REPORT

City of Port Alberni

Stage 2/3 Liquid Waste Management Plan

JULY 2020

A Carbon Neutral Company

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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.

TABLE OF CONTENTS

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 (c̓išaaʔatḥ) 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:

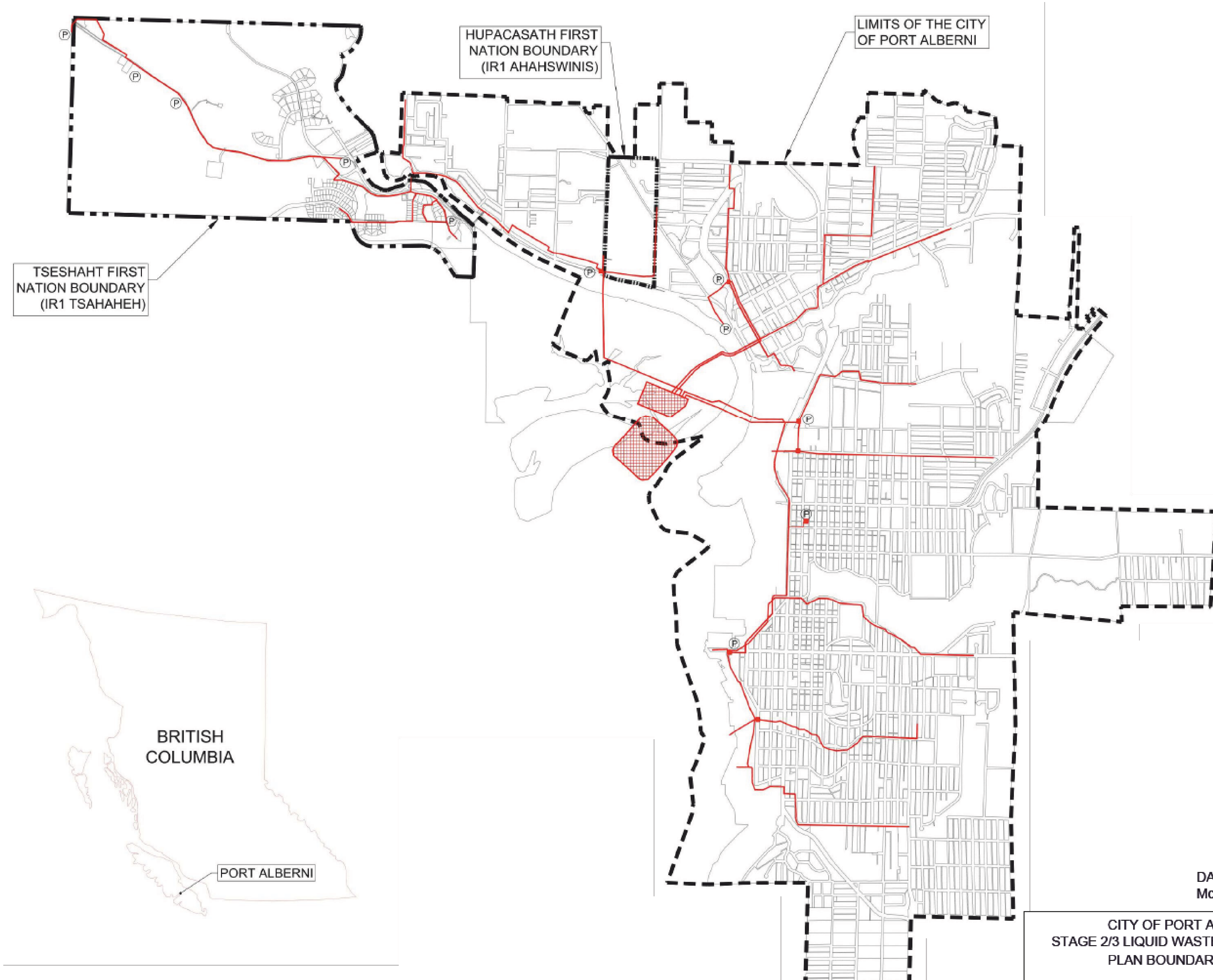
1. Completion of an Environmental Impact Study (EIS) to support the design of the upgraded WWTF and to confirm the effluent discharge criteria.
2. Strategy for returning treated effluent into the Alberni Inlet.

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.



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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°N / 124.8136°W)	Alberni Inlet	PE-331
Argyle Street CSO	Argyle (49.2347°N / 124.8164°W)	Alberni Inlet	PE-332
Tahsis Street CSO	Argyle (49.2298°N / 124.8135°W)	Alberni Inlet	PE-333
Maitland Street CSO	4th Avenue (49.2489°N / 124.8137°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.

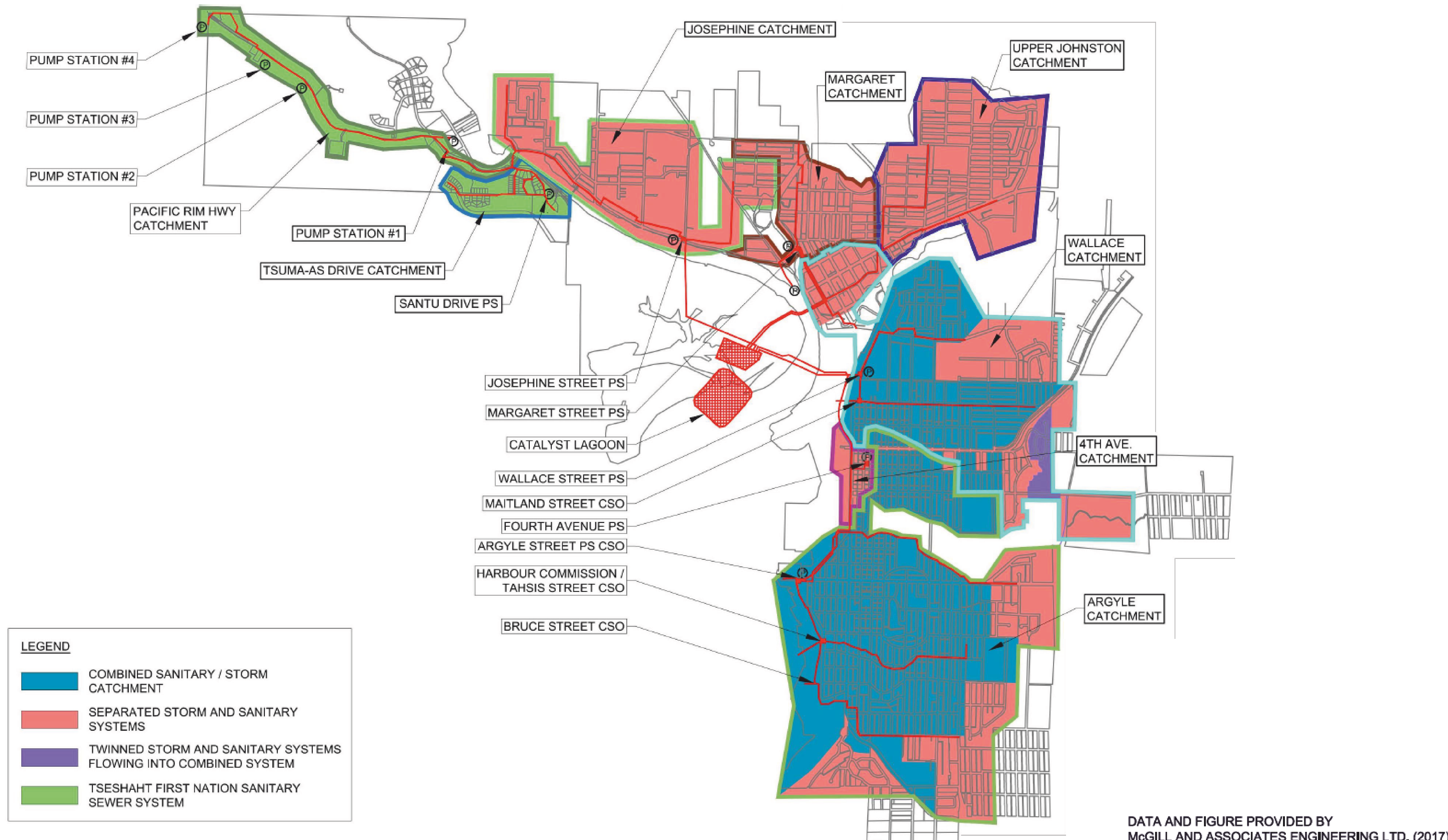
3.2.2 Pump Station, Interceptor and Force Main Upgrades

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)
4th 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	$m^3/d\text{-}p$
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

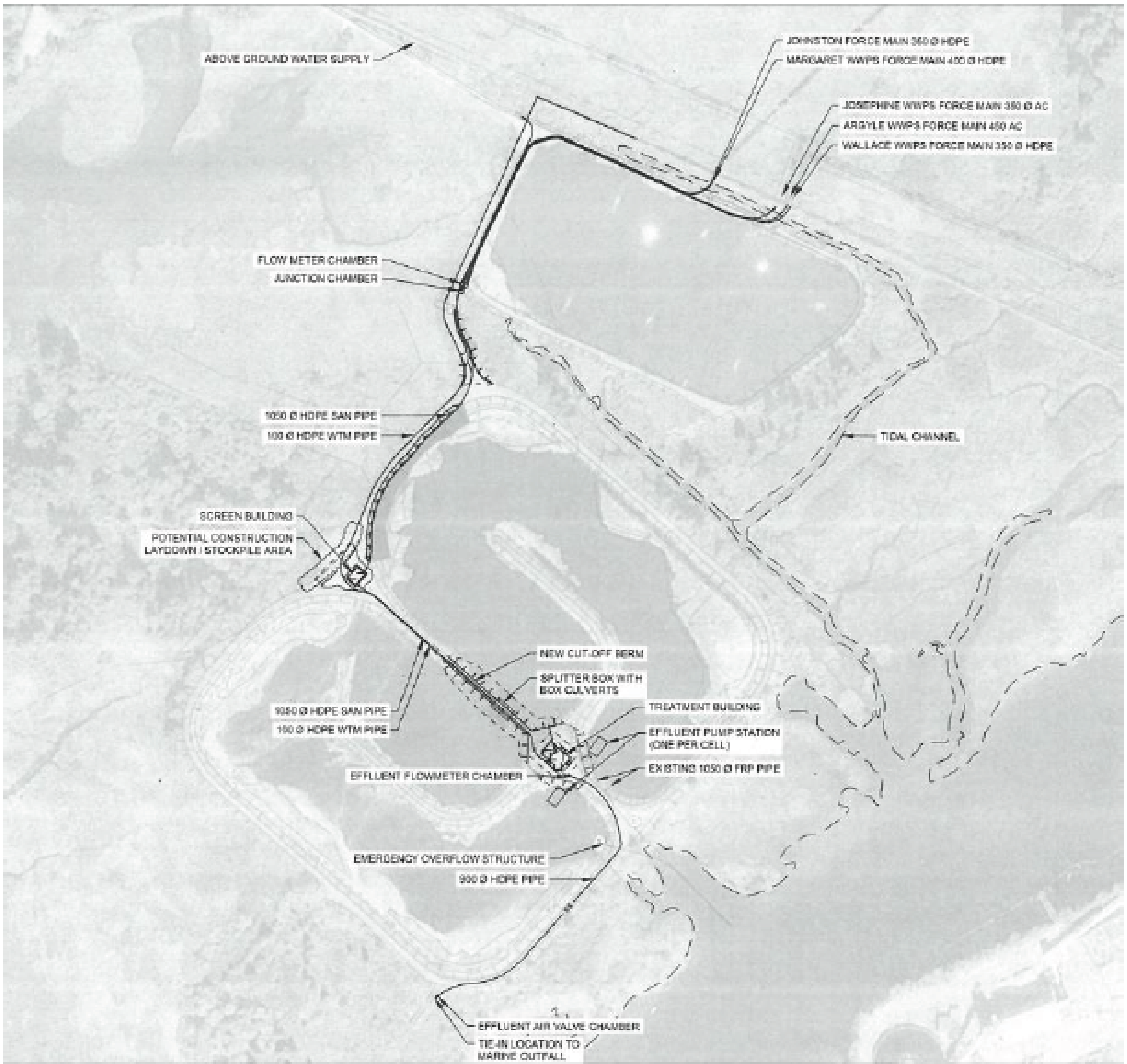


Figure 5-1
Site Layout

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
		  ○ Source Control and Volume Reduction
		  ○ Combined Sewer Overflows
		  ○ Inflow and Infiltration
		  ○ Sustainability and Resource Recovery
		  ○ Urban Stormwater Management
		• Next Steps
		• Question and Answer Period

PMC Meeting #2	June 16, 2020	• Objectives
		• Implementation Plan
		• Monitoring Plan
		  ○ Monitoring Through Data Collection
		  ○ Collection System Monitoring
		  ○ 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

Respectfully submitted,

Prepared by:

Sylvia Woolley, M.A.Sc., EIT
Wastewater Engineer

Michal Simhon, M.A.Sc., P.Eng., ENV SP
Wastewater Process Engineer

Reviewed by:

Tom Robinson, M.A.Sc., P.Eng.
Project Manager

Hugh Hamilton, Ph.D., P.Ag.
Environmental Science Specialist

SW/MS/TR/HH/lp

APPENDIX A - HISTORICAL SUMMARY OF THE CITY OF PORT ALBERNI WASTEWATER TREATMENT OPTIONS

As part of the Stage 2 LWMP process, the City developed and evaluated a number of options to identify the preferred wastewater management strategy for the community. Acquisition of the former Catalyst Paper Lagoon system and construction of a new mechanical wastewater treatment plant were not financially feasible for the City during the early phases of the Stage 2 LWMP process. However, in efforts to reduce the costs of the wastewater treatment system, a number of subsequent wastewater treatment options were investigated by the City.

The City developed and evaluated several wastewater treatment system alternatives, including the following:

- Constructing a new mechanical wastewater treatment plant.
- Operating the City's 5-hectare aerated lagoon system and adding a constructed wetland to treat and polish the effluent prior to discharge to the Somass River.
- Acquiring and repurposing the lagoon from Catalyst Paper with and without use of the Old City Lagoon, including the following variations:
  - Adding half of the Former Catalyst Lagoon capacity to the Old City Lagoon with new aeration systems for both lagoons.
  - Adding all of the Former Catalyst Lagoon capacity to the Old City Lagoon with new aeration systems for both lagoons.
  - Adding all of the Former Catalyst Lagoon capacity with a new aeration system using the Old City Lagoon for polishing (without a new aeration system).
  - Adding all of the Former Catalyst Lagoon capacity with a new aeration system without use of the Old City Lagoon.
- Constructing a new lagoon equal to half of the capacity of the Former Catalyst Lagoon with use of the Old City Lagoon.
- Constructing a new City lagoon equal to full capacity of the Former Catalyst Lagoon.

A historical summary of wastewater treatment options investigated by the City as part of the City's LWMP process is provided in Table A-1.

Table A-1
Historical Summary of Wastewater Treatment Options Evaluated by the City of Port Alberni

Option	Year	Description	Status	Reference
Co-Treatment via Newly Repurposed WWTF	2003	Co-treatment of municipal waste with pulp mill waste through a portion of 14 ha lagoons via shared or purchase agreement with the mill owner.	Option eliminated by mill owner during Stage 2 LWMP process.	Draft Stage 2 LWMP (Associated Engineering, 2003)
Integrate the City's WWTF with New Mechanical WWTF	2003	Convert the Old City Lagoon to primary treatment/equalization basin and integrate as part of new mechanical treatment facility. Treated effluent discharged via new outfall.	Option eliminated by the City in 2003 based on prohibitive costs for the community	Draft Stage 2 LWMP (Associated Engineering, 2003)
New Mechanical WWTF	2003 2010	Abandon the Old City Lagoon and replace with a new mechanical treatment facility. Treated effluent discharged via new outfall.	Option eliminated by the City in 2003 and 2010 based on prohibitive costs for the community	Draft Stage 2 LWMP (Associated Engineering, 2003) Discussion Paper to Draft Stage 2 LWMP (Associated Engineering, 2010)
City's WWTF and New Mechanical WWTF	2003	Upgrade the Old City Lagoon to treat a portion of wastewater flows. A new mechanical WWTF (located on-site or off-site of the Old City Lagoon) would treat the remaining portion of wastewater flows. Treated effluent discharged via new outfall.	Option eliminated by the City in 2003 based on prohibitive costs for the community (proposed property for WWTF no longer available)	Draft Stage 2 LWMP (Associated Engineering, 2003)
City's WWTF with New Constructed Wetland	2007	Upgrade the Old City Lagoon and add new constructed wetland for effluent polishing. Treated effluent discharged via new outfall.	Option eliminated by the City in 2008 (proposed property for constructed wetland no longer available)	Supplemental Report to Draft Stage 2 LWMP (McElhanney Consulting Services Ltd., 2007)
City's WWTF with 7 ha Newly Repurposed WWTF	2008 - 2010	Upgrade the Old City Lagoon and expand the treatment capacity through acquisition and repurposing of 7 ha of Catalyst Paper lagoon WWTF. Treated effluent discharged via new outfall.	Option investigated further by the City in 2009 and 2010 Option eliminated by City in 2012 via purchase of 14 ha Catalyst Paper WWTF	Discussion Paper to Draft Stage 2 LWMP (Associated Engineering, 2008) Capacity Assessment of Catalyst Paper Lagoons (NovaTec Consultants, 2009) Discussion Paper to Draft Stage 2 LWMP (Associated Engineering, 2010)

Option	Year	Description	Status	Reference
City's WWTF with 14 ha Newly Repurposed WWTF	2010	Upgrade the Old City Lagoon and expand the treatment capacity through acquisition and repurposing of 14 ha Catalyst Paper lagoon WWTF. Treated effluent discharged via existing Catalyst Paper surface outfall to Alberni Inlet.	Option eliminated by City in 2012 via purchase of 14 ha Catalyst Paper WWTF and decision to abandon the City's existing WWTF	Discussion Paper to Draft Stage 2 LWMP (Associated Engineering, 2010)
14 ha Newly Repurposed WWTF with City's WWTF for Effluent Polishing	2010	Upgrade Catalyst Paper 14 ha lagoon with Old City Lagoon for effluent polishing. Treated effluent discharged via existing Catalyst Paper surface outfall to Alberni Inlet.	Option eliminated by the City in 2011 via purchase of 14 ha Catalyst Paper lagoon WWTF	Discussion Paper to Draft Stage 2 LWMP (Associated Engineering, 2010)
City's WWTF with Newly Repurposed 7 ha Lagoon WWTF	2010	Maintain the Old City Lagoon WWTF with addition of new 7 ha earthen lagoon. Treated effluent discharged via new outfall.	Option eliminated by the City in 2010 based on prohibitive costs for the community	Discussion Paper to Draft Stage 2 LWMP (Associated Engineering, 2010)
City's WWTF with Newly Repurposed 14 ha Lagoon WWTF	2010	Maintain the Old City Lagoon WWTF with addition of new 14 ha earthen lagoon. Treated effluent discharged via new outfall.	Option eliminated by the City in 2010 based on prohibitive costs for the community	Discussion Paper to Draft Stage 2 LWMP (Associated Engineering, 2010)
Upgrade 14 ha Catalyst Paper WWTF (shared outfall between City and Catalyst Paper)	2010	Abandon the Old City Lagoon and upgrade 14 ha Catalyst lagoon. Treated effluent discharged via existing Catalyst Paper surface outfall to Alberni Inlet.	Option eliminated by the City in 2011. New outfall will be required to meet MWR requirements.	Discussion Paper to Draft Stage 2 LWMP (Associated Engineering, 2010)
Upgrade 14 ha Catalyst Paper WWTF (new outfall)	2011 - Present	Abandon the Old City Lagoon and upgrade 14 ha Catalyst lagoon WWTF. Treated effluent discharged via new outfall.	Option currently under consideration by City as part of Stage 2 LWMP	Discussion Paper to Draft Stage 2 LWMP (Associated Engineering, 2011)

APPENDIX B - HISTORICAL SUMMARY OF THE CITY OF PORT ALBERNI EFFLUENT INTEGRATION OPTIONS AND EVALUATION

B.1 Option Development and Description

Figure B-1 identifies the potential effluent discharge locations that were identified in collaboration with the Wastewater Advisory Committee (WAC), and subsequently investigated by field studies conducted during the previous Stage 2 LWMP and other available information.**Option 1: Freshwater River Discharge**

Option 1 represents a freshwater river discharge location upstream of the saltwater wedge that extends up into the Somass River from Alberni Inlet. The effluent would be discharged via a multi-port diffuser. According to the MWR's definition, this would be considered a river discharge, rather than an estuary discharge. The actual extent of saltwater wedge intrusion into the Somass River is not precisely known, but field data collected in September 2013, using specific conductivity measurements as a surrogate for saltwater, found that it extends at least to Victoria Quay during flood tides. Thus, the Option 1 location circle may potentially need to be shifted further upstream. Overall, it is anticipated that initial dilution of effluent discharged in such a location would be high and minimally affected by tidally-influenced hydraulics.

Option 2a: Estuarine River Discharge

Option 2a could best be described as an "estuarine river" discharge location (in the lower reach of the Somass River), although according to the MWR this as an estuary location because of the mixed fresh water/ saltwater environment. Option 2a is a relatively shallow area (e.g. 4 m depth at low water elevation) in close proximity to the Former Catalyst Lagoon. Again, effluent would be discharged via a multi-port diffuser.

Option 2b: Estuarine Inlet Discharge

Option 2b could best be described as an "estuarine marine" discharge location (in Alberni Inlet), although according to the MWR this as an estuary location because of the mixed fresh water / saltwater environment. Option 2b purposefully locates the effluent discharge point (i.e. multi-port diffuser) in a deeper area with a minimum 10 m depth at low water elevation.

Option 3: Intertidal Zone Wetlands

Option 3 would discharge treated effluent to the intertidal zone wetlands, and could be programmed to release effluent to the intertidal marsh located south and southwest of the Former Catalyst Lagoon on a falling tide (i.e. twice per day) to take advantage of the flushing action of the tides to provide enhanced initial dilution of effluent. Unlike the other options, Option 3 would include two or more distinct and spatially-separated discharge points, without the use of multi-port diffusers, so that the effluent is diffused through the marsh rather than concentrated at a single discharge location.

