- McGill & Associates Engineers (as consultants to the City)
- Ministry of Environment
- Ministry of Health
- Port Alberni Port Authority
- Alberni-Clayoquot Regional District of
- Somass Estuary Management Plan Committee / Alberni Valley Enhancement Association
- Tseshaht First Nation
- West Coast Aquatic
- Western Forest Products

A list of WAC members and their affiliations is presented in Appendix E.

Nine WAC meetings were conducted during the Stage 2 LWMP. For meetings that included presentation of studies or Discussion Papers prepared as part of the LWMP, drafts of these documents were provided to WAC members by the City in advance of meetings to allow adequate time for review and comment by WAC members. PowerPoint presentations were made to the WAC that provided a summary of these studies and LWMP progress to date. The presentations also provided opportunities for discussion and questions by WAC members.

An overview of the WAC meetings convened as part of the Stage 2 LWMP is presented in Table 11-1.

Table 11-1
Overview of the City's Stage 2 LWMP WAC Meetings

Meeting	Date	Main Topics of Discussion
WAC Meeting #1	April 17, 2013	• Overview of City's LWMP process • Background and history of City's Stage 1 LWMP and Stage 2 LWMP • Proposed alternatives for return of effluent to the environment • Next steps
WAC Meeting #2	June 25, 2013	• Background and history of City's Stage 1 LWMP and Stage 2 LWMP • Alternatives under investigation for return of effluent to the environment • Intertidal Zone • Somass River • Alberni Inlet • Preliminary screening of alternatives for return of effluent to the environment • Next Steps

Meeting	Date	Main Topics of Discussion
WAC Meeting #3	October 1, 2013	• Background and history of City's Stage 1 LWMP and Stage 2 LWMP • Preliminary screening of discharge location alternatives • Somass River baseline water quality survey (two rounds of sampling) • Outfall concepts – feasibility and constructability: ▪ Somass River ▪ Alberni Inlet – surface layer ▪ Alberni Inlet – subsurface layer • Next steps
WAC Meeting #4	November 12, 2013	• Background • Overall objective – project definition ▪ Establish discharge location ▪ Establish treatment objectives ▪ Establish treated effluent quality requirements ▪ Completion of Stage 2 LWMP • Discharge location screening exercise • Alternative 1: Freshwater river discharge • Alternative 2a: Estuarine river discharge • Alternative 2b: Estuarine inlet discharge • Alternative 3: Intertidal zone wetlands • Next steps
WAC Meeting #5	December 12, 2013	• Overview of City's Stage 2 LWMP document • Overview of City's Environmental Impact Study - Part 1 document • Next steps
WAC Meeting #6	October 29, 2014	• Summary of work done to date • Update on EIS Part 1 • Update on EIS Part 2 (sediment sampling, shellfish survey, tide and water quality survey) • Preliminary result from Seaconsult Model on Dissolved Oxygen (DO) at depth • Scenario development for comparative evaluation • Scenario 1: One gravity-fed, long, deep pipe • Scenario 2a: Two long, twinned, gravity fed, deep pipes • Scenario 2b: Two long, twinned, gravity fed and pumped, deep pipes • Scenario 3: One gravity fed, long, deep pipe + one SED to Somass River • Scenario 4: One gravity fed, long, deep pipe + one SED to City's old City lagoon • Scenario 5: One pumped, long, deep pipe • Scenario 6: One pumped, long, deep pipe • Comparative evaluation using a Triple Bottom Line (TBL) analysis • Environmental attributes • Social attributes • Economic attributes • Evaluation of importance/weightings of quantifiable attributes • Next steps

Meeting	Date	Main Topics of Discussion
WAC Meeting #7	February 24, 2015	• Development of Scenario #7: One pumped, long, shallow pipe • Revision of TBL with Scenario #7 • Addition of Risk Factors • RF 1: Potential reduction in in-situ DO levels • RF 2: Anticipated fecal coliform levels at the edge of the IDZ • Evaluation of TBL + R for short-listed scenarios (Scenario # 5 to # 7) • Outcome: Scenario #7 is the preferred scenario • Next steps

WAC Meeting #8	October 6, 2016	• Recap of WAC Meeting #7, including preferred wastewater management scenario
		• Draft Environmental Impact Study (EIS) Part 2
		  • Summary presentation
		  • Discussion
		• Wastewater treatment project components for preferred scenario
		• Next steps

WAC Meeting #9	February 14, 2017	• Presentation of the Draft Stage 2 LWMP Report • Key topics to be discussed: • Regulatory Framework • Existing Wastewater Management • Basis for Planning • Source Control • Effluent Integration • Wastewater Management Strategy • Combined Sewer Overflows • Sustainability and Resource Recovery • Urban Stormwater • Plan for restoration of the Old City Lagoon

Summary presentations for each WAC meeting during the City's Stage 2 LWMP are provided in Appendix E.