B.2 Option Screening

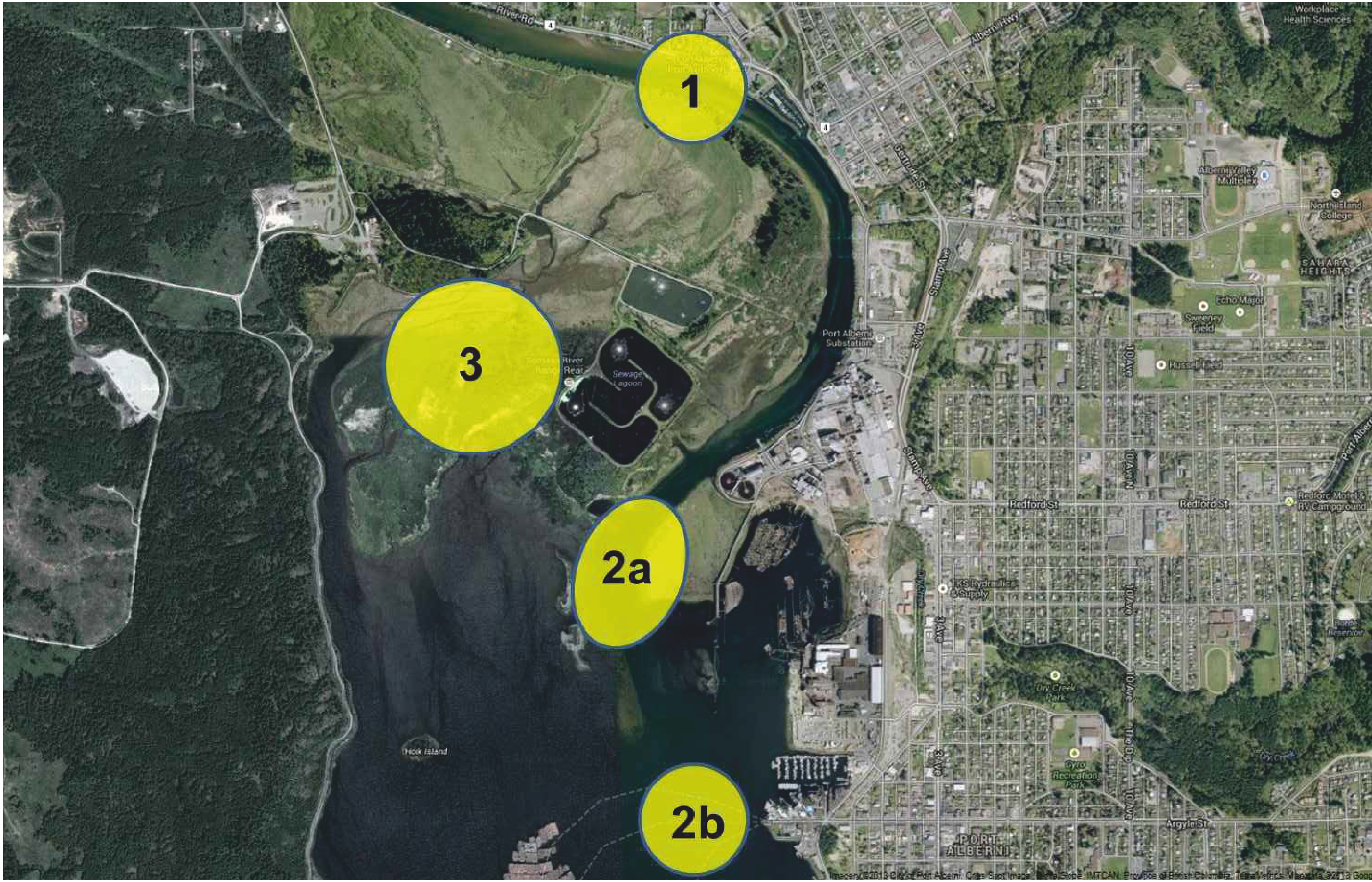
As noted previously, the effluent discharge location options were subjected to a screening process that was intended to identify any specific option "show-stopper(s)" (i.e. '**FAIL**') attributes that on their own would eliminate the option from further consideration. Although the focus was on effluent discharge location (i.e. multi-port diffuser), in most options there would also be the need to convey effluent to this point in a pipeline. The screening exercise also considered the likely pipeline routings and construction approaches.

The screening approach involved four broad categories:

- Archeological considerations;
- Construction permitting / mitigations;
- Wastewater treatment implications; and
- Conformance to the MWR requirements.

Each of these broad categories was broken down into specific attributes that provided further resolution. The consultant team developed the methodology collaboratively with the City, with the screening categories and attributes informed by earlier WAC workshop discussions. Table B-1 provides the results of the screening exercise, as finalized by the WAC.

Although all four options are contained in a single table the analysis presented should not be construed as a comparative evaluation amongst the options. Instead, the options should be viewed individually on their own merits. Key points resulting from the analysis for each option are as follows:



CITY OF PORT ALBERNI
STAGE 2 LIQUID WASTE MANAGEMENT PLAN
POTENTIAL EFFLUENT DISCHARGE LOCATIONS

Associated Engineering

Dwg. No.: FIGURE B-1
Date: Dec.18, 2013

Table B-1
Effluent Discharge Location Screening Analysis

Green	Sufficient information exists at this time to make a PASS judgement on this alternative attribute and a PASS has been assigned
Yellow	Insufficient information exists at this time to make either a PASS or FAIL judgement on this alternative attribute
Red	Sufficient information exists at this time to make a FAIL judgement on this alternative attribute and a FAIL judgement has been assigned

Screening Category & Attributes	Option 1 Freshwater River Discharge (u/s of Victoria Quay)	Option 2a Estuarine River Discharge	Option 2b Estuarine Inlet Discharge	Option 3 Intertidal Zone Wetlands
Archeological Considerations				
First Nations past use including weir fish traps, etc. and current perspectives including traditional use plants	First Nations investigation in progress	First Nations investigation in progress	First Nations investigation in progress	First Nations investigation in progress
Construction Permitting / Mitigations				
Emergency anchorage location	Not applicable	Not applicable	Can be relocated if necessary	No outfall required thus not applicable
Navigable Waters Act	New regulations coming out shortly	New regulations coming out shortly	Parallel routing of outfall adjacent to the river channel would likely not be problematic	No outfall required thus not applicable
Mill-related contamination of intertidal mud flat area	Not applicable	Limited screening-level sampling program required to understand potential economic implications related to trenching/spoils management and construction methods	Sediment sampling demonstrated very low potential for contamination	No outfall required thus not applicable
Fibre mat disturbance and potential release of underlying contaminants	Not applicable	Not applicable	Feasible outfall routing likely exists based on Cycle 5 Environmental Effects Monitoring (EEM) study and earlier surveys conducted for the mill	Not applicable
General mitigation requirements	Nothing obvious that would significantly impact economic feasibility	Nothing obvious that would significantly impact economic feasibility	Nothing obvious that would significantly impact economic feasibility	Environmentally-sensitive habitat for blue- and red-listed plant, waterfowl and shorebird species along with juvenile and migrating adult salmonid species
Wastewater Treatment Implications				
MOE November 2012 Phosphorus Management In Vancouver Island Streams	Chemical precipitation and filtration required	Not applicable for estuarine waters	Not applicable for estuarine waters	Not applicable for estuarine waters
Specific need for ammonia reduction	Not likely required given available dilution based on above-noted calculations	Slack tide effects still unknown - dilution/dispersion modelling required	Not likely required based on anticipated available dilution	Slack tide effects still unknown - dilution/dispersion modelling required
Municipal Wastewater Regulation (MWR) Requirements Conformance				
Minimum 10 m depth at mean low water elevation for estuarine discharges	Not applicable	Too shallow (e.g. 4 m)	Appropriate depth available	Too shallow if not classified as reclaimed water for "maintaining wetlands or marshes"
Minimum 30 m distance from nearest diffuser port to bank under mean low water elevation for estuarine discharges	Not applicable	Appropriate distance likely available	Appropriate distance available	Effluent discharge essentially on "bank" if not classified as reclaimed water for "maintaining wetlands or marshes"
300 m distance from edge of IDZ to recreational areas, water intakes, shellfish harvesting areas	- Historic non-contact recreational use in the area (e.g. kayaking, fishing); contact use includes swimming off Clutesi Marina dock and elsewhere. Mitigated by meeting recreational fecal coliform requirements at the edge of the initial dilution zone (IDZ). - No water intakes near likely diffuser locations based on license information - Freshwater area therefore no shellfish	- Historic non-contact recreational use in the area (e.g. kayaking, fishing); contact use potentially includes snorkelling. Mitigated by meeting recreational fecal coliform requirements at the edge of the initial dilution zone (IDZ). - No water intakes as brackish water quality - Purple varnish clams recently discovered adjacent to existing municipal lagoon, which is a potentially harvestable invasive species. Further investigative work required.	- Historic non-contact recreational use in the area (e.g. kayaking, fishing); contact use includes windsurfing. Mitigated by meeting recreational fecal coliform requirements at the edge of the initial dilution zone (IDZ). - No water intakes as brackish water quality - Investigative work illustrated that a harvestable population of purple varnish clams was not found in the intertidal area within 400 m of the proposed diffuser location'	- Historic non-contact recreational use in the area (e.g. kayaking, fishing); contact use includes windsurfing. Mitigated by meeting recreational fecal coliform requirements at the edge of the initial dilution zone (IDZ). - No water intakes as brackish water quality - Purple varnish clams, which is a potentially harvestable invasive species, unlikely in area but investigative work needed to confirm.

Option 1: Freshwater River Discharge

The BC MOE confirmed that the in-stream total phosphorus (TP) concentration in the Somass River, at the edge of the effluent initial dilution zone (IDZ) downstream of the effluent discharge point, would need to meet the 5 µg TP/L average and 10 µg TP/L maximum values stipulated in the BC MOE November 2012 document titled "Phosphorus Management in Vancouver Island Streams" (BC Ministry of Environment, 2012). A preliminary analysis revealed that meeting the in-stream 5 µg TP/L value would require effluent TP concentrations of < 0.3 mg TP/L and potentially down to approximately 0.1 mg TP/L. This was based on the estimated summer month's effluent dilution at the downstream edge of the IDZ and in consideration of upstream TP levels.

Achieving such low effluent TP concentrations, which are approaching the limit of conventional technology, would require chemical precipitation of soluble phosphorus along with effluent filtration to remove phosphorus-containing suspended solids. These processes would come with substantial capital and operations costs (e.g. > $60,000/year for chemicals alone) and system complexity, as well as increased sludge production and handling. Furthermore, the use of chemicals induce would include an environmental cost in the form of greenhouse gas emissions (GHG) embedded in chemical production and transport.

On this basis, Option 1 received a '<u>FAIL</u>' judgment for the phosphorus-related wastewater treatment attribute.

Option 2a: Estuarine River Discharge

The MWR requires a minimum depth of 10 m below low water elevation for discharge into an estuary. With the depth at low water being as little as 4 m in the lower reach of the Somass River, a discharge at this location would not conform to the MWR requirements. The BC MOE confirmed that no flexibility exists with respect to this MWR requirement for a long-term effluent integration solution. On this basis, Option 2a received a '<u>FAIL</u>' judgment for the minimum depth-related MWR conformance attribute.

Option 2b: Estuarine Inlet Discharge

As shown in Table B-1, Option 2b did not receive any fail judgments across the variety of screening attributes.

Option 3: Intertidal Zone Wetlands

A review of the considerable amount of scientific information that exists for Alberni Inlet revealed that this potential effluent discharge location is an environmentally-sensitive habitat for blue- and red-listed plant, waterfowl and shorebird species along with juvenile and migrating adult salmonid species. The potential for the effluent to have a detrimental effect on the permanent tidal channel and tidal marsh habitats were both rated as "very high" (Associated Engineering, 2013a), irrespective of whether the wastewater is treated to MWR standards. No practical mitigation strategy exists against these anticipated impacts. As a result, Option 3 received a '<u>FAIL</u>' judgment for the general mitigation requirements attribute.

Furthermore, as shown in Table B-1, Option 3 received '<u>FAIL</u>' judgments for MWR conformance attributes related to effluent discharge depth and distance-from-bank, since this effluent discharge approach could not be classified as reclaimed water use for the purposes of maintaining wetlands or marshes.

Screening Results

The screening analysis removed all but one option – Option 2b estuarine inlet discharge. No other options passed the screening feasibility test. This finding is notable because:

- There is no need for a comparative evaluation of feasible options, such as a triple-bottom-line evaluation.
- As Table B-1 indicates, some uncertainties exist for a few Option 2b attributes related to archeological considerations, construction permitting / mitigations and conformance to MWR requirements. Additional information is needed to determine that these **'<u>UNKNOWN</u>'** judgments can become **'<u>PASS</u>'** judgments. This work was undertaken as part of the Environmental Impact Study (EIS).

On the basis of these conclusions a number of effluent discharge/reintegration scenarios based on Option 2b (estuarine inlet discharge) were developed, as presented in the next section.

B.3 Scenario Development and Description

As part of LWMP Stage 2, and subsequent to discussions with the BC MOE, the City undertook a Triple Bottom Line (TBL) evaluation of different discharge design approaches, based on Option 2b (estuarine inlet discharge) as identified in Section B.2.

A Triple Bottom Line + Risk (TBL + R) analysis allows for a comparative evaluation of design scenarios through the examination of attributes deemed as significant. The TBL model incorporates a balance between environmental efficiency, social acceptance, and economic feasibility to accommodate for stakeholder values. These attributes are weighted according to importance by the relevant stakeholders. An important nuance of the TBL + Risk analysis is the use of defendable metrics which ultimately remove any subjectivity or bias from the analysis. This section provides a summary of the attributes that were considered in the development of seven scenarios that were inputs to the TBL evaluation.

Under BC MOE's Municipal Wastewater Regulation (MWR), a discharge of treated wastewater in a marine estuary is required to be a minimum of 10 m below the low tide. For the bathymetry of the Somass Estuary, a 1500 m long discharge pipeline from the Former Catalyst Lagoon would be required to reach the 10 m depth requirement.

The implications of laying a 1500 m pipeline to convey the maximum effluent flows under the full range of tidal conditions are substantial from a hydraulics and construction standpoint.

Discharging treated effluent into Alberni Inlet requires energy for several reasons:

- To overcome the hydraulic limitations of gravity flow against high tides.
- To overcome density differential of fresh water entering a salt-water environment.
- To provide the needed energy for diffusers to provide the required mixing and dilution. (Tideflex™ valves on the diffuser ports provide increased dilution but require hydraulic energy to operate.)

The energy needed must be provided, either by gravity or by pumping. The elevation differential between the lagoon operating level and the high tide is very limited. Gravity flow alone requires a relatively large pipe; however, supplemental pumping enables a smaller pipe to be used.

A number of conceptual designs were developed as discharge scenarios for TBL analysis, presented in Table B-2. Experience and engineering judgement were used to provide a wide range of discharge approaches based on gravity flow and pumping.

Table B-3 presents the MWR requirements and the method by which each scenario meets these regulatory requirements. The MWR requirements for the IDZ and the dilution ratio were established only for Preferred Scenario 7, since these parameters were the subject of the detailed modelling completed as part of the Combined EIS Report.

Scenarios 1: One Gravity-fed, Long, Deep Pipe

Scenario 1 was a full flow discharge through a single pipe to a depth of 10 m in the estuary. One of the disadvantages with this approach is that as the flows are reduced over time, this pipe will gradually become oversized for the flow. Another disadvantage is its relative high capital cost. As a result, additional scenarios were developed that better address the long-term decrease of wet weather flows resulting from the City's phased separation of sanitary and stormwater sewers.

Scenario 2a and 2b: Two Long, Twinned, Deep Pipes

One way of addressing the phased approach is presented in Scenarios 2a and 2b. Both scenarios incorporate twinned pipes rather than a single, larger pipe. In each case, one of the two pipelines would convey wet weather flows that will be reduced over time; this pipeline would be decommissioned when the flows have been sufficiently reduced. Scenario 2a relies solely on gravity flow. Although it eliminates the need for pumping, the limited hydraulic head available requires a relatively large pipe. By contrast, Scenario 2b would utilize pumping and therefore enables a smaller pipe size to be used. Scenario 2b may also have some operational advantages, such as the ability of lowering the lagoon level in advance of wet weather events. Nevertheless, for both Scenarios 2a and 2b, the material and construction costs of long pipes (each 1500 m long) must be considered.

Scenario 3: Gravity-fed, Long, Deep Pipe + Surplus Effluent Discharge to Somass River

Scenario 3 was developed as an alternative to long, large diameter pipelines. Flows up to 30 ML/d would be discharged by gravity to the 10 m depth location. Flows in excess of 30 ML/d (i.e. wet weather) would be discharged through a shorter outfall diffuser system into the estuary adjacent to the existing lagoons which we referred to as the Surplus Effluent Discharge (SED).

Scenario 4: One Gravity-fed, Long, Deep Pipe + One SED to Old City Lagoon

A small modification to Scenario 3 was developed as Scenario 4. In this instance, flows exceeding 30 ML/d would be diverted back to the Old City Lagoon. Only when the Old City Lagoon reached overflow levels would it discharge through the existing channel discharge to the river.

(In response to comments from the BC MOE, the Old City Lagoon was investigated for intermittent use as a wet weather spill/equalization facility (with no aeration) upstream of the Former Catalyst Lagoon. Following a wet weather event, a pump station would transfer the contents of the Old City Lagoon into the Former Catalyst Lagoon for secondary treatment. The main problem with this concept is that any settled putrescible solids would be unavoidably retained in Old City Lagoon after pumping. For this reason, this option was not carried forward into the TBL analysis.)

Scenario 5: One Pumped, Long, Deep Pipe

Scenario 5 incorporates one long pipe to reach the required 10 m depth in the estuary. However, unlike Scenario 1, the energy provided by a low-head pump would allow for a smaller pipe diameter. A pumped discharge system would also better handle high tides that would be problematic for a gravity system. During low tides, a large diameter gravity discharge pipeline could not be made to flow completely full, which would lead to the problem of air trapped in the pipeline when the tide rises. During maximum high tides, the available static head between the lagoon and sea level decreases to less than 1.00 m, which is insufficient for gravity flow.

Scenario 6: One Pumped, Long, Deep Pipe

Scenario 6 was similar to Scenario 5, but was developed to explore the cost impact of a smaller pipe and a more robust effluent pump station, which would provide additional energy.

Scenario 7: One Pumped, Long, Shallow Pipe

Scenario 7 was developed as a shallower discharge option to address the concerns expressed during WAC Meeting #6 (October 29, 2014). Providing a shallow discharge would prevent the depression of dissolved oxygen concentrations at depth. This would reduce the potential likelihood of impacting the salmon that hold in the Alberni Inlet until conditions are suitable for them to enter the Somass River to spawn. Scenario 7 incorporates one continuously running pump.

Table B-2: Description of Scenarios Developed for TBL

	Scenario 1	Scenario 2a	Scenario 2b	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
Overall Description								
Flows	The entire flow discharged by gravity through a single pipe and discharged at a 10 m depth in the estuary.	The flow is split between two large pipes, both discharged by gravity at a depth of 10 m in the estuary.	The flow is split between two pipes, one of which discharges by gravity and the other is pumped. Both pipes discharge at a depth of 10 m in the estuary.	The flows are split between two gravity pipes, with Pipe #1 discharging at a depth of 10 m in the estuary, and Pipe #2 discharging adjacent to the lagoons. Flows up to 30 ML/d will be discharged through Pipe #1. The excess flow (during wet weather flow events) will be discharged through a short Surplus Effluent Discharge (SED) (Pipe #2) near the existing City effluent channel.	The flows are split between two gravity pipes, with Pipe #1 discharging at a depth of 10 m in the estuary, and with Pipe #2 discharging into the old City lagoon. Flows up to 30 ML/d will be discharged through Pipe #1. The excess flow (during wet weather flow events) flows through old City lagoon before being discharged through the existing effluent channel.	The entire flow is pumped (using a low head high flow pump) through a single pipe and discharged at a 10 m depth in the estuary.	The entire flow is pumped (using a large pump) through a single pipe and discharged at a 10 m depth in the estuary.	The entire flow is continuously pumped through a single pipe and discharged at a shallow depth in the estuary
Disinfection	Disinfection is applied to the full flow.	Disinfection is applied to the full flow.	Disinfection is applied to the full flow.	Disinfection is applied to the full flow.	Disinfection is applied to the full flow.	Disinfection is applied to the full flow.	Disinfection is applied to the full flow.	Disinfection is applied to the full flow.
Old City Lagoon	Old City lagoon is decommissioned and restored as a natural habitat area.	Old City lagoon is decommissioned and restored as a natural habitat area.	Old City lagoon is decommissioned and restored as a natural habitat area.	Old City lagoon is decommissioned and restored as a natural habitat area.	Old City lagoon is utilized downstream of the upgraded lagoon to handle wet weather flows.	Old City lagoon is decommissioned and restored as a natural habitat area.	Old City lagoon is decommissioned and restored as a natural habitat area.	Old City lagoon is decommissioned and restored as a natural habitat area.
Long term strategy when peak flows are reduced to < 30 ML/d	No change.	Once flows are reduced to 30 ML/d, Pipe #2 can be decommissioned.	Once flows are reduced to 30 ML/d, Pipe #2 can be decommissioned.	Once flows are reduced to 30 ML/d, Pipe #2 to the SED can be decommissioned.	Once flows are reduced to 30 ML/d, Pipe #2 to old City lagoon can be decommissioned.	No change.	No change.	No change.
Pipe #1								
Diameter (mm)	1200	800	800	800	800	800	600	900
Max. flow (ML/d)	60	30	30	30	30	60	60	60
Length of pipe (m)	1500	1500	1500	1500	1500	1500	1500	1200
Mode of flow	Gravity	Gravity	Gravity	Gravity	Gravity	Pump	Pump	Pump
Depth of discharge (m)	10	10	10	10	10	10	10	3m depth at low tide; 5m depth at mean tide; 7m depth at high tide
Diffuser	16 x 6" ports	8 x 6" ports	8 x 6" ports	8 x 6" ports	8 x 6" ports	16 x 6" ports	16 x 6" ports	26 x 4" ports
Pipe #2								
Diameter (mm)	N/A	800	400	800	800	N/A	N/A	N/A
Max. flow (ML/d)	N/A	30	30	30	30	N/A	N/A	N/A
Length of pipe (m)	N/A	1500	1500	200	600	N/A	N/A	N/A
Mode of flow	N/A	Gravity	Pump	Gravity	Gravity	N/A	N/A	N/A
Depth of discharge (m)	N/A	10	10	5	N/A	N/A	N/A	N/A
Diffuser	N/A	8 x 6" ports	8 x 6" ports	8 x 6" ports	N/A; Open pipe into old City lagoon	N/A	N/A	N/A

Table B-3: Compliance of Scenarios with the MWR

MWR Articles	Scenario 1	Scenario 2a	Scenario 2b	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
Article 35 – Redundancy requirements for Category I.	Repurposed lagoon to be split into two cells run in parallel. Redundant units will also be provided for UV disinfection units, blowers, and aerators. Backup power to be provided.	Repurposed lagoon to be split into two cells run in parallel. Redundant units will also be provided for UV disinfection units, blowers, and aerators. Backup power to be provided.	Repurposed lagoon to be split into two cells run in parallel. Redundant units will also be provided for UV disinfection units, blowers, and aerators. Backup power to be provided.	Repurposed lagoon to be split into two cells run in parallel. Redundant units will also be provided for UV disinfection units, blowers, and aerators. Backup power to be provided.	Repurposed lagoon to be split into two cells run in parallel. Redundant units will also be provided for UV disinfection units, blowers, and aerators. Backup power to be provided.	Repurposed lagoon to be split into two cells run in parallel. Redundant units will also be provided for UV disinfection units, blowers, and aerators. Backup power to be provided.	Repurposed lagoon to be split into two cells run in parallel. Redundant units will also be provided for UV disinfection units, blowers, and aerators. Backup power to be provided.	Repurposed lagoon to be split into two cells run in parallel. Redundant units will also be provided for UV disinfection units, blowers, and aerators. Backup power to be provided.
Article 52 – Disinfection and Chlorination requirements.	Form of disinfection used is Ultraviolet (UV) disinfection. No application of chlorine.	Form of disinfection used is Ultraviolet (UV) disinfection. No application of chlorine.	Form of disinfection used is Ultraviolet (UV) disinfection. No application of chlorine.	Form of disinfection used is Ultraviolet (UV) disinfection. No application of chlorine.	Form of disinfection used is Ultraviolet (UV) disinfection. No application of chlorine.	Form of disinfection used is Ultraviolet (UV) disinfection. No application of chlorine.	Form of disinfection used is Ultraviolet (UV) disinfection. No application of chlorine.	Form of disinfection used is Ultraviolet (UV) disinfection. No application of chlorine.
Article 91 – Edge of IDZ is 300m away from recreational areas, shellfish, etc.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Article 93 – Initial Dilution Zone (IDZ) dimensions (Calculated only for Preferred Scenario as part of EIS Part 2 Modelling)	N/A (Calculated only for the preferred scenario)	N/A (Calculated only for the preferred scenario)	N/A (Calculated only for the preferred scenario)	N/A (Calculated only for the preferred scenario)	N/A (Calculated only for the preferred scenario)	N/A (Calculated only for the preferred scenario)	N/A (Calculated only for the preferred scenario)	Radius of IDZ = 100m
Article 94 – Dilution Ratio (Calculated only for Preferred Scenario as part of EIS Part 2 Modelling)	N/A (Calculated only for the preferred scenario)	N/A (Calculated only for the preferred scenario)	N/A (Calculated only for the preferred scenario)	N/A (Calculated only for the preferred scenario)	N/A (Calculated only for the preferred scenario)	N/A (Calculated only for the preferred scenario)	N/A (Calculated only for the preferred scenario)	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 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.
Article 94 – Municipal effluent quality requirements: Maximum monthly average of 45mg/L for BOD_5 and TSS for flow >50 m^3/d, estuary receiving environment, and dilution ratio >40:1	Maximum monthly average concentrations: BOD_5 = 45 mg/L TSS = 45 mg/L	Maximum monthly average concentrations: BOD_5 = 45 mg/L TSS = 45 mg/L	Maximum monthly average concentrations: BOD_5 = 45 mg/L TSS = 45 mg/L	Maximum monthly average concentrations: BOD_5 = 45 mg/L TSS = 45 mg/L	Maximum monthly average concentrations: BOD_5 = 45 mg/L TSS = 45 mg/L	Maximum monthly average concentrations: BOD_5 = 45 mg/L TSS = 45 mg/L	Maximum monthly average concentrations: BOD_5 = 45 mg/L TSS = 45 mg/L	Maximum monthly average concentrations: BOD_5 = 45 mg/L TSS = 45 mg/L
Article 96 – Allowable fecal coliforms For non-shellfish harvesting areas, fecal coliform concentrations must be <200 CFU/100mL at the edge of the IDZ	Disinfection provided by UV to provide a fecal coliform concentration of <200CFU/100mL at the edge of the IDZ	Disinfection provided by UV to provide a fecal coliform concentration of <200CFU/100mL at the edge of the IDZ	Disinfection provided by UV to provide a fecal coliform concentration of <200CFU/100mL at the edge of the IDZ	Disinfection provided by UV to provide a fecal coliform concentration of <200CFU/100mL at the edge of the IDZ	Disinfection provided by UV to provide a fecal coliform concentration of <200CFU/100mL at the edge of the IDZ	Disinfection provided by UV to provide a fecal coliform concentration of <200CFU/100mL at the edge of the IDZ	Disinfection provided by UV to provide a fecal coliform concentration of <200CFU/100mL at the edge of the IDZ	Disinfection provided by UV to provide a fecal coliform concentration of <200CFU/100mL at the edge of the IDZ
Article 100 – For discharges > 5,000m^3/d, minimum outfall depth is 10m, and minimum outfall length is 30m	Outfall depth = 10m Outfall length = 1500m	Outfall depth = 10m Outfall length = 1500m	Outfall depth = 10m Outfall length = 1500m	Pipe #1 Outfall depth = 10m Pipe #1 Outfall length = 1500m Pipe #2 Outfall depth = 5m Pipe #2 Outfall length = 200m	Pipe #1 Outfall depth = 10m Pipe #1 Outfall length = 1500m Pipe #2 Outfall depth = N/A (into the Old City lagoon) Pipe #2 Outfall length = 600m	Outfall depth = 10m Outfall length = 1500m	Outfall depth = 10m Outfall length = 1500m	Outfall depth = 3m depth at low tide; 5m depth at mean tide; 7m depth at high tide Outfall length = 1200m

B.4 TBL Attributes and Risk Factors

The purpose of the TBL + R analysis is to provide a comprehensive and interactive comparative means of evaluating different scenarios. It is important to capture the potential attributes in a quantifiable manner to ensure proper comparison can be conducted, with minimal reliance on subjective opinion. Table B-4 identifies the attributes that were examined, and the methodology used to evaluate the different scenarios.

In addition to the quantifiable attributes within the TBL framework, two risk factors (RF) were developed to address concerns raised by stakeholders and WAC members:

- RF 1: The anticipated extent of the potential reduction in in-situ dissolved oxygen (DO) levels and the volume of the affected area relative to that of known salmon habitat in Upper Alberni Inlet; includes consideration of both acute (mortality) and chronic (reproduction and survival) effects
- RF 2: The anticipated fecal coliform levels at the edge of the IDZ in the Scenario and relative to those measured (i.e. existing conditions) per the field programs conducted in the months of June and September 2013 as noted below.

The RFs were applied only to the short-listed, highest scoring, scenarios. These were Scenario 5, 6, and 7. For each of the short-listed scenarios, the RFs were evaluated as the product of the probability of such an event occurring and the severity should the event occur. The probability scale varied from rare, unlikely, possible, likely, to almost certain. The severity scale varies from insignificant, minor, moderate, major, to extreme. A negligible or workable risk would result from a low probability and a low severity. Conversely, a critical and unacceptable risk would result from a high probability and a high severity. Figure B-2 provides the detailed probability and severity evaluations.

Through the evaluation of the severity and probability of each risk factor for each of the scenarios, the risk factor consequences were determined. These scores (shown in detail in Figure B-2) include input from experts in the field (i.e. DFO) as well as local knowledge provided by the WAC members.

Table B-5 is the populated attribute table for each of the seven scenarios:

Table B-4: Quantifiable Attributes for TBL Analysis

Potential Attribute and Risk Factors	Metric	Quantifiable Units	Comments
Environmental			
Physical footprint disturbance	Disturbed terrestrial + foreshore / estuary area	m^2	Calculated separately for terrestrial and estuary areas
Carbon footprint	GHG emissions associated with operations over an analysis horizon that extends from Year 2015 to 2035	t CO^2e	Constrain to combusted diesel fuel and purchased electricity
Aquatic life	The Biochemical Oxygen Demand discharged through the deep outfall(s) (i.e. 10 m depth) using Maximum Month Flows (MMF)	kg $cBOD_5$/day	Calculate $cBOD_5$ loads for the outfall(s) at a depth of 10 m
Natural Habitat Restoration Area	Footprint of restored area	m^2	This is applicable to the restoration of the current old City lagoon to its natural habitat (i.e. estuary)
Social			
Recreational Water Use	Fecal coliform concentration at the edge of the IDZ using Maximum Month Flows (MMF)	CFU/100 mL	Weighted value based on concentration at the edge of the IDZ for all discharge locations based on the MMF of 43 ML/d. It is also assumed that the entire flow is disinfected
Economic			
Capital Cost	Initial capital costs incurred for works constructed in the first five (5) years of implementation	2014 $	Includes the capital costs for all constructed works, including mitigation costs
Life - cycle cost	Total NPV of all construction and O&M costs over an analysis horizon that extends from Year 2015 to 2035	2014 $	Includes monitoring program, end-destination biosolids management costs (e.g. transport to landfill and tipping fees), and return of old City lagoon to natural environment (i.e. dyke removal)

Table B-5 Populated TBL + R

Potential Attribute and Risk Factors	Metric	Quantifiable Units	SCENARIO 1 1 Long Deep	SCENARIO 2a 2 Gravity Long Deep	SCENARIO 2b 1 Gravity Long Deep + 1 Pump Long Deep	SCENARIO 3 1 Gravity Long Deep + 1 SED to River	SCENARIO 4 1 Gravity Long Deep + 1 SED to City Lagoon	SCENARIO 5 1 Pump Long Deep	SCENARIO 6 1 Pump Long Deep	SCENARIO 7 1 x 36" Pump Long Shallow
Environmental										
Physical footprint disturbance	Disturbed terrestrial + foreshore / estuary area	m^2	7,200	7,200	6,300	6,120	7,560	5,400	4,800	4,680
Carbon footprint	GHG emissions associated with operations over an analysis horizon that extends from Year 2015 to 2035	t CO^2e	2,777	2,777	2,840	2,777	2,777	2,908	3,646	3,472
Aquatic life	The Biochemical Oxygen Demand discharged through the deep outfall(s) (i.e. 10 m depth) using Maximum Month Flows (MMF)	kg $cBOD_5$/day	1075	1075	1075	750	750	1075	1075	0
Natural Habitat Restoration Area	Footprint of restored area	m^2	50000	50000	50000	50000	0	50000	50000	50000

Potential Attribute and Risk Factors	Metric	Quantifiable Units	SCENARIO 1 1 Long Deep	SCENARIO 2a 2 Gravity Long Deep	SCENARIO 2b 1 Gravity Long Deep + 1 Pump Long Deep	SCENARIO 3 1 Gravity Long Deep + 1 SED to River	SCENARIO 4 1 Gravity Long Deep + 1 SED to City Lagoon	SCENARIO 5 1 Pump Long Deep	SCENARIO 6 1 Pump Long Deep	SCENARIO 7 1 x 36" Pump Long Shallow
Social										
Recreational Water Use	Fecal coliform concentration at the edge of the IDZ using Maximum Month Flows (MMF)	CFU/100 mL	2	2	2	7	7	2	2	4
Economic										
Capital Cost	Initial capital costs incurred for works constructed in the first five (5) years of implementation	2014 $	$18,416,000	$17,397,000	$16,320,000	$15,551,000	$15,866,000	$15,571,000	$14,810,000	$15,589,000
Life - cycle cost	Total NPV of all construction and O&M costs over an analysis horizon that extends from Year 2015 to 2035	2014 $	$26,910,000	$25,700,000	$24,480,000	$23,490,000	$23,870,000	$23,650,000	$23,310,000	$24,960,000
Risk Factors										
Total Risk	Consequence	Unitless	N/A	N/A	N/A	N/A	N/A	1,375	1,375	750

project	LWMP
client	City of Port Alberni
file no.	20132344.00.E.03.00
subject	Risk factor definitions and scales - "change up" based on ideas discussed with H. Hamilton Feb 13/15
by	D. Shiskowski
revision	Feb 13 / 15

Probability of Occurrence	Risk Factor-Specific Description	Value
in a "given year" context:	**applies to Risk Factors 1 and 2**	
rare	expected to occur with a frequency of < 1 time / 100 yrs	1
unlikely	expected to occur with a frequency of 1 time / 100 yrs to 1 time / 50 yrs	10
possible	expected to occur with a frequency of 1 time / 50 yrs to 1 time / 10 yrs	25
likely	expected to occur with a frequency of 1 time / 10 yrs to 1 time / yr	50
almost certain	expected to occur with a frequency of 1 time / yr to 10 times / year	100

Definition Statements

Risk Factor 1 - **decreased receiving water dissolved oxygen levels:** the subjective judgment is based on the probability that the discharge of City effluent will result in a reduction of in-situ dissolved oxygen levels to below the threshold where adverse effects on Pacific salmon have been historically experienced

Risk Factor 2 - **increased receiving water fecal coliform levels:** the subjective judgment is based on the probability that the City will experience an "event" that results in an effluent-related exceedence of the recreational water quality objective of 200 cfu/100 mL at the edge of the initial dilution zone

Severity of Impact	Risk Factor-Specific Description	Value
	Risk Factor 1 - **decreased receiving water dissolved oxygen levels**	
insignificant	-	5
minor	-	15
moderate	-	50
major	-	200
extreme / catastrophic	-	700
	Risk Factor 2 - **increased receiving water fecal coliform levels**	
insignificant	- fecal coliform concentration 2 orders-of-magnitude lower than existing condition (e.g. _____ CFU/100 mL)	5
minor	- fecal coliform concentration 1 order-of-magnitude lower than existing condition (e.g. _____ CFU/100 mL)	15
moderate	- fecal coliform concentration same order-of-magnitude as existing condition (e.g. _____ CFU/100 mL)	50
major	- fecal coliform concentration 1 order-of-magnitude higher than existing condition (e.g. _____ CFU/100 mL)	200
extreme / catastrophic	- fecal coliform concentration 2 orders-of-magnitude higher than existing condition (e.g. _____ CFU/100 mL)	700

Definition Statements

Risk Factor 1 - the subjective judgment is based on both the anticipated extent of the potential reduction in in-situ DO levels and the volume of the affected area relative to that of known salmon habitat in Upper Alberni Inlet; includes consideration of both acute (mortality) and chronic (reproduction and survival) effects

Risk Factor 2 - the subjective judgment is based on the anticipated fecal coliform levels at the edge of the IDZ and relative to those measured in the general area during the 2014 field programs (i.e. existing conditions)

Risk Factor Consequence (Probability x Severity)	Severity Definitions
negligible	workable risk
medium	tolerable risk
high	undesirable risk
critical	unacceptable risk

Severity Definitions

	severity				
probability	insignificant	minor	moderate	major	extreme
rare	5	15	50	200	700
unlikely	50	150	500	2,000	7,000
possible	125	375	1,250	5,000	17,500
likely	250	750	2,500	10,000	35,000
almost certain	500	1,500	5,000	20,000	70,000

B.5 TBL + R Methodology and Evaluation Results

During WAC Meeting #6 (October 29, 2014), members of the WAC were guided through a consensus exercise to determine the weighting of each of the attributes. Table B-6 summarizes the consensus reached; these values were inputted into the TBL model in order to complete the comparative analysis. A value of 100 indicates the attribute is of most importance. Other attributes are rated in relation to the most important one. For instance, if an attribute is rated at 50 (i.e. carbon footprint), it was deemed to be half as important as the most important attribute (i.e. aquatic life).

Table B-6: Consensus of Attribute Weighting

Attribute	Description	Attribute Weighting	Main Category Weighting
Environmental			100
Physical footprint disturbance	Disturbed terrestrial + foreshore / estuary area in locations	50	
Carbon footprint	GHG emissions associated with operations over an analysis horizon from Year 2015 to 2035	50	
Aquatic life	The Biochemical Oxygen Demand discharged through the outfall(s) using Maximum Month Flows (MMF)	100	
Natural habitat restoration area	Footprint of restored area (i.e. Old City lagoon)	50	
Social			50
Recreational water use	Fecal coliform concentration at the edge of the IDZ using Maximum Month Flows (MMF)	100	
Economic			75
Capital cost	Initial capital costs incurred for works constructed in the first 5 years of implementation	100	
Life - cycle cost	Total NPV of all construction and O&M costs over an analysis horizon from Year 2015 to 2035	90	

The scoring for each scenario is summarized in Table B-7.

Table B-7: Results from TBL Analysis – All 7 Scenarios

Scenario	TBL Score*
SCENARIO 1 (1 Long Deep)	0.411
SCENARIO 2a (2 Gravity Long Deep)	0.514
SCENARIO 2b (1 Gravity Long Deep + 1 Pump Long Deep)	0.641
SCENARIO 3 (1 Gravity Long Deep + 1 SED to River)	0.565
SCENARIO 4 (1 Gravity Long Deep + 1 SED to City Lagoon)	0.400
SCENARIO 5 (1 Pump Long Deep)	0.735
SCENARIO 6 (1 Pump Long Deep)	0.730
SCENARIO 7 (1 Pump Long Shallow)	0.730

* Note: Maximum possible score is 1.000.

Using these attribute weightings, the three highest scoring scenarios were shortlisted: Scenarios 5, 6, and 7. The remainder of the scenarios were eliminated from further analysis.

To adequately compare the short-listed scenarios (during WAC Meeting #7 on February 24, 2015), attributes with quantified values within 10% of each other were eliminated from the analysis as they did not help distinguish the scenarios from one another. As a result, the following attributes were removed from the next step of comparison:

- Natural Habitat Restoration Area (Environmental Category)
- Capital Cost (Economic Category)
- Life Cycle Cost (Economic Category)

The fecal coliform concentration achieved in all of the scenarios is anticipated to be two orders of magnitude below the MWR requirements. As a result, the Recreational Water Use attribute (Social Category) was eliminated from the analysis.

After removing these categories, the RFs were applied to the analysis of the three shortlisted scenarios. The risk for each of the shortlisted scenarios was as follows:

- RF 1: Receiving water dissolved oxygen levels
  - Scenarios #5 and #6 exhibited high risk
  - Scenario #7 exhibited tolerable risk
- RF 2: Receiving water fecal coliform levels
  - Scenarios #5 and #6 exhibited negligible risk
  - Scenario #7 exhibited tolerable risk

Table B-8 provides a summary of the consensus for the attribute weightings applied to the short-listed scenarios.

Table B-8: Revised Attribute Weightings for Shortlisted Scenarios

Attribute	Description	Attribute Weighting	Main Category Weighting
Environmental			100
Physical footprint disturbance	Disturbed terrestrial + foreshore / estuary area in locations	50	
Carbon footprint	GHG emissions associated with operations over an analysis horizon from Year 2015 to 2035	50	
Aquatic life	The Biochemical Oxygen Demand discharged through the outfall(s) using Maximum Month Flows (MMF)	100	
Natural habitat restoration area	Footprint of restored area (i.e. Old City lagoon)	0	
Social			0
Recreational water use	Fecal coliform concentration at the edge of the IDZ using Maximum Month Flows (MMF)	0	
Economic			0
Capital cost	Initial capital costs incurred for works constructed in the first 5 years of implementation	0	
Life - cycle cost	Total NPV of all construction and O&M costs over an analysis horizon from Year 2015 to 2035	0	
Risk			100
Total Risk	Consequence and probability of two evaluated risk factors	100	

Using this revised attribute weighting, Scenario 7 had the highest score, with a greater gap between the scoring of Scenario 7 and Scenarios 5 and 6 (see Table B-9). WAC Meeting #7 culminated with a consensus decision from all participants that Scenario 7 is the preferred scenario.

Table B-9: Results from Short-Listed Scenarios (with Updated Weightings)

Scenario	TBL Score*
SCENARIO 5 (1 Pump Long Deep)	0.125
SCENARIO 6 (1 Pump Long Deep)	0.104
SCENARIO 7 (1 Pump Long Shallow)	0.904

* Note: Maximum possible score is 1.000.

APPENDIX C - HYDRAULIC MODEL ANALYSIS OF COMBINED SEWER OVERFLOWS

R E P O R T

CITY OF PORT ALBERNI

Hydraulic Model Analysis of CSO's

March
2003

TABLE OF CONTENTS

CONTENTS

INTRODUCTION

SECTION 1

Currently, a significant portion of the City of Port Alberni's sewer system operates as a combined sanitary sewage and storm water collection and conveyance system. During some larger rainfall events, overflows of combined sewage (CSO's) to Alberni Inlet occur at some locations. From a regulatory and aesthetic point of view, these overflows are not desirable. As a result, methods to mitigate their occurrence needs to be found.

The present study utilized hydraulic modelling to investigate the occurrence of combined sewer overflows (CSO's) from the City's four overflow structures. The intent was to estimate the magnitude of the overflows during severe events and to determine the measures that would be required to eliminate combined sewer overflows for wet weather events up to and including the five-year return period, i.e., such that a CSO will occur only once every five years, on average.

MODEL DEVELOPMENT

SECTION 2

2.1 MODEL PHILOSOPHY

The Port Alberni sewer system is divided into four sectors: the Northwest Sector, the North Sector, the Central Sector and the South Sector (see Figure 2-1).

The Northwest Sector, which is tributary to the Josephine Street sanitary pump station, does not have any CSO's and, therefore, was not included in this modeling exercise. The South, Central and Northern Sectors were modelled in order to investigate CSO occurrences in the City. Two separate models were developed. The "Wallace" model encompassed all sub-catchments (North and most of Central Sector) that are tributary to the Wallace Street sanitary pump station. The "Argyle" model incorporated those sub-catchments (South Sector and remainder of Central Sector) that are served by the Argyle Street sanitary pump station. The "Argyle" model also included the 4th Avenue sub-catchment and pump station. Both models included their respective major pump stations (Argyle and Wallace) and the force mains to the wastewater treatment lagoon.

The South Sector and portions of the Central Sectors are primarily combined sanitary and storm sewers, and are tributary to the Argyle Street pump station. Some areas of separated sanitary and storm sewers exist along the eastern edge of these two sectors, and to the south. Three overflow structures (Argyle, Tahsis and Bruce) direct peak wet weather flows away from the wastewater collection system to outfalls in Alberni inlet to protect the low gradient interceptor sewers that run along the harbour, and the Argyle street pump station. These overflow structures effectively remove all peak wet weather flows in excess of approximately three times the average dry weather flows. Upstream of the CSO's, the collection system is essentially designed, and functions as, a storm sewer system to convey large wet weather flows.

The Wallace street pump station is protected from high flows originating in the combined sewer portions of the Central Sector by the Maitland Street overflow structure, which outfalls to Lupsi Cupsi Creek. This overflow performs the same function as the three associated with the Argyle Street pump station, i.e., to protect the system and pump station from excessive flows during larger wet weather events. Approximately half of the Central sector that is tributary to the Wallace Street pump station, and all of the North sector, have separated sanitary and storm sewer systems. However, much of the separated sanitary systems in the northern portions of the City are older, and the sections at lower

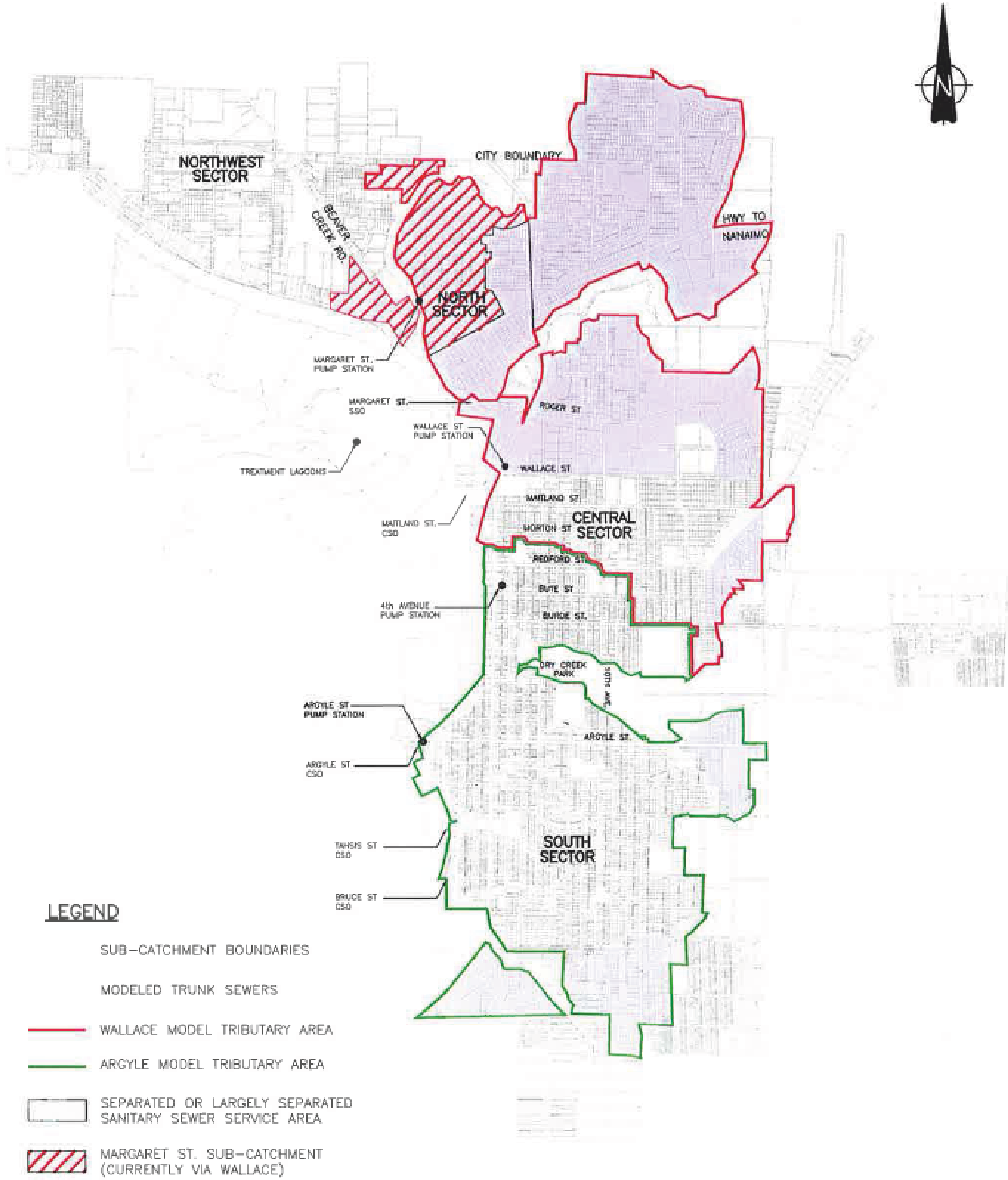


FIGURE 2-1
PORT ALBERNI
SEWER SYSTEM MODEL

Time: 14:6 Date: 2002/11/27 Plot Scale: 1=1 (Paper Space) AutoCAD File: 992993\STAGE2\FIG2-1.DWG (ST) elevations traverse ground that is often saturated. Therefore, it is reasonable to expect that Rainfall Derived Inflow and Infiltration (RDI&I) and Groundwater Infiltration (GWI) will increase flows above the strictly sanitary component.

In order to keep the modelling effort to a reasonable level, each sub-catchment was treated as a lumped catchment. That is, the internal sewer systems of smaller pipes were not modelled and inputs to the sanitary system were modelled as a single input at the downstream end of each catchment. Only the large trunk or interceptor sewers that convey flows to the pump stations were actually modelled. Implicit in this approach is the assumption that any system deficiencies that exist within each sub-catchment were considered to have been remedied so that all flow reaches the trunk system without diversion or overflowing to ground. The modelled trunk sewer system is indicated in Figure 2-1.