Members of the WAC were also invited to attend the Stage 2 LWMP public open house held in Port Alberni on March 15, 2017 at the Echo Centre (Fir Room) from 11:30 a.m. to 8 p.m. Additional information about the City's public open house is presented below in Section 11.1.3.

11.1.2 First Nations Consultation

Consultation with the Tseshaht First Nation and Hupačasath First Nation was a key part of the City's Stage 2 LWMP process. The City also invited the Tseshaht and Hupačasath to participate as members of the WAC. A total of six consultation meetings were held with Tseshaht First Nation. The Hupačasath First Nation preferred to be kept informed of developments with emails and information communication. The consultation activities were conducted to provide an opportunity for input directly to the City's LWMP process. The letters of support for the Stage 2 work from the Tseshaht First Nation and Hupačasath First Nation are in **Appendix F1**.

Meetings were held with the Tseshaht on the following occasions:

- April 16, 2013 – Formal Presentation to Council
- June 25, 2013 – Formal Presentation to Council

- October 1, 2013 – Formal Presentation to Council
- December 2, 2013 – Formal Presentation to Council
- March 3, 2015 – Presentation to Council
- September 9, 2015 – Presentation to Council
- September 15, 2016 – Presentation to Council
- February 6, 2017- Discussion at Tseshaht Community Meeting (approximately 50 people in attendance from the community)

Records of Meeting are provided in **Appendix F2** where a formal presentation was made. Due to significant changes to the Tseshaht Council members during the Stage 2 LWMP, some of the meetings were held to familiarize the new council members with the project. A less formal presentation was also made to the Hupačasath on October 6, 2016.

In addition to consultation with the Tseshaht and Hupačasath, the City informed an additional eight adjacent First Nation communities. These communities were identified using the Provincial First Nations Consultative Areas Database, and are as following:

- We Wai Kai Nation
- Qualicum First Nations
- K'omoks First Nations
- Wei Wai Kum First Nations
- Laich-kwil-tach Treaty Society
- Nanwakolas First Nations Referrals Office
- Te'Mexw Treaty Association
- Snaw'Naw'as Nation

These communities were contacted and provided with a project update notice in November of 2015 (**See Appendix F3**). The communities were also provided with the opportunity to contact the City with any questions or concerns related to the project. To date, no requests for additional information have come from these organizations.

11.1.3 General Public Engagement

For the City's Stage 2 LWMP public engagement activities, the City provided opportunities for the general public to learn about and solicit input to the City's LWMP process. These engagement activities are summarized in the following sections.

11.1.3.1 Web-Based Resource Materials

The City developed educational materials for on to its website to inform the local community (and others) of the City's on-going LWMP activities. This webpage has had 450-page views between January 2016 and March 2017. The content can be accessed on the City's LWMP webpage:
www.portalberni.ca/liquid-waste-management-plan

Examples of the web-based resource materials prepared for the City's public engagement are provided in **Appendix G-1**.

11.1.3.2 Open House

A public information session was held on February 25, 2017 at the Alberni Bulldogs hockey game (approximately 1,100 people in attendance). The City set up a booth with a number poster boards that were also presented in the subsequent open house. The main purpose of this event was to advertise the March open house and obtain feedback from the public. Over 100 people viewed the display, and detailed conversations were held with approximately 30 people. There was general awareness of the project and support for the proposed approach, with specific questions pertaining to the cost of the project.

A public open house was held March 15, 2017 from 11:30AM to 8PM at the Echo Centre (Fir Room) in Port Alberni to encourage the public to learn about the City's LWMP process and to provide opportunities to solicit input and comments on the Draft Stage 2 LWMP.

The date, time, and location of the public open house were advertised in the community using the local media including the newspaper, radio, etc. Examples of these advertisements are provided in **Appendix G-2**.

The event had a turnout of approximately 60 people, with generally positive feedback. Materials and other information prepared for the public open house are provided in **Appendix G-3**. A memorandum from the City is included in **Appendix G-4**, detailing a summary of the public participation carried out for the LWMP and how it compares to public participation efforts carried out for other similar planning processes.

11.1.3.3 Community Survey

A community survey was distributed at the public open house held on March 15, 2017. The purpose of the survey was to assess the public's general understanding of the project and to provide an opportunity to the local residents to provide feedback to the City. The results of this community survey are summarized in **Appendix G-5**.