Similarly, the trunk sewer system was modelled so that all flows remained within the conveyance system, except at the overflow structures. This was accomplished by setting manhole rim elevations high enough to ensure there was no surcharging to ground in the trunk system. Extraneous losses of wet weather volumes were avoided and all flows were routed either to the overflows or to the pump stations and, ultimately, the treatment lagoon. Therefore, no hidden or unintentional "safety valves" existed in the model to decrease the volumes of flow that had to be handled.

2.2 MODEL SOFTWARE

The hydrologic/hydraulic model software used was the Visual Hydro package from CAICE software. This software is a derivative of the USEPA's well-established SWMM software. Visual Hydro is capable of modelling both the hydrologic and hydraulic aspects of the systems, including fully dynamic hydraulic modelling. This is especially important where conditions may give rise to backwater effects within the system, or where tidal backwater influences on overflow rates must be considered.

2.3 DATA SOURCES

The City made data available for the sanitary sewer system operations. These are discussed below.

Manhole location and IDs were made available in an AutoCAD drawing. Sanitary sewer pipe lengths, inverts and IDs were obtained from a spreadsheet database. Base mapping was used to determine sub-catchment areas, and to estimate overland travel distances, average catchment slope and other hydrologic parameters. Percentage impervious area, which is necessary for modelling the combined system sub-catchments, was estimated from land-use type and apparent impervious area visible from orthographic air photos provided by the City.

Lagoon flow records were used to determine overall dry weather flow rates. Water use records, distributed according to sub-catchments, were used to apportion the dry weather flows for each sub-catchment.

The City conducted an assessment of system overflows during 1994 and 1995. The Argyle, Tahsis and Maitland overflow structures were monitored during different periods for overflow events. The resulting report, "Combined Sewer Overflows, Preliminary Quality and Quantity Monitoring Results, 1994-1995", provides the only available flow data for the functioning of the overflows during wet weather periods.

Flow measurement was accomplished by City staff by measuring the depth of water above the overflow weirs. The water depth was then converted to an estimated flow using the dimensions of the weir and the appropriate head-discharge equations for each weir. Simultaneous measurements at more than one overflow structure were not carried out, and no measurements were obtained at the Bruce Street overflow due to its physical configuration.

2.4 DEVELOPMENT OF BASE MODELS

Base models, representing the existing system under present development and I&I conditions, were developed from the data discussed above.

Portions of sub-catchments served by combined sewers were treated from a normal drainage approach. Percentage of impervious area utilized varied from 40% to 65% depending upon such factors as the predominance of green space, single family housing and commercial development within each sub-catchment. Given the older nature of most of these sub-catchments, it was assumed that current storm water Best Management Practices (BMPs) have not been applied.

Sanitary base flows were established from the lagoon flow data and pump records during dry periods. Dry weather flows were distributed to each sub-catchment according to their proportion of water consumption during the low potable water demand period of Jan. 1 to Apr. 30th, 2001.

Sub-catchments that are served by separate storm and sewer systems were modelled by assuming that 2% of total rainfall entered the sanitary sewer system as RDI&I. This quantity is based on experience with other municipalities' systems. Groundwater infiltration, which occurs over a longer time frame, was not explicitly modelled, but is likely partially accounted for in the base sanitary flows obtained from pump station run times and the lagoon flow records. RDI&I originating in the separated system would be significantly smaller than direct storm water inputs generated by the combined system.

2.5 CALIBRATION AND VERIFICATION

Using rainfall data available in the City's 1995 CSO report, several rain events were mathematically replicated to compare volumes spilled at the overflow structures in the model with those estimated from the water level data and head-discharge relationships. Each overflow had to be calibrated individually, since only one overflow was monitored at a time.

Using the recorded rain gauge data from the Port Alberni airport, provided in the City's CSO report, each storm was reproduced in the Visual Hydro model. The model was run and the results compared with the recorded volumes and flows. It was noted that there appears to be a time mismatch between recorded overflows and intense storm activity. In some cases the data provided indicates very large overflows volumes occurring after, or as a result of, extremely minor rainfall events. For example, on Nov. 1, 1994, 1.8 mm of recorded rainfall resulted in an overflow volume of 17,500 m^3 at the Argyle CSO. This event was preceded by at least one day of no precipitation. Conversely, the Oct. 30, 1994 event saw 31.2 mm of rainfall but only recorded an overflow volume of 9225 m^3 at the Argyle CSO. While overflow volumes will depend upon antecedent conditions and the intensity and duration of the storm, and not just total rainfall depths, these discrepancies are not readily explained.

Table 2-1 below summarizes the calibration comparison between the model and the recorded flows for selected rainfall events. The table summarizes the recorded and modelled runoff results. For comparison purposes, the maximum possible volume (MPV) for each storm was calculated. This volume assumes that the entire tributary area produces runoff (100% impervious), and that the system is able to convey the entire volume to the overflow. Flows that remained within the system for conveyance to the treatment plant, i.e., did not overflow, are not reflected in the modelled volumes shown below.

Table 1
Calibration of Overflow Data[1]

Overflow	Argyle	Tahsis	Maitland	Maitland
Date	Nov. 3, 1994	Nov. 20 to 23, 1994	Nov. 7-8, 1995	Jan. 28, 1995
Rainfall (mm)	38.8	88.1	22.4	80.0
Catchment Area 1	186	116.0	141.1	141.1
Peak Flow -Model (m^3/s)	1.52	0.54	0.35	0.76
Peak Flow -Reported (m^3/s)	2.01	1.64	0.38	0.97
Volume -Model (m^3)	43,000	18,700	2810	21,014
Volume -Reported (m^3)	47,597	99,916	10,409	18,906
MPV (m^3)	72,200	95,985	31,606	112,880

[1] No measured data was obtained from the Bruce CSO structure.

The flows and volumes modelled at Argyle were considered to be in reasonable agreement with those recorded. The recorded flows appear to be higher, but the event of Nov. 3, 1994 included a high tide cycle in which flows could have backed up and surcharged the overflow weir in the Argyle overflow structure, which would have "inflated" the overflow measurements. The recorded water levels used to calculate flows did not take into account tidal backwater effects in the Argyle overflow pipe. Since the various runoff parameters utilized, and the model assumptions, are conservative, it was not deemed necessary to adjust these parameters to increase runoff.

The overflow data recorded at the Tahsis overflow structure is interesting. Comparing the volume recorded with the maximum possible volume (MPV), based on tributary area and total rainfall, indicates that the volume estimated as overflowing is equivalent to 105% runoff. This estimate does not include the volumes that would remain within the sanitary system and routed to the Argyle pump station. Unless an unidentified phenomenon is occurring that would increase flows above that expected from the catchment, such as the tributary area is effectively larger because streams are being intercepted and routed into the system, these reported high volumes are not credible.

Given the hydrologic characteristics of the Tahsis sub-catchments, where land uses are mostly single family residential and small commercial, percent impervious values similar to those employed in Argyle were deemed adequate.

The Bruce overflow was not monitored, only pro-rated data from the Tahsis overflow was provided. Therefore, it was not possible to verify the assumed parameters employed in the model for the Bruce area. However, it is reasonable to assume that it would be similar in characteristics to the other two areas. It should be noted that a greater proportion of this catchment, as compared to the Argyle and Tahsis catchments, is served with separate storm and sanitary sewers, so the overflow volumes that could be expected at Bruce would be more than proportionally smaller than that suggested by the area's size (69.4 ha), relative to Argyle (186 ha) or Tahsis (116 ha).

The Maitland overflow in the Wallace model was calibrated against storm events on Nov. 7-8, 1994 and Jan. 28, 1995. The larger event, on Jan. 28, 1995 in which 80.0 mm of rainfall was recorded, did not have a time distribution of rainfall available. However, a model run with an assumed distribution produced volumes that were slightly larger than those recorded, but with a lower peak flow. The Nov. 8, 1994 storm produced a recorded overflow volume of 10,409 m^3, compared with the modeled result of 2810 m^3. Since the larger storm of Jan. 28, 1995 was better replicated, and was reproduced fairly well, the Wallace model calibration was considered within the variability of the model as well as the margin of error of the recorded overflow volumes.

MODEL ANALYSIS - EXISTING SYSTEM

The calibrated models were used to assess system performance for a variety of storm conditions. The Provincial Municipal Sewage Regulations (MSR) require that CSO occurrences be eliminated for precipitation events with less than a 5-year return period. Therefore, most storms that were investigated were 5-year return period storms of differing lengths. Temporal distributions were developed from the appropriate curves for Atmospheric Environment Service (AES) rainfall distribution curves for long-duration and short-duration coastal storms. Rainfall depths were obtained from Intensity-Duration-Frequency (IDF) data for the Port Alberni Airport.

The 5-year return period storms all produced large overflow volumes at each of the overflows, regardless of storm duration. Longer storms inevitably produce larger total volumes as the total depth of rainfall increases with time.

The original sewer system design incorporated larger sewer capacity in the upper portions of the catchment to convey all storm and sanitary flows to the foreshore. The capacity of the foreshore sewers and pumping stations were designed to accommodate three times the average dry weather flow (ADWF). Overflow structures were installed to divert excess flows to the harbour. The model results indicate that the collection system functions as originally designed. The overflow structures act as the demarcation between what is functionally the storm sewer system and the sanitary sewer system.

Flows from Tahsis and Bruce catchments are collected and directed to the Argyle pump station. Excess flows (i.e., flows >3 x ADWF) are diverted to the harbour through CSO's located at the foot of Tahsis and Bruce Streets. During large storm events, flows from Tahsis and Bruce catchments are significant enough to cause back up of flows from the Argyle catchment, leading to sewage overflows at the Argyle CSO. The Argyle Street pump station hydraulics and configuration favour preferential collection of Bruce/Tahsis flows over flows from the Argyle catchment. However, during peak storms, flows from Bruce/Tahsis, which exceed the capacity of the Argyle pump station, can bypass the station wet well and overflow at the Argyle CSO.

The model indicates that the Bruce overflow structure consistently allows approximately 50 L/s to pass downstream to the Argyle pump station during peak conditions. Excess flows are routed to the outfall by the overflow structure. Hydraulic conditions at Argyle can surcharge the system upstream to Tahsis and may choke flows that would otherwise pass the Tahsis overflow structure to enter the sanitary system. Therefore, flows that are forwarded to Argyle from Tahsis are less consistent, but vary between approximately 100 to 150 L/s during peak flow conditions.

During the most intense, short duration, five year storms, the peak overflow rates at Argyle can be up to 20 times the ADWF. Fortunately, the duration of these storms is short and, therefore, the total volumes are less than produced by a long duration storm.

In addition to the five year storms described above, various storm intensities (corresponding to various return periods) for the 3 hour and 12 hour duration storms were input into the model to develop ratings curves for each of the CSO's (Figures 3-1 and 3-2). These ratings curves are useful for predicting the volume of overflow that can be expected for various rainfall events. Because of the variability introduced by antecedent conditions, rainfall distribution (and tidal influences at Argyle), the volumes indicated on the ratings curve should be considered order-of-magnitude estimates and subject to potentially large variability for any given real-life storm.

Figure 3-1 Overflow Ratings Curves for Port Alberni CSOs

12 hour Storm

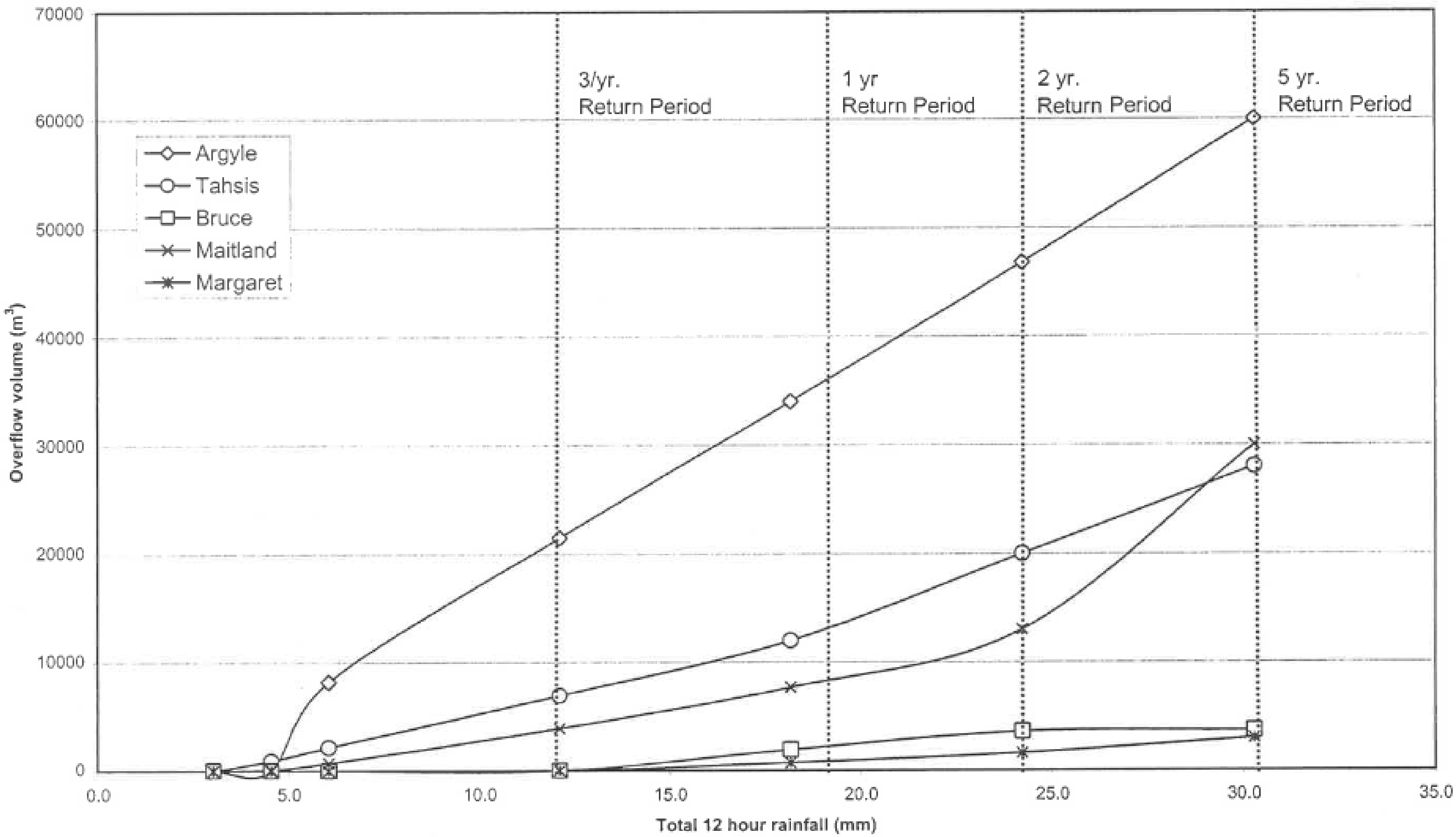


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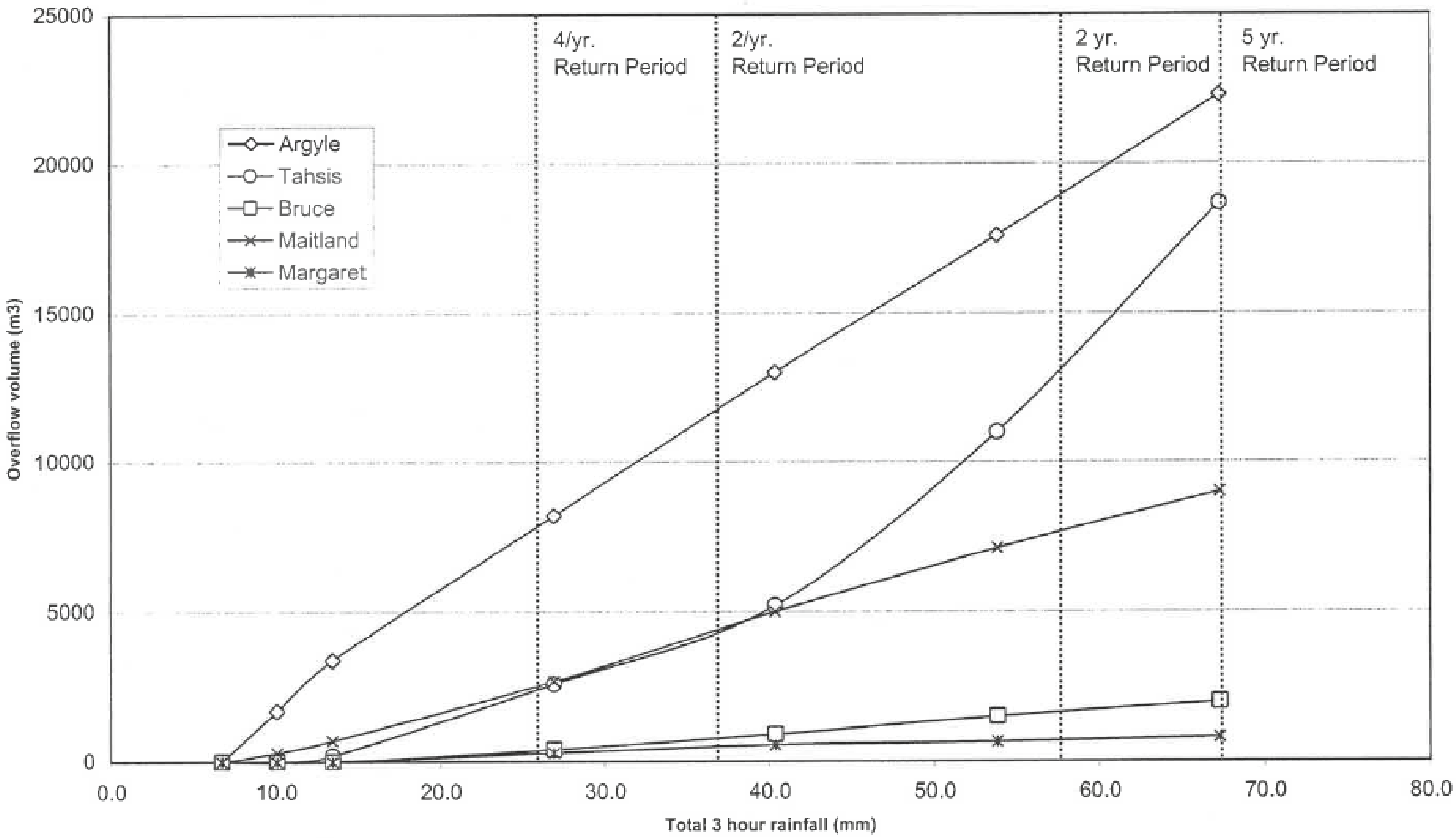
Figure 3-2 Overflow Ratings Curves for Port Alberni CSOs

3 hour Storm



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MODEL ANALYSIS - MITIGATION MEASURES

SECTION 4

Table 4-1 summarizes the four general methods that have been evaluated for reducing the occurrence and magnitude of CSO's at the four major overflow structures.

Table 4-1
Summary of CSO Mitigation Alternatives

Alternative	Description
1	Conveyance Upgrades • Upgrade Argyle and Wallace pumping stations to convey 100% of the peak flows to the wastewater treatment facility. • Upgrade force mains and gravity sewers to convey 100% of the peak flows.
2A	Off-line Storage • Provide new off-line equalization tanks to provide storage of peak wet weather flows.
2B	Storage and Conveyance Upgrades • Provide new equalization tanks (smaller than in Alternative 2A) to provide storage of peak wet weather flows, and upgrade gravity sewers, pumping stations and force mains, such that 25 to 50 percent of the storage volumes will be restored within a 24-hour period.
3	Off-line Treatment of Overflows • Provide off-line treatment process (e.g. vortex solids separators) to treat CSO's prior to discharge.
4	Separate Combined Sewers • Convert existing combined sewers into storm sewers. • Construct a new sanitary sewer adjacent to the existing collection system.

The following sections contain more detailed discussion of these four options.

4.1 ALTERNATIVE 1 - CONVEYANCE UPGRADES

Under this scenario, the required conveyance system improvements needed to convey all combined sewer flows for the 5-year return period event were estimated. These system improvements have been sized to handle the total volume of flow generated by the storm event to prevent CSO's under peak instantaneous flows. In this scenario, it was assumed that there would be no storage provided to attenuate the peak flows.

Conceptually, the entire combined sewer system would be designed and operated as a storm water drainage system, including the pump stations and force mains. The system components are sized to reflect the much higher flows typical of a drainage system, as opposed to a sanitary sewer system. The estimated capacities and sizes of major system improvements are indicated in Table 4-2.

Table 4-2
Major Conveyance Improvements

Item	Improvement
Pump Stations	
Argyle Pump Station	Increase total capacity from 0.21 m^3 /s to 3.75 m^3/s @ 70 m TDH.
Wallace Pump Station	Increase total capacity from 0.35 m^3/s to 2.0 m^3/s @ 25 m TDH.
Trunk Sewers	
Bruce Overflow to Tahsis Overflow	Replace with 340 m of 900 mm dia.
Tahsis Overflow to Argyle Pump Station	Replace with 582 m of 1050 mm dia.
Maitland Overflow to Wallace Pump Station	Replace with 255 m of 1200 mm dia.
Margaret St, to Wallace Pump Station	Replace with 500 m of 600 mm dia., and 200 m of 750 mm dia.
Force Main: Argyle Pump Station to Lagoon	Twin existing with 3100 m of 1050 mm dia.
Force Main: Wallace Pump Station to Lagoon	Twin existing with 970 m of 750 mm dia.

4.2 ALTERNATIVE 2A - OFFLINE STORAGE

The required storage volumes to retain all CSO occurrences, for storm events up to the 5 year-return period, are equal to the overflow volumes predicted by the model. However, once full, the storage tank must be emptied to restore sufficient storage volume in advance of the next storm. If the storage tank is not emptied, a subsequent storm, even if smaller than the 5-year return period, could result in a CSO. During the winter storm season, when successive rainfall events are a near certainty, restoration of storage volumes is essential. For this assessment, it was assumed that the next storm would occur within 12 hours of the end of the governing storm, and that 25% of the storage volume would have to be restored before this storm arrived. The model analysis indicates that the existing conveyance system upstream of the Argyle pump station, and the Argyle pump station itself, does not have sufficient capacity to restore storage before the next storm event.

The storage option, by itself, will not function to prevent a CSO from occurring for a 5-year return period storm preceded or followed by associated storm events. Simply adding more storage volume to handle additional storm occurrences would not resolve the issue. During a severe winter, the required storage volume would have to accommodate several storms, as the conveyance system would not be able to "catch" up with the stored volumes.

The required storage volumes for a single event, 5-year return period, 12 hour-duration storm at each of the four major combined sewer overflows is indicated in Table 4-3. As may be seen from Table 4-3, the sizes of the required tanks are substantial. These storage volumes do not include any extra capacity for preceding or subsequent storm overflow volumes. It is possible that a series of lesser return period storms could result in a larger storage volume being required. It should be noted that the calculated storage volumes would be exceeded for longer duration storms, but are a useful indication of the magnitude of storage required.

Table 4-3
Required Storage Volumes to Prevent Overflow of the 5-year Return 12 hour Duration Storm

	Argyle	Tahsis	Bruce	Wallace/Maitland	Margaret St.
Storage Volume (m^3)	60,000	28,000	3100	30,000	2300
Nominal Tank Area at 5 m (m^2) Deep	12,000	5600	620	6000	460

4.3 ALTERNATIVE 2B - STORAGE AND CONVEYANCE IMPROVEMENT

This scenario is based on providing a combination of conveyance system improvements in addition to storage. The conveyance system improvements would allow the available storage to be restored in advance of the next storm event. Generally, the conveyance improvements were sized to restore 25% to 50% of the storage volume within a 24-hour period. The rate at which storage volume is restored assumes that any immediately preceding or following storm event is not so large as to require a storage volume comparable to the five-year design storm. For example, the five-year event is not closely followed by a two or three-year return period storm.

As with the previous scenario, based on providing conveyance improvements, this scenario would effectively transform the trunk sewer system, force mains, and pump stations into a drainage system. The system components are sized to handle the attenuated flows that would be generated by a five-year return period storm, but the required capacity of these conveyance components is reduced, due to the flow attenuation afforded by off-line storage.

The conveyance improvements and storage volumes required for Alternative 2B are presented in Table 4-4 and 4-5, respetively.