To try and reach out to a greater number of respondents, the survey was issued on-line in March 2017 and received 48 additional responses. Feedback from the online responses is summarized in **Appendix G-6**.

11.2 Combined Stage 2/3 Consultation (2020)

11.2.1 Plan Monitoring Committee

For formation of the PMC, active member representatives from the WAC were invited to participate in the committee. Provincial and Federal member organizations declined the invitation to participate in the PMC. The following is a complete list of organizations that participated in the committee:

- Catalyst Paper
- City of Port Alberni
- Fisheries and Oceans Canada, *declined invitation*
- Environment Canada, *declined invitation*
- Hupačasath First Nation
- McGill & Associates Engineers (as consultants to the City)
- Ministry of Environment, *declined invitation*
- Port Alberni Port Authority
- Alberni-Clayoquot Regional District of

- Somass Estuary Management Plan Committee / Alberni Valley Enhancement Association
- Tseshaht First Nation *would decide on future participation in Committee following formal consultation*.

A list of PMC members and their affiliations is presented in Appendix E.

As described in Section 10.3.2, two PMC meetings were held in June of 2020, for the purpose of soliciting feedback and support for the City's Combined Stage 2/3 LWMP. In particular, the Implementation and Monitoring Plans were presented to the committee.

Due to the health and safety concerns related to the COVID-19 pandemic, meetings were held using video conferencing. Prior to each meeting, an agenda and the latest draft of the LWMP report was provided to PMC members by the City. PowerPoint presentations were made to the PMC that provided a summary of the LWMP progress to date. The presentations also provided opportunities for discussion and questions by PMC members.

An overview of the PMC meetings convened as part of the Stage 2 LWMP is presented in Table 11-2.

Table 11-2
Overview of the City's Combined Stage 2/3 LWMP PMC Meetings

Meeting	Date	Main Topics of Discussion
PMC Meeting #1	June 2, 2020	• Objectives • Background and Project History • Update on Construction of the WWTF Upgrades • Combined Stage 2/3 LWMP Components o Source Control and Volume Reduction o Combined Sewer Overflows o Inflow and Infiltration o Sustainability and Resource Recovery o Urban Stormwater Management • Next Steps • Question and Answer Period
PMC Meeting #2	June 16, 2020	• Objectives • Implementation Plan • Monitoring Plan o Monitoring Through Data Collection o Collection System Monitoring o Wastewater Treatment Facility Monitoring • Public Engagement Activities • Next Steps

Summary presentations for each PMC meeting during the City's Stage 2 LWMP are provided in Appendix E.

Members of the PMC were also invited to participate in the City's 2020 public engagement campaign and survey. Further information is presented below in Section 11.2.3.

Following PMC Meeting 2, each PMC member was provided with an opportunity to provide written feedback and confirm support of the Implementation and Monitoring Plans. All members that provided a response confirmed their support of the plan, and some additional feedback was provided and incorporated in this report.

On July 7, 2020, a discussion was organized between representatives of the Alberni Valley Enhancement Association (Phil Edgell and Dr. Ian Birtwell), the City, and the City's consultant team (Associated Engineering, and Great-Pacific Consulting). The purpose of the meeting was to discuss the potential for verification of the effluent plume model in the receiving environment, specifically during the sensitive summer periods.

Included in this discussion was the City's plans for monitoring in the receiving environment. In addition, there was mention of the City's ability to utilize an ebb-tide release system for discharge of wastewater during the late summer periods (as previously mentioned in Section 5.3). Dye tracer testing was suggested as a method to visualize the effluent plume and verify the modeling results during the "worst-case" conditions. The City will consider the feasibility of implementing this suggestion and committed to keep the Alberni Valley Enhancement Association informed and involved in future plans. The earliest time for implementation would be August 2021, after the upgraded WWTF has been commissioned.

11.2.2 First Nations Consultation

On-going engagement with the First Nations has been a priority for the City. Throughout the detailed design and construction of upgrades at the WWTF, both the Tseshaht and Hupačasath First Nations have been involved in various capacities. For example, members have been present throughout on-site archaeological investigations and installation of the outfall in the Alberni Inlet. In addition, the Tseshaht members were involved in the receiving environmental monitoring program by providing boats and staff resources to the City for sampling in the Alberni Inlet. In addition, the Tseshaht Nation expressed concern in 2019 regarding the diffuser within the Alberni Inlet, specifically the potential for fish nets to get caught on the discharge ports. As a result, the City involved Tseshaht fishers in designing diffuser guards to protect nets from getting caught on the protruding diffuser ports. A photo of the installed diffuser port and guard is shown in Figure 11-1.