Table 4-4
Alternative 2B - Major Conveyance Improvements

Item	Improvement
Pump Stations	
Argyle Pump Station	Increase total capacity to 1.2 m^3/s @ 72 m TDH.
Wallace Pump Station	Existing capacity adequate for this scenario
Trunk Sewers	
Bruce Overflow to Tahsis Overflow	Replace with 340 m of 450 mm dia.
Tahsis Overflow to Argyle Pump Station	Replace with 582 m of 600 mm dia.
Maitland Overflow to Wallace Pump Station	Replace with 255 m of 1200 mm dia.
Margaret St. to Wallace Pump Station	Replace portions with 37 m of 450 mm dia., 45 m of 900 mm dia.
Force Main: Argyle Pump Station to Lagoons	Twin existing with 3100 m of 450 mm dia.

Table 4-5
Alternative 2B - Required Storage Volumes
(In Combination with Conveyance Improvements)

	Argyle	Tahsis	Bruce	Wallace/Maitland	Margaret St.
Storage Volume (m^3)	27,000	22,000	3100	27,000	1600
Nominal Tank Area at 5 m Depth (m^2)	5400	4400	620	5400	320

4.4 ALTERNATIVE 3 - OFF-LINE TREATMENT

Cost estimates for off-line treatment of overflows are based on the vortex solids separation process, similar to that shown in Figure 4-1. These separators would be installed at each of the major CSO's to treat overflows prior to discharge to the harbour.

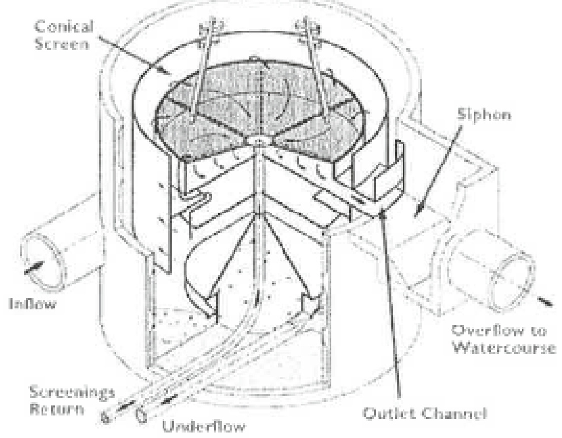


Figure 4-1 Storm King Vortex Separator

(Diagram Courtesy of Hydro International)

Vortex solids separators have no moving parts. The cylindrical chamber configuration induces rotational forces that cause the separation and removal of solids. During storm-flow conditions, flow enters the unit tangentially and a vortex is induced. This vortex concentrates solids into the underflow and thereby reduces suspended solids concentration in the clarified liquid. The concentrated solids are removed from the bottom of the unit, either mechanically or manually using vacuum trucks, and conveyed via the intercepting sewer to a wastewater treatment plant. Alternatively, the solids could be transported directly to the disposal location, depending on the properties of the sludge. Due to the number of CSO occurrences, we have assumed that solids will be removed from the separator and returned to the sewer using an automated, mechanical auger system. The vortex solids separation process has a small footprint and is relatively inexpensive, especially when compared to the storage and conveyance options. The vortex solids separation process can be designed to achieve total suspended solids and BOD_5 removals similar to conventional primary clarifiers. Other off-line treatment alternatives are available and could be considered for the Port Alberni sewage treatment plant.

4.5 ALTERNATIVE 4 - SEPARATION OF STORM AND SANITARY SYSTEMS

In the long term, with the current incremental program to separate the storm and sanitary sewers, Port Alberni will end up with a separated system. If the separation of the storm and sanitary sewers was to be implemented immediately, overflows resulting from storm events with return periods up to five years would effectively be eliminated.

To assess the impact of separating the combined storm and sanitary sewers, the model runoff parameters were adjusted to reflect the decreased percentage of the overall tributary area that would contribute storm flows to the combined system. Implicitly assumed in this incremental analysis is that each section of separated system, as it is completed, can be routed into a separate storm sewer (i.e., not another combined sewer). If the system is separated in such a way that individual sections must still connect into the combined system in the interim period, then no incremental progress will be realized until the entire separation process is completed.

Figure 4-2 illustrates the effect of reducing the combined sewer service area for each of the overflow tributary areas. While the magnitude of CSO's will be reduced in proportion to the percent of sewer separation, from these plots, it is apparent that the occurrence of CSO's for 5-year return period storm events will not be entirely eliminated until essentially the entire combined sewer service area is separated.

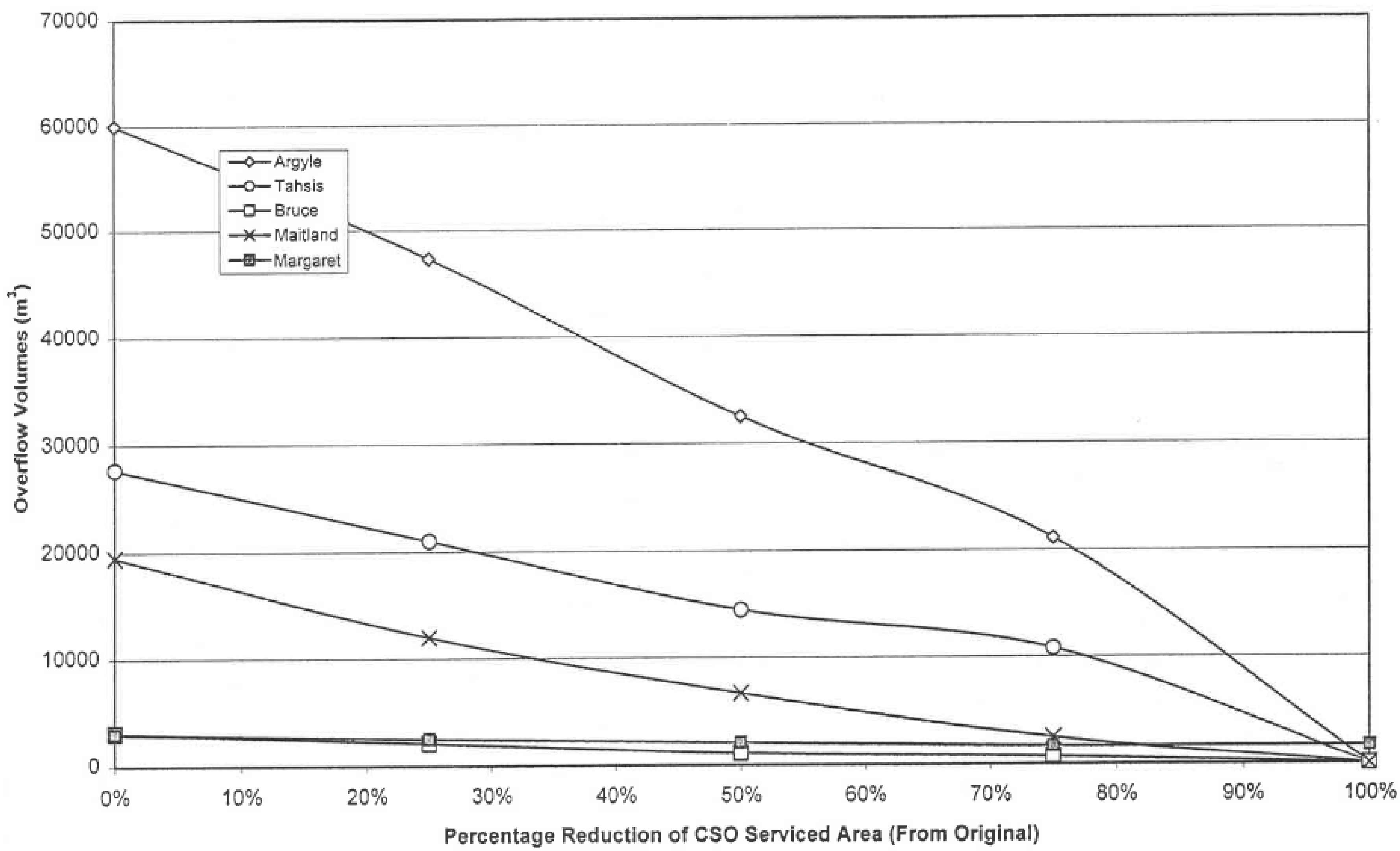
4.6 WALLACE PUMP STATION AND PEMBERTON STREET SSO HYDRAULICS

The Wallace model incorporates the existing Pemberton Street sanitary sewer overflow (SSO). Overflow volumes at Pemberton Street are indicated for the modelled storm events for the various scenarios. It was not possible to calibrate the I&I in the separated system since it was impractical to separate this component of flow from the much larger wet weather flows contributed by the combined portions of the system. For this reason, assumed I&I parameters were used to model portions of the separated sanitary sewer system in the North Sector. Therefore, the volumes calculated for the Pemberton Street overflow are, at best, order-of-magnitude estimates.

The Pemberton Street SSO could be eliminated by simply blocking the overflow pipe. However, this would require a more detailed assessment of the hydraulic conditions in the collection system throughout the sub-catchment. The skeletonized trunk system model does not have sufficient detail to indicate the impact on the collection system if this overflow relief were completely eliminated. It is likely that some capacity upgrades in the system would be required, otherwise surcharging to the ground, with uncontrolled overland flows of sanitary sewage to the creek would result.

Figure 4-2 Overflow Volumes for Various Percentage Reductions of CSO Serviced Areas

12 hour, 5 year return period AES Storm



We understand that plans are being developed to direct the Margaret Street pump discharge directly to the treatment lagoon. Diversion of the Margaret Street flows would provide a significant reduction in SSO volumes. However, SSO's at the Pemberton Street overflow appear to be partially influenced by a backwater effect from the Wallace Street Pump Station during large storm events, when Wallace Street is dominated by combined system generated flows. Therefore, SSO's may still occur on a reduced basis even with the diversion of Margaret Street Pump Station directly to the treatment lagoon.

Under current circumstances, a 5 year return period event will overflow at Wallace Pump Station for some storms. The design floor slab elevation at Wallace is 3.50 m +/-, with the model analysis indicating a peak water level elevation of 4.10 m for the 3 hour storm, and 2.65 m for the 12 hour storm. The shorter storm produces higher peak runoff than the pump station can handle, based on our model assumptions. These hydraulic grade lines (HGLs) confirm the operation of the Pemberton Street overflow as a relief valve for the Wallace pump station.

For some storms, particularly the short duration intense storms, the model indicates that there is a backflow of approximately 50 L/s, from Wallace to the Pemberton Street overflow. The longer duration, but less intense, 12 hour storms have lower "backflows" of approximately 25 L/s. Therefore, the Pemberton Street overflow acts as a relief for the Wallace Pump Station.

If the Pemberton and Johnston catchments (i.e. all tributary areas north of Roger Creek) are re-routed, then the relief provided by the Pemberton Street overflow is not available for Wallace Pump Station. Since there is a net flow past Wallace to the overflow, there will be an increase in HGLs. For the 3 hour, 5 yr storm, the HGL at Wallace would increase to 4.90 m, for the 12 hour, 5 year storm the HGL would increase to 3.15 m. Increased overflows at Wallace Pump Station would result.

The overflow at Maitland is not hydraulically affected by the Wallace pump station or Pemberton Street overflow. Therefore, the disconnection of the Pemberton and Johnston catchment from Wallace does not significantly affect the overflow volumes at Maitland.

We investigated whether having a controlled gate at the Maitland overflow could be used to protect the Wallace Pump Station from surcharging to ground, and Lupsi Cupsi Creek. The gate would be shut during large events, so that all combined sewer generated flows would be routed to the overflow, and the proposed future vortex treatment unit, rather than overflowing at Wallace Pump Station. Our model analysis indicates that this scheme would certainly reduce the volume and occurrence of overflows at the pump station itself, but short duration intense storms, for example the 5 year-3 hour storm would still result in an overflow (albeit reduced in volume) at the pump station itself. It is worth noting that there is approximately 10 hectares of catchment in the "lower" Maitland area that are serviced with combined sewers that connect into the trunk sewer system below the Maitland overflow structure and upstream of the Wallace pump station. Therefore, not all excessive wet weather flows are diverted or controlled by the Maitland overflow structure. Similarly, while it appeared from the system drawings that most of the two catchments along Rogers Avenue have separated storm and sanitary sewer, a small portion (about 25%) of both catchments still appears to be serviced with a combined system. (This is subject to confirmation by the City.)

As we understand it, a proposed North Sector siphon will serve those areas of the Johnston catchment, including future development, that are above the Esquimalt Northern Railway (ENR) line. The flows to the lagoons will be whatever the siphon is designed for. The Margaret and lower Johnston catchments can either continue to be routed to Wallace (subject to wet weather capacity problems), or pumped directly to the lagoon. Given the backflow from Wallace and flows from Margaret and lower Johnston, there would likely still be a SSO (or CSO) overflow at Pemberton Street.

Also, it is worth mentioning that, at present, during wet weather, there is no additional capacity available to handle sanitary flows from new development. With the existing system, new flows mean additional overflow volume at Pemberton Street.

COST ESTIMATES

SECTION 5

The estimated costs of the improvement scenarios are summarized below. Both capital and O&M costs are included. Details of the cost estimates are included at the end of this Appendix.

5.1 ESTIMATED COSTS OF CSO MITIGATION ALTERNATIVES

Order-of-magnitude budgetary estimates were developed for capital, operating and maintenance costs for the various alternatives. The cost estimates are for comparing alternatives and establishing preliminary budgets, and are based on Year 2003 dollars.

The cost estimates have been developed using a number of sources. These include published costing curves for reservoir installations, published unit costs for gravity sewer and force main installations, equipment manufacturer budgetary estimates, and experience from similar projects.

The estimated costs for the four CSO mitigation measures investigated are summarized in Table 5-1. Spreadsheets showing the cost breakdown are included as an Appendix to this report.

Table 5-1
Estimated Costs of CSO Mitigation Alternatives

Alternative		Capital Cost [1]	Annual O&M [2]	Present Value [3]
1	Conveyance Upgrades	$19.6 M	$0.3 M	$23.6 M
2A	Storage Upgrades	$32.9 M	$0.4 M	$39.0 M
2B	Storage and Conveyance Upgrades	$31.8 M	$0.7 M	$41.8 M
3	Off-line Treatment of Overflows	$13.2 M	$0.05 M	$13.8 M
4	Separate Combined Sewers	$66.6 M	0.6 M	$75.4 M

Notes:

1. Capital cost estimate includes contractor profit, engineering, and contingencies.
2. O&M cost estimate includes operating, maintenance, material, chemical and energy costs.
3. Present value cost estimate based on 20 years at 6% interest and 2% inflation.

5.2 DISCUSSION OF COSTS

Based on the estimated costs presented in Table 5-1, the least costly alternative would be to provide off-line treatment of overflows (Alternative 3). Implementing conveyance upgrades (Alternative 1) is the next least costly alternative, but at double the Alternative 3 estimated cost. Sewer separation (Alternative 4) is considerably more costly than the other alternatives.

The Municipal Sewer Regulation (MSR) requires that the combined portions of the collection and conveyance system be separated over a ten-year time frame. This would dictate an aggressive program to separate storm and sanitary sewer systems with a very high associated cost. Other municipalities and districts have adopted much longer schedules for implementing the separation of combined sewers. This would be a more realistic strategy for the City of Port Alberni. However, an interim solution for reducing CSO overflows is necessary to meet the minimum treatment requirements for primary treatment as stipulated in the MSR.

Based on the cost analysis results, the recommended approach is to phase the separation of the combined sewers over a period of time, to be determined based on available funding. In the interim, off-line treatment of overflows (Alternative 3) would be implemented to meet the minimum requirements under the MSR for primary treatment of all flows over two times average dry weather flows (2 x ADWF).

The initial capital expenditure on combined sewer separation will influence the cost of the off-line overflow treatment system. Figure 5-1 shows the estimated total present value cost of the vortex solids separation system for different peak wet weather flows. The estimated costs are based on quotations provided by a manufacturer of a vortex solids separation process. The estimates suggest that this process does not have economies of scale. A total estimated peak flow capacity of about 350,000 m^3/d (4 m^3/s) would be required to provide adequate treatment of the overflows using the off-line vortex solids separation process. Figure 5-2 shows the estimated total present value cost to separate the combined sewers based on percent reduction in combined sewer area.

Figure 5-1
Off-line Treatment of Overflows with Solids Separators

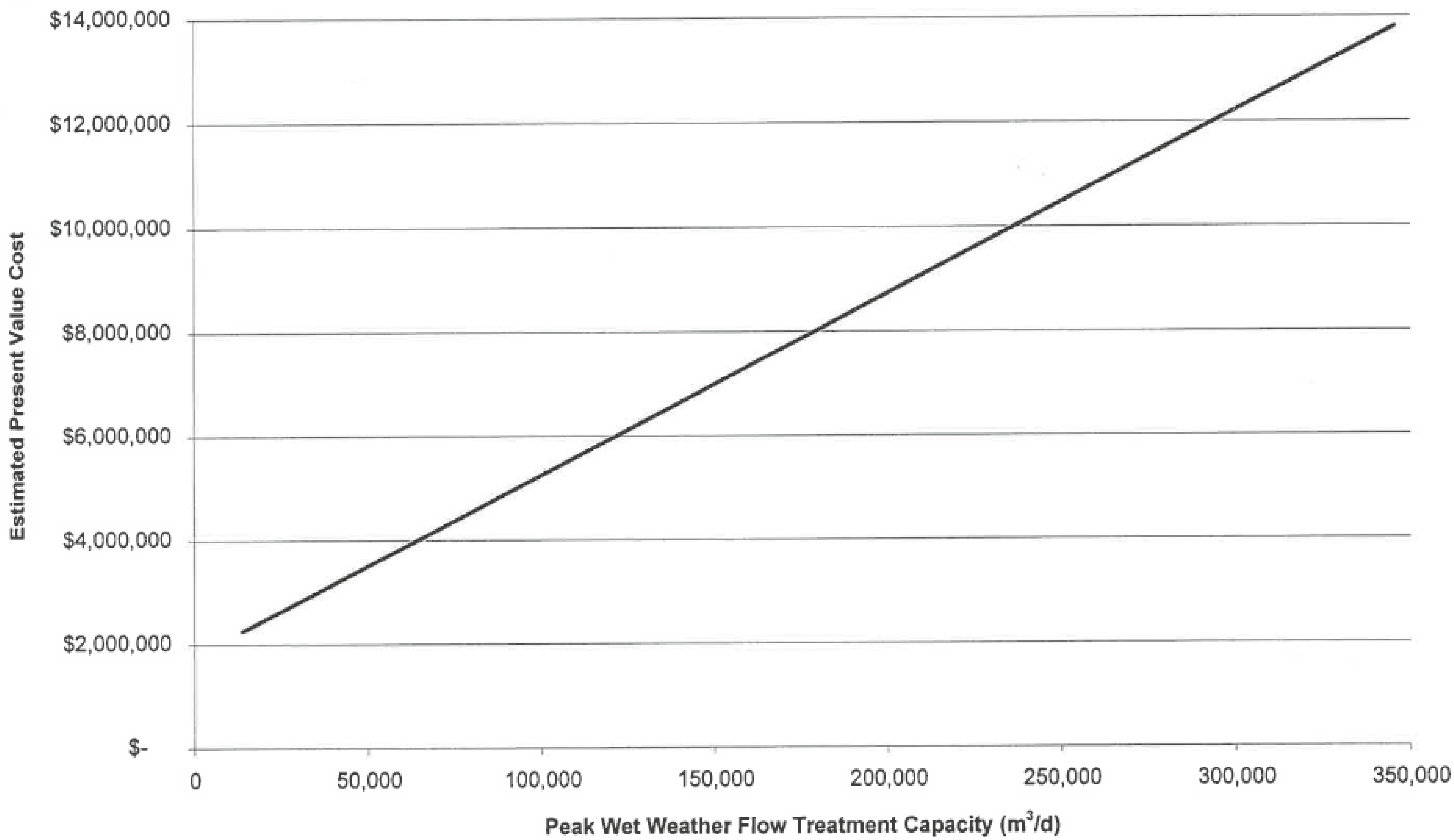
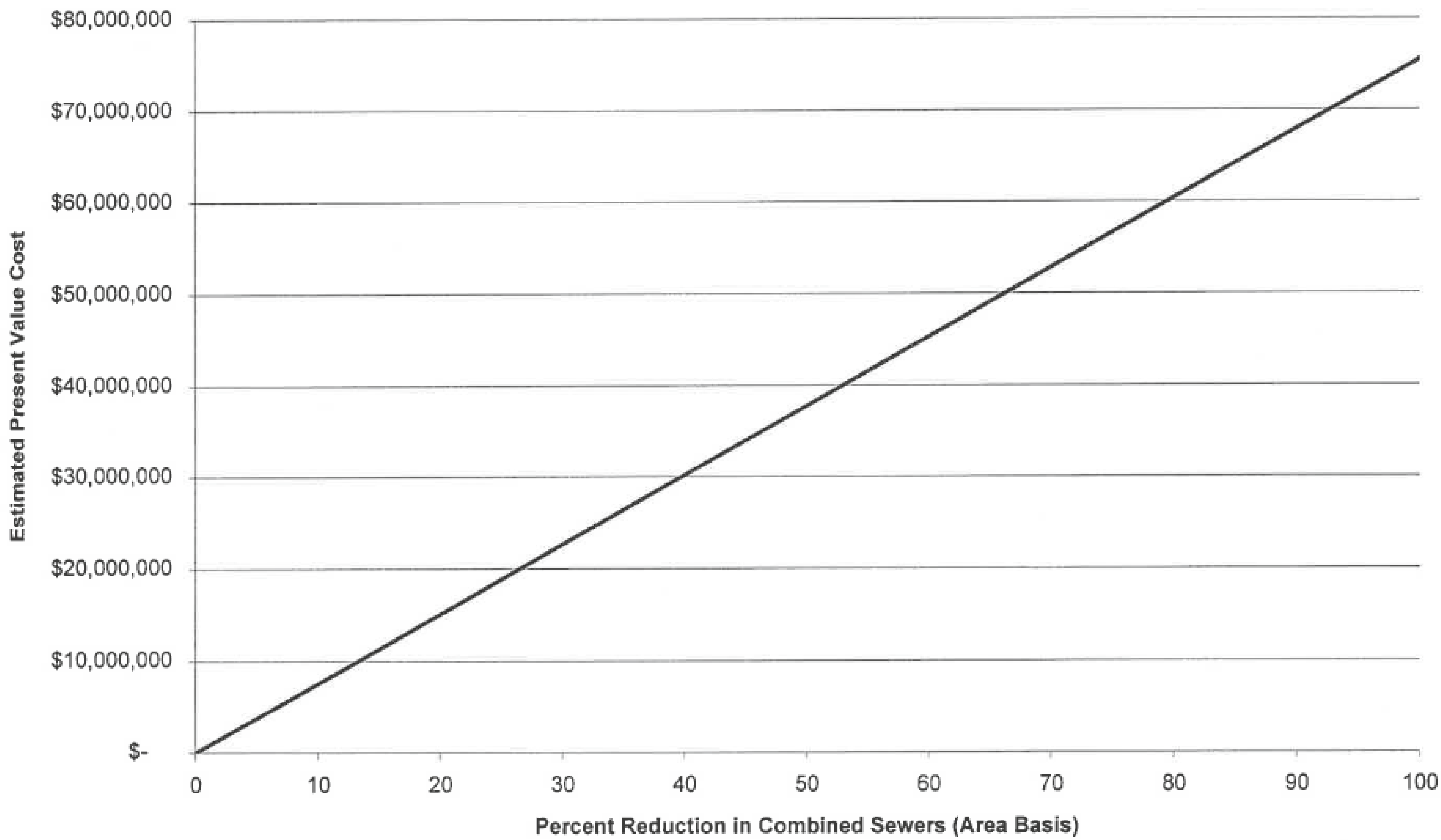


Figure 5-2
Separate Combined Sewers



DISCUSSION AND RECOMMENDATIONS

SECTION 6

The cost estimates for the scenarios involving storage or conveyance improvements demonstrate that these options are impractical. To convert the existing sanitary system to a conveyance system sized to handle the 5-year return period flow results in excessively large system components and costs. The system would effectively be scaled-up to act as a drainage system for the combined sewer catchments. Providing storage tanks to attenuate the peak flows and spread out the demands on the system, also results in significant land and construction costs. The 5 m (16.4 ft) deep storage tank required to prevent overflows at Argyle, in the combined storage and conveyance scenario, would require a foot print of 5400 m^2 or roughly 100 m by 54 m, which is nearly the size of a regulation CFL football field. This structure would be placed at the foot of Argyle Street in a commercial/tourist area of the waterfront. Deeper tanks would require a smaller footprint but would run into constructability problems in terms of depth of excavation and groundwater considerations.

Reduction of the sewer flows to a reasonable level would best be accomplished by separating the combined portions of the collection and conveyance system. The MSR requires that CSO and SSO occurrences be eliminated over a ten-year period (for precipitation events with less than a 5-year return period). This would dictate an aggressive program to separate the storm and sanitary systems. In current dollars, this equates to a capital expenditure of $7.5 million per year over the next ten years which is considered prohibitive. While this expenditure may be impractical, a more gradual program to separate the sewer and sanitary systems should still be adopted. Meanwhile, an interim solution for reducing CSO overflows is necessary to meet MSR requirements. Of the interim measures investigated, off-line treatment of CSO flows is by far the most cost-effective. The use of vortex separators has been used for costing, but other treatment options exist and should be further investigated before a final selection is made.

CSO Mitigation Alternatives
Alternative 1: Conveyance Upgrades

			Unit $/m	Cost Construction	O&M annual	Energy annual
Pumping Upgrades						
New Pump Station						
Argyle	3.1 m3/s	@70 m TDH		$ 5,600,000	$ 97,200	$ 67,500
Wallace	1.34 m3/s	@40 m TDH		$ 2,750,000	$ 66,700	$ 27,800
Conveyance Upgrades						
Argyle forcemain						
1.05 m diam.	3100 m		700	$ 2,170,000		
Argyle gravity sewers						
1.05 m diam.	582 m		615	$ 357,930		
0.9 m diam.	340 m		550	$ 187,000		
Wallace forcemain						
0.75 m diam.	970 m		550	$ 533,500		
Wallace gravity sewers						
0.6 m diam.	380 m		440	$ 167,200		
0.75 m diam.	490 m		490	$ 240,100		
1.2 m diam.	255 m		685	$ 174,675		
				$ -		
O&M Costs	6117 m		5.4		$ 33,032	
Sub-total 1				$ 12,180,405		
Profit (12%)				$ 1,461,649		
Sub-total 2				$ 13,642,054		
Miscellaneous (5%)				$ 682,103		
Legal (2%)				$ 272,841		
Engineering (15%)				$ 2,046,308		
Inspection (1%)				$ 136,421		
Contingency (20%)				$ 2,728,411		
Technical (1%)				$ 136,421		
Total				**$ 19,644,557**	**$ 196,932**	**$ 95,300**
Total Present Value (20-Year Life, 6% interest, 2% inflation)				**$ 23,616,083**		

Notes:

1 Conveyance improvements assumed to be at 3 m depth
2 Pump station costs assume firm pumping capacity at new pumping station and are based on Capdet estimates
3 O&M cost of collection system upgrades based on "Wastewater Treatment Plants" (1985) cost tables, updated using ENR
4 Unit cost includes pipe with imported backfill, distributed manhole, distributed pavement restoration and sewer lateral connections.

CSO Mitigation Alternatives
Alternative 2a: Storage Upgrades

				Cost Construction	O&M annual	Energy annual
Storage Upgrades (Equalization Tanks with Mixing)						
	Argyle	60000 m3	0.13	$ 7,705,167	$ 42,610	$ 137,041
	Tahsis	28000 m3	0.17	$ 4,879,606	$ 38,470	$ 63,507
	Bruce	4500 m3	0.36	$ 1,631,150	$ 34,280	$ 7,621
	Wallace	30000 m3	0.17	$ 5,085,629	$ 37,030	$ 45,792
	Margaret	2300 m3	0.47	$ 1,090,882	$ 35,400	$ 7,621
Sub-total 1				$ 20,392,433		
Profit (12%)				$ 2,447,092		
Sub-total 2				$ 22,839,525		
Miscellaneous (5%)				$ 1,141,976		
Legal (2%)				$ 456,791		
Engineering (15%)				$ 3,425,929		
Inspection (1%)				$ 228,395		
Contingency (20%)				$ 4,567,905		
Technical (1%)				$ 228,395		
Total				**$ 32,888,916**	**$ 187,790**	**$ 261,581**
Total Present Value (20-Year Life, 6% interest, 2% inflation)				**$ 38,996,020**		

Notes:

1 Energy costs for storage based on Capdet estimates and 5 events per year.

2 Equalization O&M costs based on Capdet estimates. Construction costs based on AE reservoir unit cost curve

CSO Mitigation Alternatives
Alternative 2b: Storage and Conveyance Upgrades

			Unit	Cost Construction	O&M annual	Energy annual
Pumping Upgrades						
New Pump Station						
Argyle	1.2 m3/s	@72 m TDH		$ 3,000,000	$ 60,300	$ 294,000
Conveyance Upgrades			Unit $/m			
Argyle forcemain						
0.45 m diam.	3100 m		390	$ 1,209,000		
0.3 m diam.	1200 m		310	$ 372,000		
Argyle gravity sewers						
0.6 m diam.	582 m		440	$ 256,080		
0.45 m diam.	340 m		400	$ 136,000		
Wallace gravity sewers						
0.9 m diam.	45 m		550	$ 24,750		
0.45 m diam.	37 m		400	$ 14,800		
O&M Costs	5304 m		5.4		$ 28,642	
Storage Upgrades (Equalization Tanks with Mixing)						
Argyle	27000 m3		0.18	$ 4,774,387	$ 38,050	$ 60,833
Tahsis	22000 m3		0.19	$ 4,222,857	$ 36,850	$ 50,805
Bruce	3100 m3		0.42	$ 1,304,609	$ 34,280	$ 7,621
Wallace	20000 m3		0.20	$ 3,988,371	$ 37,030	$ 45,792
Margaret	500 m3		0.87	$ 437,040	$ 35,400	$ 2,538
Sub-total 1				$ 19,739,894		
Profit (12%)				$ 2,368,787		
Sub-total 2				$ 22,108,681		
Miscellaneous (5%)				$ 1,105,434		
Legal (2%)				$ 442,174		
Engineering (15%)				$ 3,316,302		
Inspection (1%)				$ 221,087		
Contingency (20%)				$ 4,421,736		
Technical (1%)				$ 221,087		
Total				**$ 31,836,501**	**$ 270,552**	**$ 461,589**
Total Present Value (20-Year Life, 6% Interest, 2% Inflation)				**$ 41,786,524**		

Notes:

1 Conveyance improvements assumed to be at 3 m depth
2 Pump station costs assume firm pumping capacity at new pumping station and are based on Capdet estimates
3 O&M cost of collection system upgrades based on "Wastewater Treatment Plants" (1985) cost tables, updated using ENR
4 Energy costs for storage based on Capdet estimates and 5 events per year.
5 Equalization O&M costs based on Capdet estimates. Construction costs based on AE reservoir unit cost curve
6 Unit cost includes pipe with imported backfill, distributed manhole, distributed pavement restoration and sewer lateral connections.

CSO Mitigation Alternatives
Alternative 3: Off-line Treatment of Overflows with Vortex Solids Separators

				Cost Construction	O&M annual	Energy annual
Vortex Solids Separators						
	Argyle	138,240 m3/d	1600 L/s	$ 3,126,193	$ 9,000	
	Tahsis	86,400 m3/d	1000 L/s	$ 2,007,797	$ 9,000	
	Bruce	25,920 m3/d	300 L/s	$ 703,001	$ 9,000	
	Margaret	11,133 m3/d	129 L/s	$ 383,986	$ 9,000	
	Maitland	83,907 m3/d	971 L/s	$ 1,954,013	$ 9,000	
	Fraction	1.0				
Sub-total 1				$ 8,174,989		
Profit (12%)				$ 980,999		
Sub-total 2				$ 9,155,988		
Miscellaneous (5%)				$ 457,799		
Legal (2%)				$ 183,120		
Engineering (15%)				$ 1,373,398		
Inspection (1%)				$ 91,560		
Contingency (20%)				$ 1,831,198		
Technical (1%)				$ 91,560		
Total				**$ 13,184,623**	**$ 45,000**	**$ -**
Total Present Value (20-Year Life, 6% interest, 2% inflation)				**$ 13,796,188**		
Interest				0.04		
Life				20		

Notes:

1 Based on quote for StormKing units
2 O&M based on cleaning after each storm event, and 5 events per year. Costs are based on CDS estimates
3 Costs do not include disinfection of Vortex treated water or dewatering of sludge.
4 Construction costs equal to 100% of equipment costs
5 Estimates based on gravity operated unit (no energy cost estimates, no mechanical cleaning equipment).

CSO Mitigation Alternatives
Alternative 4: Separate Combined Sewers

		Area ha	Est. Linear Sewer m	Unit $/m cap	$/m O&M	Cost Construction	O&M annual	Energy annual
Separate Sewers								
	Argyle	202	26208	$ 345	$ 5.4	$ 9,041,760	$ 141,523	
	Tahsis	118	15392	$ 345	$ 5.4	$ 5,310,240	$ 83,117	
	Bruce	88	11492	$ 345	$ 5.4	$ 3,964,740	$ 62,057	
	Margaret	67	8684	$ 345	$ 5.4	$ 2,995,980	$ 46,894	
	Maitland	446	58006	$ 345	$ 5.4	$ 20,012,070	$ 313,232	
	Fraction	1.00						
Sub-total 1						$ 41,324,790		
Profit (12%)						$ 4,958,975		
Sub-total 2						$ 46,283,765		
Miscellaneous (5%)						$ 2,314,188		
Legal (2%)						$ 925,675		
Engineering (15%)						$ 6,942,565		
Inspection (1%)						$ 462,838		
Contingency (20%)						$ 9,256,753		
Technical (1%)						$ 462,838		
Total						**$ 66,648,621**	**$ 646,823**	**$ -**
Total Present Value (20-Year Life, 6% interest, 2% inflation)						**$ 75,439,154**		
Interest						0.04		
Life						20		

Notes:

1 O&M cost of collection system upgrades based on "wastewater treatment plants" cost tables, updated using ENR

2 Capital costs assume 85% 200 mm diam., 10% 300 mm diam., and 5% 450 mm diam.

3 Estimates linear length of sanitary sewer based on 130 m/ha, determined based on a section. This may overestimate less populated areas such as northern Port Alberni.

4 Unit cost includes pipe with imported backfill, distributed manhole, distributed pavement restoration and sewer lateral connections.

APPENDIX D - CSO MODIFICATION PLAN

Date:	June 27, 2014	**File:**	20132344.00.A.02.01
To:	Environment Canada		
From:	Associated Engineering on Behalf of the City of Port Alberni		
Project:	The City of Port Alberni WWTP Upgrade		
Subject:	CSO Modification Plan		

MEMO

As outlined in the Table 1, the City currently has four permitted combined sewer overflows (CSOs) within the collection and conveyance system, with CSOs occurring at these sites during high precipitation events.

Table 1
Summary of the City of Port Alberni's Combined Sewer Overflow and Sanitary Sewer Overflow Points

CSO or SSO	Catchment Basin Location (Latitude / Longitude)	Receiving Environment
Bruce Street CSO	Argyle (49.2265°N / 124.8136°W)	Alberni Inlet
Argyle Street CSO	Argyle (49.2347°N / 124.8164°W)	Alberni Inlet
Tahsis Street CSO	Argyle (49.2298°N / 124.8135°W)	Alberni Inlet
Maitland Street CSO	4th Avenue (49.2489°N / 124.8137°W)	Lupsi Cupsi Creek
Pemberton Road SSO	SSO eliminated in 2006 via North Port Sewer Abatement Project	

The City's Stage 1 Liquid Waste Management Plan (LWMP), completed in 2001, identified inflow and infiltration (I&I) to the City's collection and conveyance system as the main contribution of large volumes of wastewater to the wastewater lagoon. As a result of the City's actions to reduce and eliminate CSOs and SSOs, the City's Pemberton SSO was eliminated in 2006. In addition, the City's ongoing collection and conveyance system improvements have included 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 2 for further details). This work was undertaken by the City to reduce stormwater volume overflow and increase inflow to the City's municipal wastewater lagoon for treatment. Specifically, 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 fifteen years.

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

Year	Location	Cost
NEW STORM DRAINAGE INSTALLATIONS (separation)		
2000	6th Avenue - Strathern to Dunbar Outfall (180 m of 300 mm)	
2001	2nd Avenue - Mar to Montrose (160 m of 250 mm)	$50,000
2001	8th Avenue North Crescent to 6th Avenue Outfall	$88,500
2001	Strathern 3rd to Kingsway	$22,000

Year	Location	Cost
2002	Hilton Center Lane (85 m of 200 mm)	$25,000
2003	Arrowsmith from Elizabeth to East (60 m of 200 mm)	$24,000
2004	5th Avenue - Montrose to Bruce	$82,000
2006	Mar Street - 1st Avenue to 2nd Avenue (170 m)	$23,000
2007	Dobie Subdivision Storm Service (50 m)	$10,000
2007	Lane East of 9th Avenue - Neill South (162 m of 200 mm)	$71,455
2007	10th Avenue – 2407 to 2501 (170 m of 200 mm)	$80,000
2007	Hilton Avenue - 2401 North (122 m of 200 mm)	$61,000
2007	Hilton Avenue - 2553 South (140 m of 200 mm)	$70,000
2008	Bruce Street - 10th Avenue to Anderson Avenue (300 m of 450 mm)	$175,000
2008	8th Avenue - China Creek to Montrose Street (225 m)	$35,000
2009	Argyle Street - 1st Avenue to Kingsway (100 m)	$80,000
2009	15th Avenue - Burde to Redford (380 m)	$97,500
2009	10th Avenue- 2525 to Neill Street (75 m of 250 mm)	$55,080
2012	11th Avenue - Dunbar to Argyle Street to 10th Avenue (255 m of 450 mm)	$204,000
2013	10th Avenue - Argyle Street to China Creek (250 m of 300 mm)	$125,000
	TOTAL	$1,378,535

MAJOR SANITARY AND STORM SYSTEM UPGRADES

2001	Wallace Sewage Pump House Upgrade	$345,000
2006	North Port Sewer Abatement Project	$2,281,153
2008	Argyle Pump House Emergency Bypass Connection	$60,000
2009	Argyle Pump House Upgrade	$1,200,000
2011	Argyle Street - Kingsway to Outfall (Outfall & Separator)	$114,000
2011	Wood Avenue Interceptor (600 m of 600 mm)	$300,000
	TOTAL	$4,300,153

The City has implemented a program of phased separation of combined sewers and reductions in I&I (see Table 3 for future planned work). The City estimates approximately 80km of storm mains remain to be separated. Occurrence of CSOs for 5-year return period storm events are not expected to be eliminated until the entire combined sewer service area is separated.

In the interim, the City is in the process of acquiring ultrasonic monitoring sensors for the four CSOs. Once installed, the monitoring equipment will measure the occurrence and frequency of overflow events. This information will provide the City with an improved understanding of the CSOs, and will be used to prioritize sewer separation plans.

In conjunction with catchment area maps (see Figure 1 and Figure 2), data from the monitoring sensors will more clearly identify the priority locations that require attention.

Table 3
The City of Port Alberni's Five Year Capital Improvement Plan 2014-2018

Project Description	Total Estimated Cost per Year						
	2013	2014	2015	2016	2017	2018	Future (as funds allow)
Storm Drain - Main Renewals and Upgrades							
Small Capital Storm Main Replacements	$100,000	$100,000	$100,000		$200,000	$100,000	
16th Avenue - Redford Street to Bute Street (180 m)	$90,000	$90,000					
2nd Avenue - Stirling to Melrose to 3rd Avenue (240 m)	$95,000	$95,000					
Athol Street - 3rd Avenue to 4th Avenue (90 m)	$45,000	$45,000					
9th Avenue - China Creek to Montrose (210 m)	$80,000		$80,000				
Anderson Avenue - Maitland to Wallace (200 m)	$45,000		$45,000				
Kingsway Outfall Extension to Argyle Street	$100,000		$100,000				$100,000
Lathom Road - Gertrude East (160 m)	$125,000		$125,000				
Craig Road - Regina Avenue to Tebo Avenue (143 m)	$90,000			$90,000			
Haslam Road - Tebo Avenue to Bishop Avenue (190 m)	$160,000			$160,000			
4th Avenue - Bruce to Melrose (270 m)	$150,000			$150,000			

Project Description	Total Estimated Cost per Year						
	2013	2014	2015	2016	2017	2018	Future (as funds allow)
7th Avenue - Argyle Street to Angus Street (140 m)	$70,000			$70,000			
Johnston - Elizabeth to Gertrude (120 m)	$95,000				$95,000		
North Park Drive - 7th Avenue to 10th Avenue (330 m)	$350,000					$350,000	
4th Avenue -Redford to Morton (180 m)	$200,000					$200,000	
6th Avenue - Argyle Street to South	$200,000						$200,000
Storm Drains - New Main Installations							
Coal Creek Outfall Phase I	$100,000	$100,000	$100,000				
Maitland Street Trunk and CSO Upgrade	$200,000	$200,000	$200,000	$200,000			$200,000
Melrose Street- 5th Avenue to 8th Avenue (300 m)	$195,000			$195,000			
Maitland Street - Wood Avenue to Kendall Street (225 m)	$120,000				$120,000		$200,000
Melrose Street- 8th Avenue to 11th Avenue	$200,000				$200,000		
6th Avenue - Athol Street to Dunbar Street (270 m)	$180,000				$180,000		
7th Avenue - Redford to Bute (180 m)	$125,000					$125,000	
TOTAL STORM DRAINAGE PROJECTS	**$3,115,000**	**$630,000**	**$750,000**	**$865,000**	**$795,000**	**$775,000**	**$700,000**

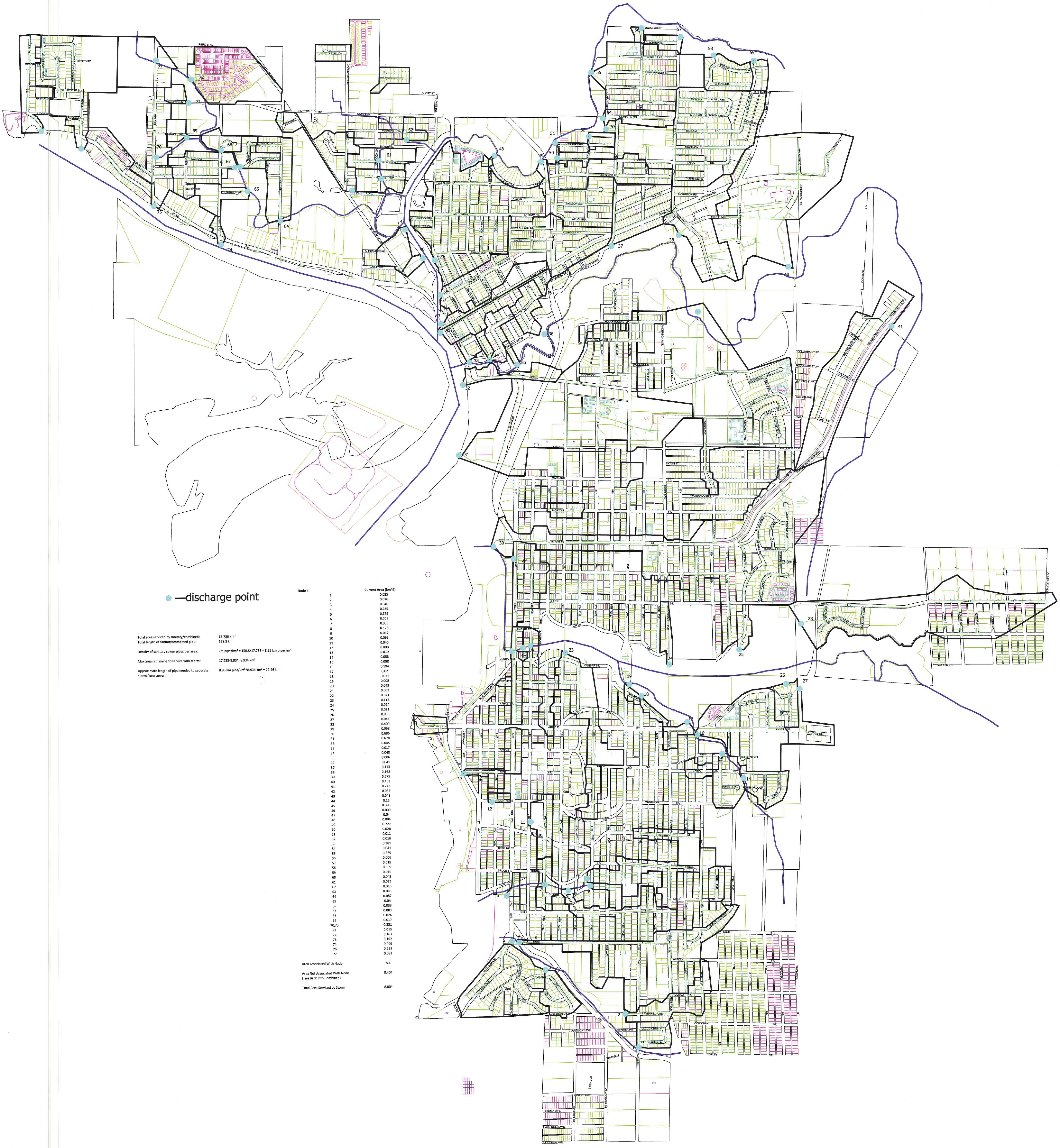
The above illustrates the City's commitment to eliminating CSOs in a timely fashion. Additional sewer separation projects will be scoped based on results from the CSO monitoring program.