Figure 11-1
Installed Diffuser Port with Guard

In late 2019, members of the Tseshaht First Nation expressed concerns over the potential for seepage of from the lagoon to the environment, and the potential impact to the receiving environment. In response to these concerns, a technical memorandum, entitled Discussion of Liner Feasibility and Potential Benefit (Associated Engineering, Revision 1, May 2020) was prepared and provided to the Tseshaht. As described in the memorandum, the lagoon dikes were constructed by the pulp and paper mill with an impervious core that appears to prevent any significant lateral seepage, and the lagoon bottom is underlain by a 12 m thick natural sand/silt layer. The rate of seepage through the 12 m sand/silt layer underlying the lagoon is expected to diminish over time as organic solids settle to the bottom of the lagoon. Any residual seepage that remains would ultimately enter the marine environment as shallow groundwater flow. The potential risk to juvenile salmon due to discharge of shallow groundwater into the habitat located directly west and northwest of the lagoon is likely low because the wastewater organics will have been significantly reduced and would undergo further filtration as it slowly migrates through the underlying granular soils. Notwithstanding, three piezometers will be installed this summer to enable sampling of the shallow groundwater along the flow pathway between the lagoon and the Alberni Inlet and Somass River.

In June 2020, as part of the Combined Stage 2/3 LWMP engagement program, the City held meetings with each of the Tseshaht and Hupačasath Nations. These meetings, and the outcomes are summarized in Table 11-3.

Table 11-3
Summary of First Nation Consultation

Meeting	Date	Meeting Outcomes
Meeting with Tseshaht Nation	June 19th, 2020	• The Tseshaht First Nation indicated their desire to meet with senior officials in the Provincial and Federal Government and have formally requested a meeting with the Minister of Environment and Climate Change Strategy. • The City hopes to have formal consultation with the Tseshaht and to continue to provide support and guidance to the Tseshaht on how the project is addressing their environmental concerns.
Meeting with Hupačasath Nation	June 25th, 2020	• The Hupačasath Nation expressed concern regarding environmental impact and management of artifacts recovered during the project. Specifically, the potential impact that the effluent could have in the Somass River, which is used for recreational activities by their members. • To address this concern, the receiving environment monitoring program has been updated with an additional water quality sampling site in the Somass River to assess potential effects of treated effluent release on the rising tide. The location for this sample is at the wharf located on the Ahahswinis Reserve of the Hupačasath Nation. An additional sampling program is being planned for August 2020 to incorporate pre-discharge monitoring for this site prior to commissioning of the upgraded WWTF, scheduled for Fall 2020. • Continued consultation and participation with the Hupačasath Nation will be a part of LWMP Implementation, through inclusion of the Hupačasath in the PMC, and by maintaining an open dialogue.

11.2.3 Public Engagement

For the City's Combined Stage 2/3 LWMP public engagement activities, the City provided opportunities for the general public to learn about and solicit input to the City's LWMP process. Due to the COVID-19 pandemic, the City was not able to host an in-person open house and hosted all activities on a virtual platform. These engagement activities are summarized in the following sections.

11.2.3.1 Web-Based Resource Materials

The City developed educational materials on to its community engagement platform called "Let's Connect" to inform the local community of the City's on-going LWMP activities. The "Let's Connect" platform uses software by Bang the Table EngagementHQ, which provides an interactive and appealing experience for users. This webpage has had 228-page views between June 19, 2020 to July 5, 2020. The content can be accessed at the following link: https://www.letsconnectpa.ca/wwtp?utm_source=ehq_newsletter&utm_medium=email&utm_campaign=ehq-We-Want-Your-Input&utm_source=ehq&utm_medium=email&utm_campaign=website

The platform was promoted using the following methods:

- Ad placements in the local Alberni Valley News.
- Direct stakeholder email to 251 people through Let's Connect platform with a 64.9% open rate.
- Multiple Facebook and Twitter posts.
- Website info uploads/updates.
- Direct email to interested parties in the community for sharing (Alberni Valley Nature Club.)

Examples of the web-based resource materials prepared for the City's public engagement are provided in **Appendix G-7**.

11.2.3.2 Community Survey

A community survey was distributed online. The purpose of the survey was to assess the public's general understanding of the project and to provide an opportunity to the local residents to provide feedback to the City. The City received 95 respondents between June 19th, 2020 and July 5th, 2020, and the results of this community survey are summarized in **Appendix G-8**. The results indicate general support for all LWMP components, with some concern regarding the discharge from the existing WWTF infrastructure, CSOs, and the cost to taxpayers that will be required to implement the plan.

CERTIFICATION PAGE

This report presents our findings regarding the City of Port Alberni, Stage 2/3 Liquid Waste Management Plan

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