Tom Robinson, M.A.Sc., P.Eng.
Project Manager
(On Behalf of Guy Cicon, P.Eng. – City of Port Alberni)

MS/TR/lp

J-C1
J-C2
J-C3
J-C4
J-C5
M-C1
M-C2
G-C1
G-C2
W-C1
W-C2
W-C3
W-C4
NODE J1
NODE J2
NODE J3
PUMPHOUSE J
NODE M3
PUMPHOUSE M
NODE G1
NODE G2
NODE W1
PUMPHOUSE W
NODE W3
City of Port Alberni Sewage Lagoon

Storm Drain Catchments and Outputs



● —discharge point

Total area serviced by sanitary/combined:	17.738 km²
Total length of sanitary/combined pipe:	158.8 km
Density of sanitary sewer pipes per area:	km pipe/km² = 158.8/17.738 = 8.95 km pipe/km²
Max area remaining to service with storm:	17.738-8.804=8.934 km²
Approximate length of pipe needed to separate storm from sewer.	8.95 km pipe/km²*8.934 km² = 79.96 km

Node #	Current Area (km^2)
1	0.035
2	0.076
3	0.046
4	0.289
5	0.179
6	0.009
7	0.033
8	0.126
9	0.017
10	0.093
11	0.045
12	0.008
13	0.019
14	0.053
15	0.058
16	0.194
17	0.02
18	0.011
19	0.008
20	0.042
21	0.003
22	0.071
23	0.112
24	0.024
25	0.021
26	0.038
27	0.044
28	0.409
29	0.068
30	0.686
31	0.678
32	0.045
33	0.017
34	0.048
35	0.006
36	0.041
37	0.113
38	0.168
39	0.579
40	0.462
41	0.243
42	0.065
43	0.048
44	0.25
45	0.395
46	0.009
47	0.04
48	0.004
49	0.227
50	0.026
51	0.011
52	0.016
53	0.381
54	0.041
55	0.229
56	0.006
57	0.019
58	0.059
59	0.019
60	0.043
61	0.052
62	0.016
63	0.085
64	0.087
65	0.04
66	0.033
67	0.083
68	0.026
69	0.017
70,75	0.231
71	0.015
72	0.163
73	0.102
74	0.009
76	0.233
77	0.083
Area Associated With Node	8.4
Area Not Associated With Node (Ties Back Into Combined)	0.404
Total Area Serviced by Storm	8.804

APPENDIX E - WASTEWATER ADVISORY COMMITTEE AND PLAN MONITORING COMMITTEE

Table E-1: Summary of the City's Stage 2 LWMP WAC Members

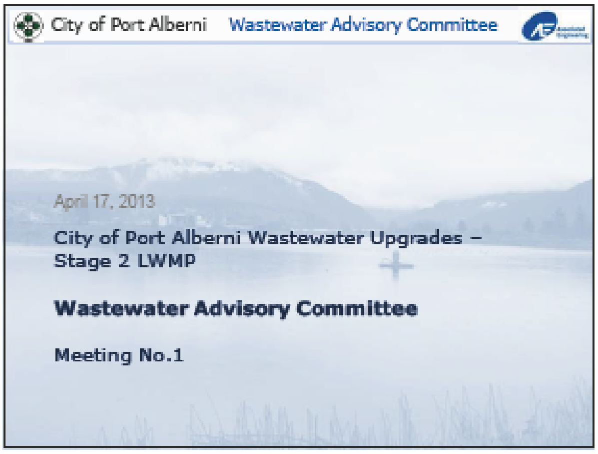
Organization	Member Representative
Associated Engineering	Tom Robinson
	Dean Shiskowski
	Quinn Crosina
	Hugh Hamilton
	Michal Simhon
Alberni Valley Enhancement Association	Phil Edgell
Catalyst Paper	Larry Cross
City of Port Alberni	Guy Cicon
	Ken Watson
	Scott Smith
	Tim Pley
	Wilf Taekema
	Brian Mousley
Department of Fisheries and Oceans	Margaret Wright
	Ian Birtwell
	Kim Hyatt
Environment Canada	James Arnott
Hupačasath First Nation	Steve Tatoosh
McGill & Associates Engineers	Brad West
Ministry of Environment	Kirsten White
Port Alberni Port Authority	Ron Kyle
Somass Estuary Management Plan Committee / Alberni Valley Enhancement Association	Rick Avis
Tseshaht First Nation	Wendy Gallic

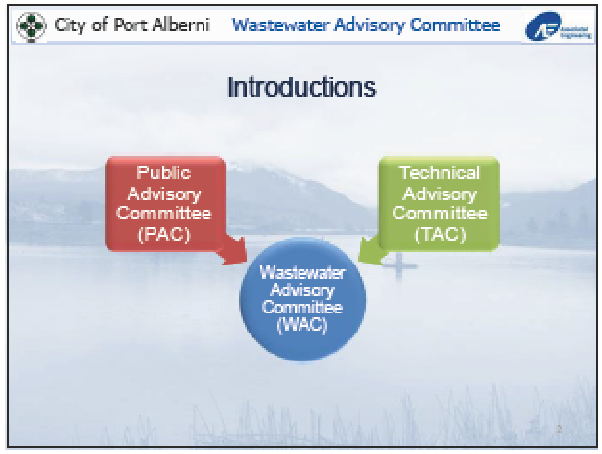
Organization	Member Representative
	Hugh Braker
	Andrew Olson
West Coast Aquatic	Sheena Falconer
GreatPacific	Jason Clarke

Table E-2: Summary of the City's Combined Stage 2/3 LWMP PMC Members

Organization	Member Representative
Associated Engineering	Tom Robinson
	Hugh Hamilton
	Michal Simhon
	Sylvia Woolley
Alberni Valley Enhancement Association	Phil Edgell
Catalyst Paper	Larry Cross
City of Port Alberni	Ken Watson
	Tim Pley
	Clinton Wright
	Alicia Puusepp
Hupačasath First Nation	Brandy Lauder
McGill & Associates Engineers	Brad West
Port Alberni Port Authority	Jenny Brunn
Somass Estuary Management Plan Committee / Alberni Valley Enhancement Association	Rick Avis
Tseshaht First Nation	Ken Watts
	Hugh Braker
	Darrel Ross

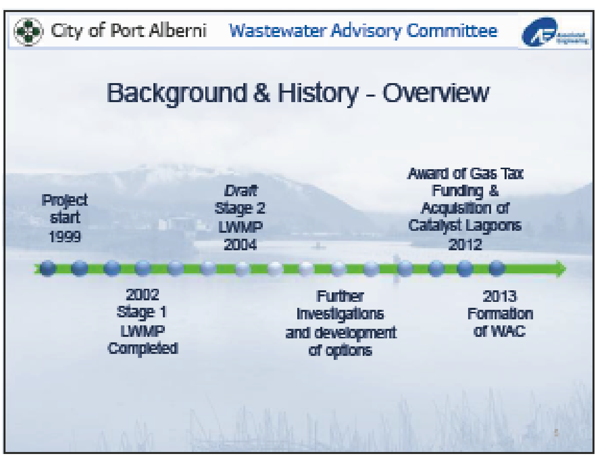
The PowerPoint slides presented at each of the WAC and PMC meetings are also provided in this section.

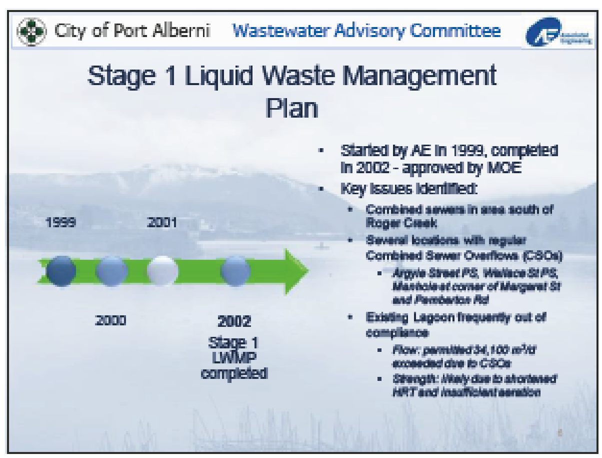

City of Port Alberni
Wastewater Advisory Committee
April 17, 2013
City of Port Alberni Wastewater Upgrades – Stage 2 LWMP
Wastewater Advisory Committee
Meeting No.1


City of Port Alberni
Wastewater Advisory Committee
Introductions
Public Advisory Committee (PAC)
Technical Advisory Committee (TAC)
Wastewater Advisory Committee (WAC)


City of Port Alberni
Wastewater Advisory Committee
Background and History
Alternative Locations for Effluent Return to the Environment
Next Steps…


City of Port Alberni
Wastewater Advisory Committee
Background & History

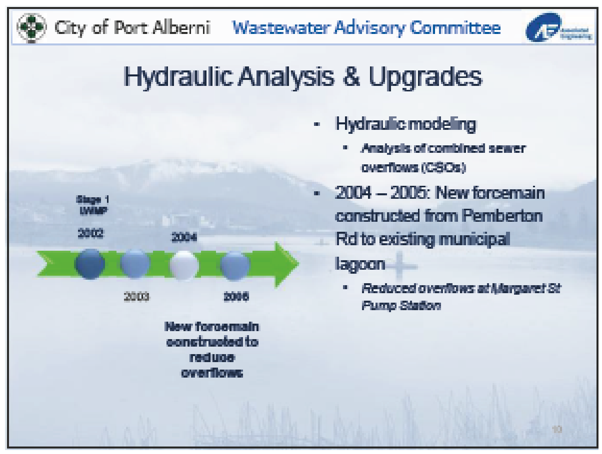

City of Port Alberni
Wastewater Advisory Committee
Background & History - Overview
Project start 1999
Draft Stage 2 LWMP 2004
Award of Gas Tax Funding & Acquisition of Catalyst Lagoons 2012
2002 Stage 1 LWMP Completed
Further investigations and development of options
2013 Formation of WAC

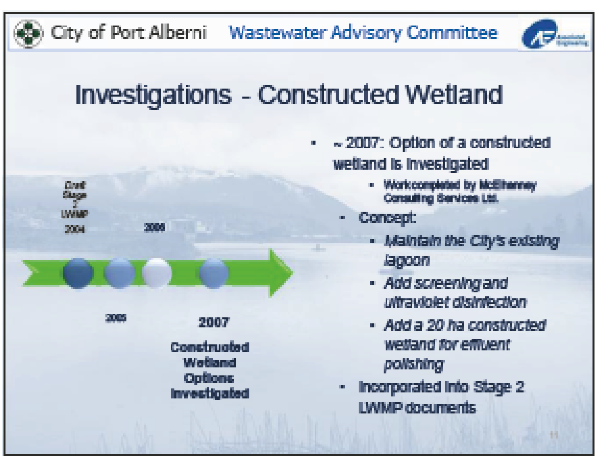

City of Port Alberni
Wastewater Advisory Committee
Stage 1 Liquid Waste Management Plan
1999
2001
2000
2002 Stage 1 LWMP completed
Started by AE in 1999, completed in 2002 - approved by MOE
Key Issues Identified:
Combined sewers in area south of Roger Creek
Several locations with regular Combined Sewer Overflows (CSOs)
Argyle Street PS, Wallace St PS, Manhole at corner of Margaret St and Pemberton Rd
Existing Lagoon frequently out of compliance
Flow: permitted 34,100 m³/d exceeded due to CSOs
Strength: likely due to shortened HRT and insufficient aeration


City of Port Alberni
Wastewater Advisory Committee
Draft Stage 2 Liquid Waste Management Plan
Stage 1 LWMP 2002
Draft Stage 2 LWMP development commenced
• Developed but not finalized
• Discussed 3 options for new Wastewater Treatment Facility:
• South of Argyle Street- treat all flows
• West of existing lagoons - treat all flows
• South of Argyle Street to - treat flows south of Roger Creek; existing lagoon to treat flows north

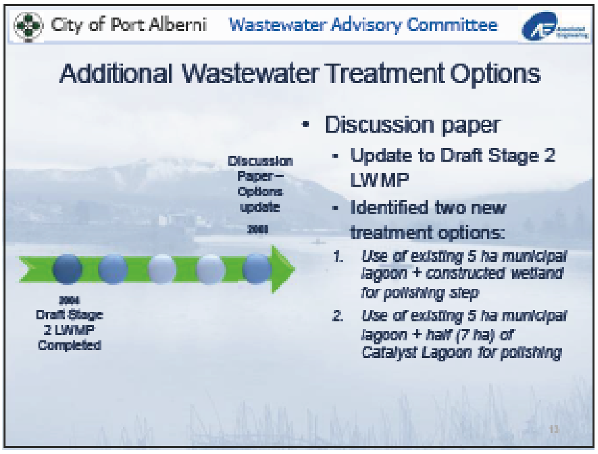

City of Port Alberni
Wastewater Advisory Committee
Draft Stage 2 Liquid Waste Management Plan
Stage 1 LWMP 2002
Odour control investigations
Stage 2 LWMP in development
• 2002: Odour control investigations
• Options investigated for odour control at Port Fish Plant
• Aim to assist with managing odours in municipal lagoon
• 2003: Co-treatment with Mill Wastewater explored
• Mill was not open to co-treatment in their surplus lagoon
• Mill's response to City's request cites regulatory issues under Federal Fisheries Act

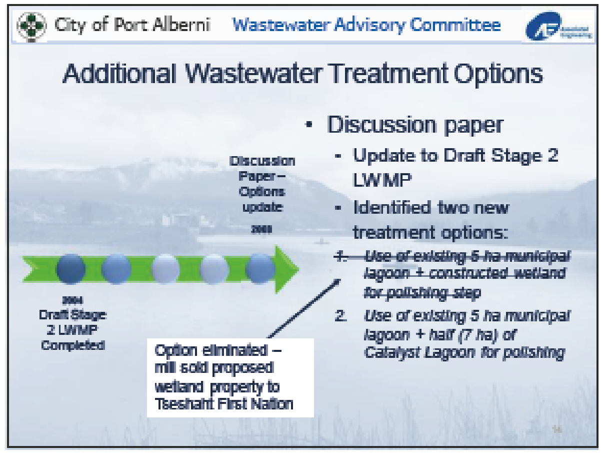

City of Port Alberni
Wastewater Advisory Committee
Draft Stage 2 Liquid Waste Management Plan
2001
2003
2002 Stage 1 LWMP
2004 Draft Stage 2 LWMP completed
• Option of sharing / purchasing mill lagoon was eliminated
• owner not willing at the time
• Conclusion: mechanical-biological treatment facility options were all deemed cost-prohibitive at the time
• Not presented to the public
• Follow-up investigations initiated
• Continued work to improve CSO and SSO situation

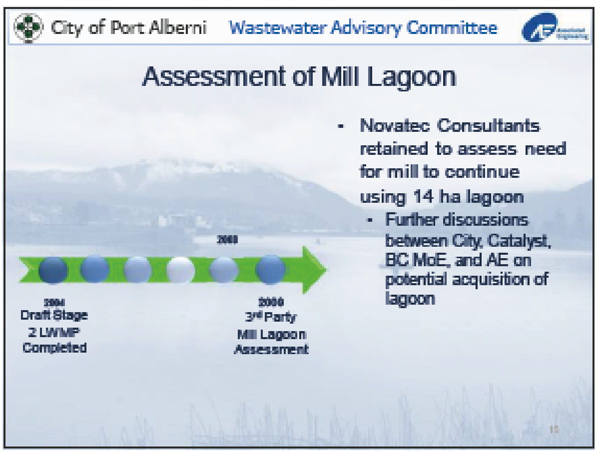

City of Port Alberni
Wastewater Advisory Committee
Hydraulic Analysis & Upgrades
Stage 1 LWMP 2002
2004
2003
2005
New forcemain constructed to reduce overflows
• Hydraulic modeling
• Analysis of combined sewer overflows (CSOs)
• 2004 – 2005: New forcemain constructed from Pemberton Rd to existing municipal lagoon
• Reduced overflows at Margaret St Pump Station

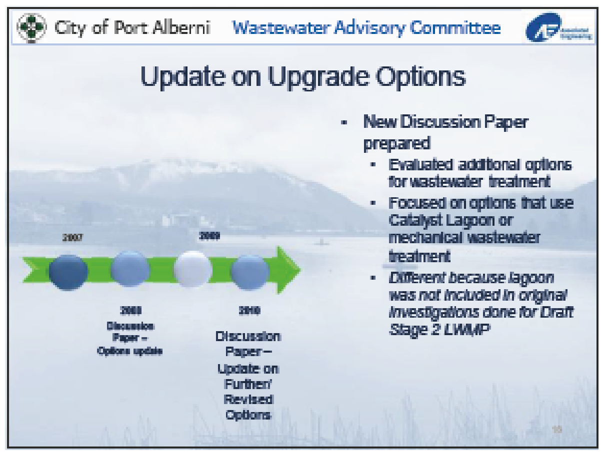

City of Port Alberni
Wastewater Advisory Committee
Investigations - Constructed Wetland
2004
2005
2007 Constructed Wetland Options Investigated
• ~ 2007: Option of a constructed wetland is investigated
• Work completed by McElhanney Consulting Services Ltd.
• Concept:
• Maintain the City's existing lagoon
• Add screening and ultraviolet disinfection
• Add a 20 ha constructed wetland for effluent polishing
• Incorporated into Stage 2 LWMP documents

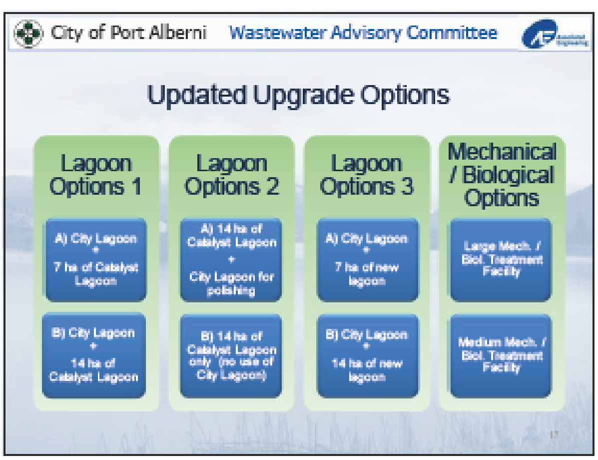

City of Port Alberni
Wastewater Advisory Committee
Compliance Review
2005
2007
2006
2008
MoE compliance review of the municipal lagoon in 2008

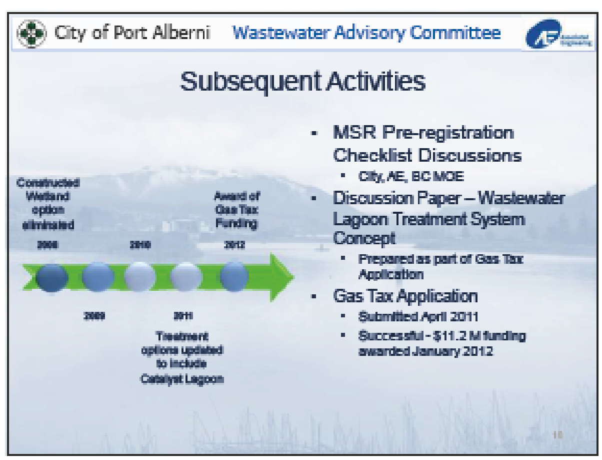

City of Port Alberni
Wastewater Advisory Committee
Additional Wastewater Treatment Options
Discussion paper
Update to Draft Stage 2 LWMP
Identified two new treatment options:
1. Use of existing 5 ha municipal lagoon + constructed wetland for polishing step
2. Use of existing 5 ha municipal lagoon + half (7 ha) of Catalyst Lagoon for polishing
Discussion Paper – Options update
Draft Stage 2 LWMP Completed


City of Port Alberni
Wastewater Advisory Committee
Additional Wastewater Treatment Options
Discussion paper
Update to Draft Stage 2 LWMP
Identified two new treatment options:
~~1. Use of existing 5 ha municipal lagoon + constructed wetland for polishing step~~
2. Use of existing 5 ha municipal lagoon + half (7 ha) of Catalyst Lagoon for polishing
Discussion Paper – Options update
Draft Stage 2 LWMP Completed
Option eliminated – mill sold proposed wetland property to Tseshaht First Nation


City of Port Alberni
Wastewater Advisory Committee
Assessment of Mill Lagoon
Novatec Consultants retained to assess need for mill to continue using 14 ha lagoon
Further discussions between City, Catalyst, BC MoE, and AE on potential acquisition of lagoon
Draft Stage 2 LWMP Completed
3rd Party Mill Lagoon Assessment

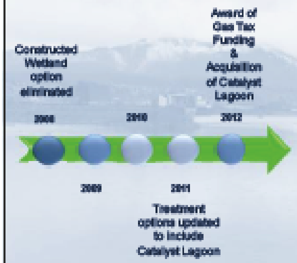

City of Port Alberni
Wastewater Advisory Committee
Update on Upgrade Options
New Discussion Paper prepared
Evaluated additional options for wastewater treatment
Focused on options that use Catalyst Lagoon or mechanical wastewater treatment
Different because lagoon was not included in original investigations done for Draft Stage 2 LWMP
2007
2009
Discussion Paper – Options update
Discussion Paper – Update on Further/ Revised Options


City of Port Alberni
Wastewater Advisory Committee
Updated Upgrade Options
Lagoon Options 1
A) City Lagoon + 7 ha of Catalyst Lagoon
B) City Lagoon + 14 ha of Catalyst Lagoon
Lagoon Options 2
A) 14 ha of Catalyst Lagoon + City Lagoon for polishing
B) 14 ha of Catalyst Lagoon only (no use of City Lagoon)
Lagoon Options 3
A) City Lagoon + 7 ha of new lagoon
B) City Lagoon + 14 ha of new lagoon
Mechanical / Biological Options
Large Mech. / Biol. Treatment Facility
Medium Mech. / Biol. Treatment Facility


City of Port Alberni
Wastewater Advisory Committee
Subsequent Activities
MSR Pre-registration Checklist Discussions
City, AE, BC MOE
Discussion Paper – Wastewater Lagoon Treatment System Concept
Prepared as part of Gas Tax Application
Gas Tax Application
Submitted April 2011
Successful - $11.2 M funding awarded January 2012
Constructed Wetland option eliminated
Award of Gas Tax Funding
Treatment options updated to include Catalyst Lagoon

City of Port Alberni Wastewater Advisory Committee

Subsequent Activities



- Summer 2012: City secures Catalyst Lagoons
  - Agreement eliminates shared use of lagoons
  - Agreement eliminates City's use of Mill's existing outfall
  - *City required to implement a new discharge point for the lagoon*

19

City of Port Alberni Wastewater Advisory Committee

Alternative Locations for Treated Effluent Return to the Environment

20

City of Port Alberni Wastewater Advisory Committee

Other Environmental Assessment / Monitoring Activity in Alberni Inlet and Somass River Estuary

- Catalyst Environmental Effects Monitoring (EEM - Cycle 6 most recent; Cycle 5 in 2010)
- Somass Estuary Management Plan (SEMP 2004)
- Somass Basin Watershed Management Plan (Pacific Salmon Commission June 2012) – climate change adaptation

21

City of Port Alberni Wastewater Advisory Committee

Preliminary Environmental Screening Work To-date:

Aim is to address key outstanding issue:
location of effluent return to environment

Options previously identified (Draft Stage 2 LWMP):	Additional option tabled:
Somass River **Alberni Inlet**	**Intertidal Zone**

Do 'deal-breakers' exist for any of the options?

22

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23

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24

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City of Port Alberni Wastewater Advisory Committee

Screen the Feasibility of River Discharge

- Current "side channel" discharge through a vegetated ditch
- MWR approach to river discharge influenced by the Dilution Ratio (DR)

$$DR = \frac{Average\ annual\ 7 - day\ Low\ Flow\ (7Q2)}{Maximum\ Weekly\ Average\ Wastewater\ Flow}$$

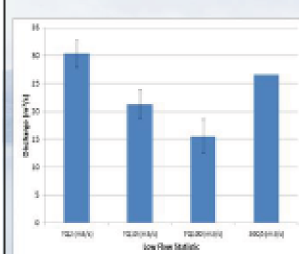
City of Port Alberni Wastewater Advisory Committee

MWR Dilution Ratio

- If >100:1 – treatment standards & EIS scope are normal
- If <100:1 EIS must determine if more stringent treatment standards are needed
- If <40:1 & used for recreation or domestic, only possible if no other option; advanced treatment required
- Prohibited if <10
- Somass River is used for recreation

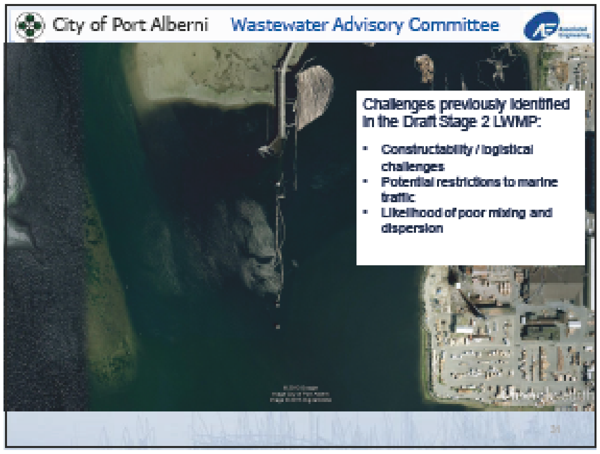
City of Port Alberni Wastewater Advisory Committee

7-Day Low Flows & Dilution Ratio

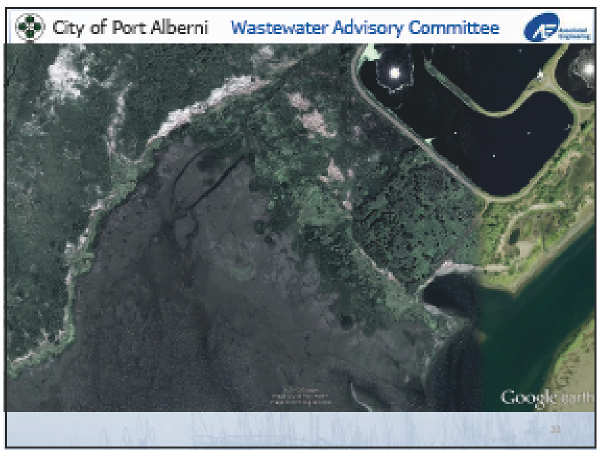


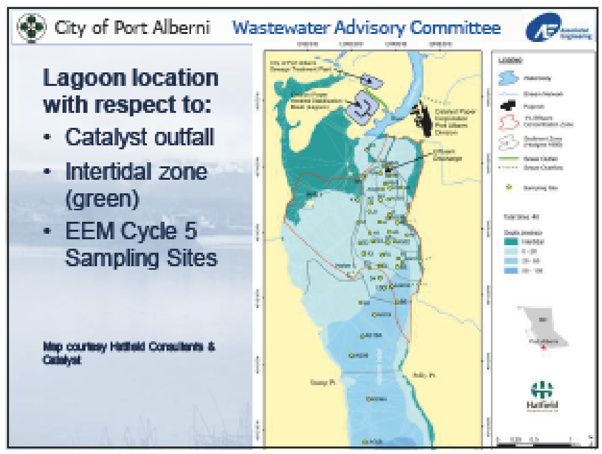
- 7Q2 = 30.3 m^3/s
- Permit max. is currently 34,100 m^3/day (0.395 m^3/s)
- **MWR DR is 77:1**
- Average WW flow is 0.232 m^3/s; ∴ ratio is 131:1
- In estuaries only river flow is used for dilution calculation

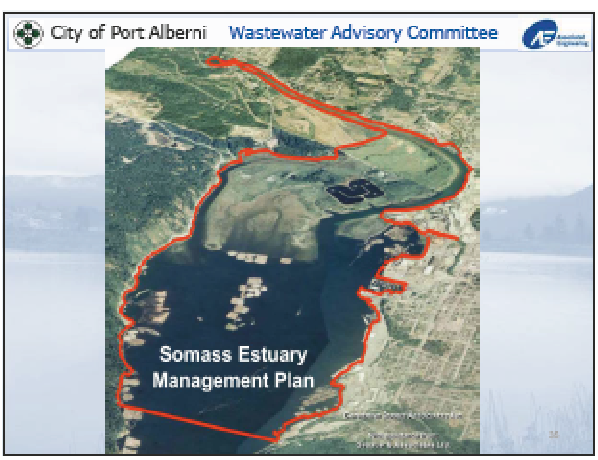
City of Port Alberni Wastewater Advisory Committee


City of Port Alberni
Wastewater Advisory Committee
Challenges previously identified in the Draft Stage 2 LWMP:
• Constructability / logistical challenges
• Potential restrictions to marine traffic
• Likelihood of poor mixing and dispersion


City of Port Alberni
Wastewater Advisory Committee


City of Port Alberni
Wastewater Advisory Committee
Google earth


City of Port Alberni
Wastewater Advisory Committee
Lagoon location with respect to:
• Catalyst outfall
• Intertidal zone (green)
• EEM Cycle 5 Sampling Sites
Map courtesy Hatfield Consultants & Catalyst


City of Port Alberni
Wastewater Advisory Committee
Somass Estuary Management Plan


City of Port Alberni
Wastewater Advisory Committee
SEMP Habitat Value Ratings
Very High
• Permanent Tidal Channel (juvenile salmon, shorebirds, river otter, etc.)
• Tidal Marsh (as above, plus 7+ blue or red plant species)
High
• River Channel
• Mudflat
Moderate
• Shallow Subtidal
Low
• Deep Subtidal

City of Port Alberni Wastewater Advisory Committee

Somas Estuary Approaching High Tide

Photo: Long B. Nguyen (public domain)

City of Port Alberni Wastewater Advisory Committee

City of Port Alberni Wastewater Advisory Committee

Next Steps

City of Port Alberni Wastewater Advisory Committee

Next Steps

1. Develop decision-making framework for effluent return location
   - Build on preliminary screening (assuming it is inconclusive)
   - Provide a structured process for identifying the most favorable solution

City of Port Alberni Wastewater Advisory Committee

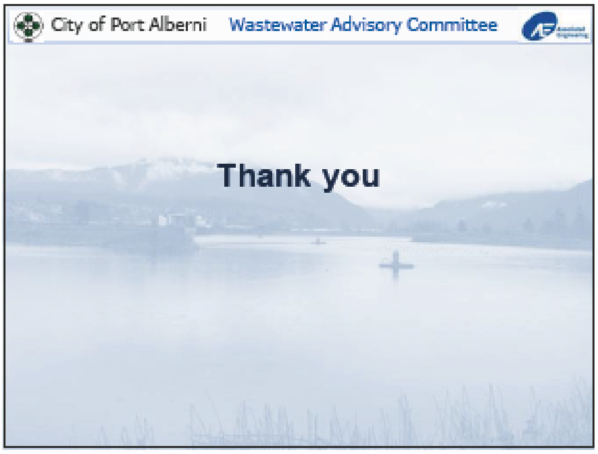
Next Steps

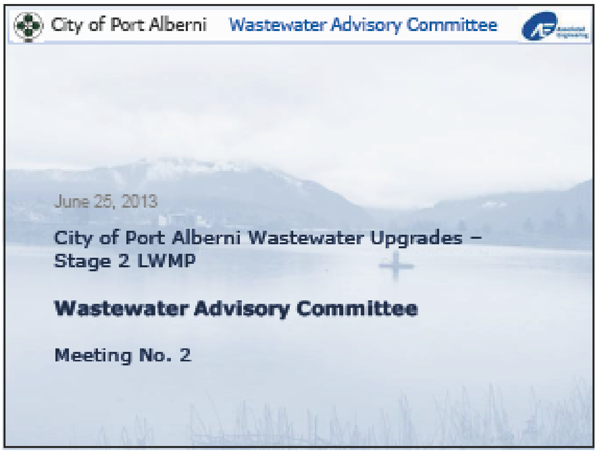
2. WAC Meeting #2
   - Further discussions and follow-through on the structured decision-making process

City of Port Alberni Wastewater Advisory Committee

Next Steps

3. Update Draft Stage 2 LWMP Document (ongoing)
   - Reflect acquisition and anticipated use of Catalyst Lagoon
   - Update effluent return-to-environment location options

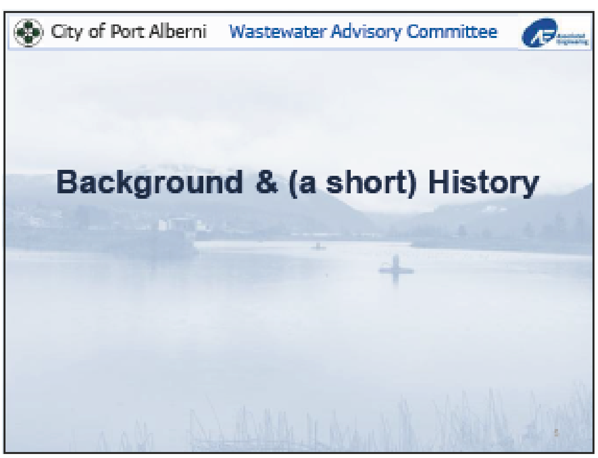

City of Port Alberni
Wastewater Advisory Committee
Thank you

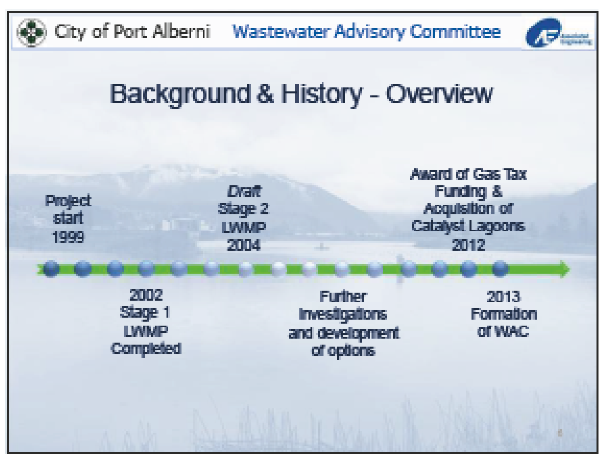

City of Port Alberni
Wastewater Advisory Committee
June 25, 2013
City of Port Alberni Wastewater Upgrades – Stage 2 LWMP
Wastewater Advisory Committee
Meeting No. 2

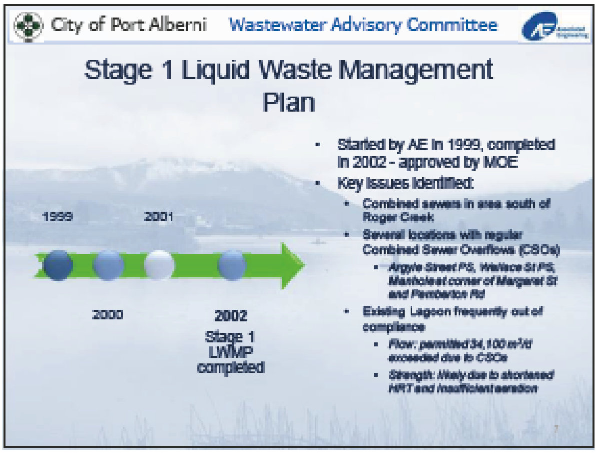

City of Port Alberni
Wastewater Advisory Committee

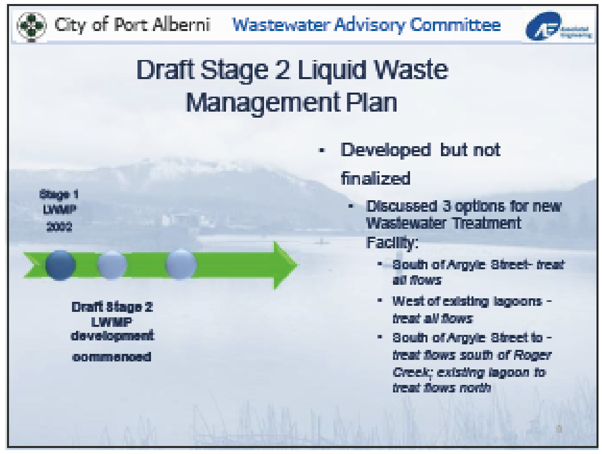

City of Port Alberni
Wastewater Advisory Committee
Introductions
Public Advisory Committee (PAC)
Technical Advisory Committee (TAC)
Wastewater Advisory Committee (WAC)


City of Port Alberni
Wastewater Advisory Committee
Background and History
Alternative Locations for Effluent Return to the Environment
Next Steps…


City of Port Alberni
Wastewater Advisory Committee
Background & (a short) History

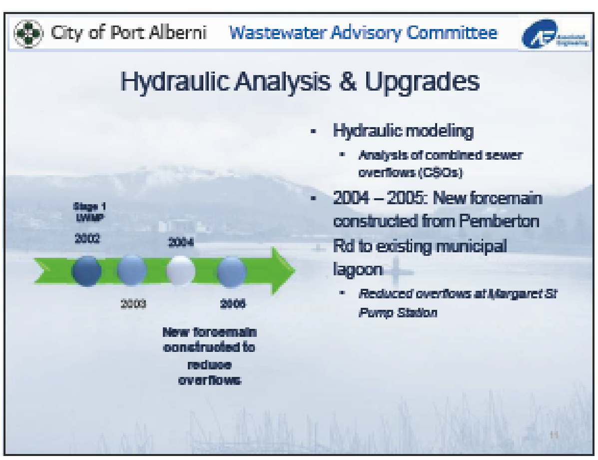

City of Port Alberni
Wastewater Advisory Committee
Background & History - Overview
Project start 1999
2002 Stage 1 LWMP Completed
Draft Stage 2 LWMP 2004
Further Investigations and development of options
Award of Gas Tax Funding & Acquisition of Catalyst Lagoons 2012
2013 Formation of WAC

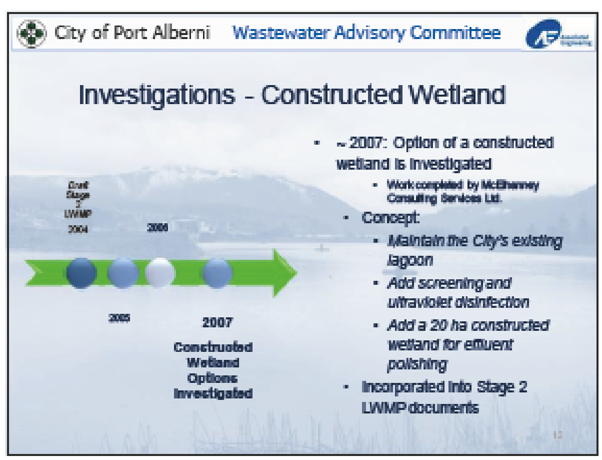

City of Port Alberni
Wastewater Advisory Committee
Stage 1 Liquid Waste Management Plan
1999
2001
2000
2002
Stage 1 LWMP completed
• Started by AE in 1999, completed in 2002 - approved by MOE
• Key issues identified:
• Combined sewers in area south of Roger Creek
• Several locations with regular Combined Sewer Overflows (CSOs)
• Argyle Street PS, Wallace St PS, Manhole at corner of Margaret St and Pemberton Rd
• Existing Lagoon frequently out of compliance
• Flow: permitted 34,100 m³/d exceeded due to CSOs
• Strength: likely due to shortened HRT and insufficient aeration

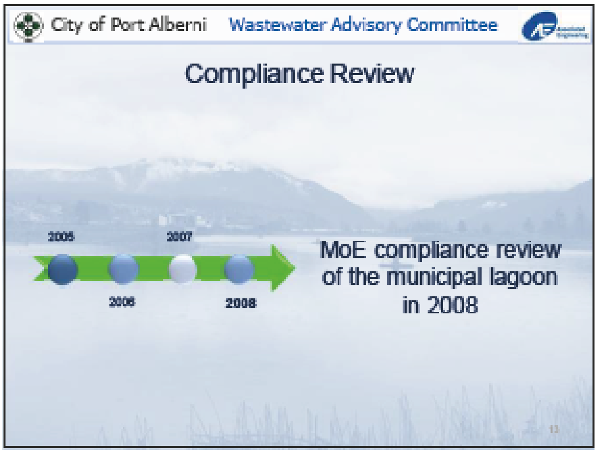

City of Port Alberni
Wastewater Advisory Committee
Draft Stage 2 Liquid Waste Management Plan
Stage 1 LWMP 2002
Draft Stage 2 LWMP development commenced
• Developed but not finalized
• Discussed 3 options for new Wastewater Treatment Facility:
• South of Argyle Street- treat all flows
• West of existing lagoons - treat all flows
• South of Argyle Street to - treat flows south of Roger Creek; existing lagoon to treat flows north

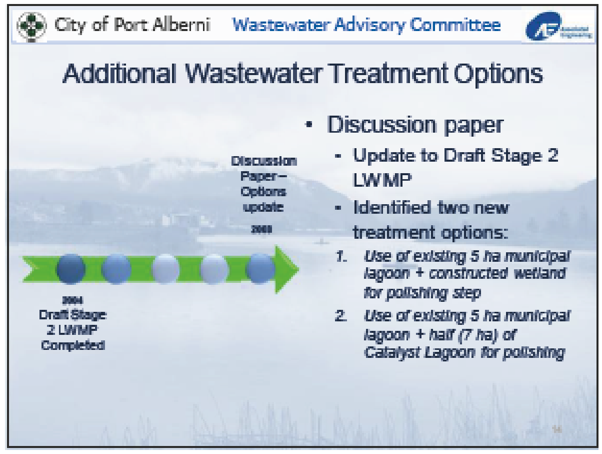

City of Port Alberni
Wastewater Advisory Committee
Draft Stage 2 Liquid Waste Management Plan
Stage 1 LWMP 2002
Odour control investigations
Stage 2 LWMP in development
• 2002: Odour control investigations
• Options investigated for odour control at Port Fish Plant
• Aim to assist with managing odours in municipal lagoon
• 2003: Co-treatment with Mill Wastewater explored
• Mill was not open to co-treatment in their surplus lagoon
• Mill's response to City's request cites regulatory issues under Federal Fisheries Act

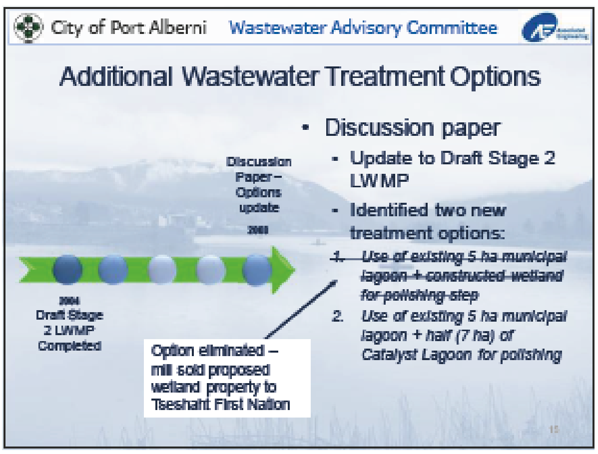

City of Port Alberni
Wastewater Advisory Committee
Draft Stage 2 Liquid Waste Management Plan
2001
2003
2002 Stage 1 LWMP
2004 Draft Stage 2 LWMP completed
• Option of sharing / purchasing mill lagoon was eliminated
• owner not willing at the time
• Conclusion: mechanical-biological treatment facility options were all deemed cost-prohibitive at the time
• Not presented to the public
• Follow-up investigations initiated
• Continued work to improve CSO and SSO situation

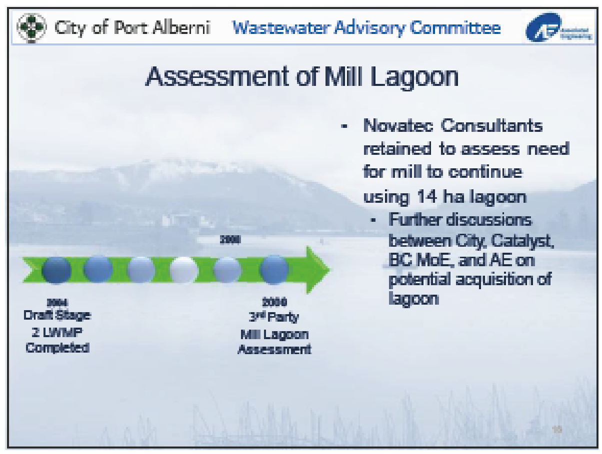

City of Port Alberni
Wastewater Advisory Committee
Hydraulic Analysis & Upgrades
Stage 1 LWMP 2002
2004
2003
2005
New forcemain constructed to reduce overflows
• Hydraulic modeling
• Analysis of combined sewer overflows (CSOs)
• 2004 – 2005: New forcemain constructed from Pemberton Rd to existing municipal lagoon
• Reduced overflows at Margaret St Pump Station

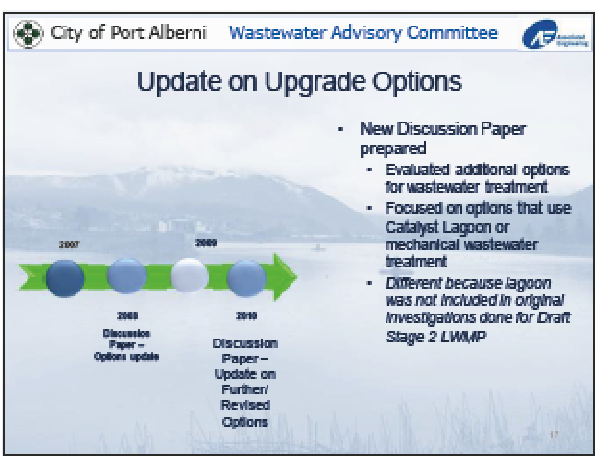

City of Port Alberni
Wastewater Advisory Committee
Investigations - Constructed Wetland
Draft Stage 2 LWMP 2004
2006
2005
2007 Constructed Wetland Options Investigated
• ~ 2007: Option of a constructed wetland is investigated
• Work completed by McElhanney Consulting Services Ltd.
• Concept:
• Maintain the City's existing lagoon
• Add screening and ultraviolet disinfection
• Add a 20 ha constructed wetland for effluent polishing
• Incorporated into Stage 2 LWMP documents

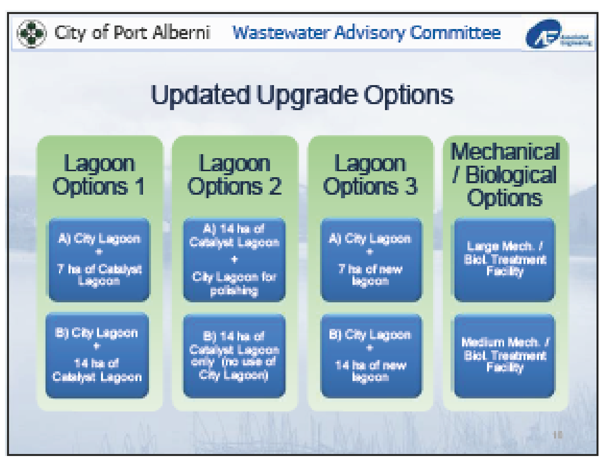

City of Port Alberni
Wastewater Advisory Committee
Compliance Review
2005
2007
2006
2008
MoE compliance review of the municipal lagoon in 2008


City of Port Alberni
Wastewater Advisory Committee
Additional Wastewater Treatment Options
Discussion Paper – Options update
2008
2004
Draft Stage 2 LWMP Completed
• Discussion paper
• Update to Draft Stage 2 LWMP
• Identified two new treatment options:
1. Use of existing 5 ha municipal lagoon + constructed wetland for polishing step
2. Use of existing 5 ha municipal lagoon + half (7 ha) of Catalyst Lagoon for polishing


City of Port Alberni
Wastewater Advisory Committee
Additional Wastewater Treatment Options
Discussion Paper – Options update
2008
2004
Draft Stage 2 LWMP Completed
Option eliminated – mill sold proposed wetland property to Tseshaht First Nation
• Discussion paper
• Update to Draft Stage 2 LWMP
• Identified two new treatment options:
~~1. Use of existing 5 ha municipal lagoon + constructed wetland for polishing step~~
2. Use of existing 5 ha municipal lagoon + half (7 ha) of Catalyst Lagoon for polishing


City of Port Alberni
Wastewater Advisory Committee
Assessment of Mill Lagoon
2008
2004
Draft Stage 2 LWMP Completed
2009
3rd Party Mill Lagoon Assessment
• Novatec Consultants retained to assess need for mill to continue using 14 ha lagoon
• Further discussions between City, Catalyst, BC MoE, and AE on potential acquisition of lagoon


City of Port Alberni
Wastewater Advisory Committee
Update on Upgrade Options
2007
2009
2008
Discussion Paper – Options update
2010
Discussion Paper – Update on Further/ Revised Options
• New Discussion Paper prepared
• Evaluated additional options for wastewater treatment
• Focused on options that use Catalyst Lagoon or mechanical wastewater treatment
• Different because lagoon was not included in original investigations done for Draft Stage 2 LWMP


City of Port Alberni
Wastewater Advisory Committee
Updated Upgrade Options
Lagoon Options 1
A) City Lagoon + 7 ha of Catalyst Lagoon
B) City Lagoon + 14 ha of Catalyst Lagoon
Lagoon Options 2
A) 14 ha of Catalyst Lagoon + City Lagoon for polishing
B) 14 ha of Catalyst Lagoon only (no use of City Lagoon)
Lagoon Options 3
A) City Lagoon + 7 ha of new lagoon
B) City Lagoon + 14 ha of new lagoon
Mechanical / Biological Options
Large Mech. / Biol. Treatment Facility
Medium Mech. / Biol. Treatment Facility

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Subsequent Activities

- MSR Pre-registration Checklist Discussions
  - City, AE, BC MOE
- Discussion Paper – Wastewater Lagoon Treatment System Concept
  - Prepared as part of Gas Tax Application
- Gas Tax Application
  - Submitted April 2011
  - Successful - $11.2 M funding awarded January 2012

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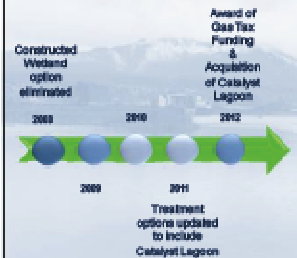
Subsequent Activities



- Summer 2012: City secures Catalyst Lagoons
  - Agreement eliminates shared use of lagoons
  - Agreement eliminates City's use of Mill's existing outfall
  - *City required to implement a new discharge point for the lagoon*

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Alternative Locations for Treated Effluent Return to the Environment

Status of Review of Alternatives since WAC Meeting #1

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Key Background: Environmental Assessment / Monitoring Activity in Alberni Inlet and Somass River Estuary

- Catalyst Environmental Effects Monitoring (EEM - Cycle 6 most recent; Cycle 5 in 2010)
- Somass Estuary Management Plan (SEMP 2004)
- Somass Basin Watershed Management Plan (Pacific Salmon Commission June 2012) – climate change adaptation

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Preliminary Environmental Screening Work To-date:

Aim is to address key outstanding issue:
location of effluent return to environment

Options previously identified (Draft Stage 2 LWMP):	Additional option tabled:
1. Somass River **2. Alberni Inlet**	**3. Intertidal Zone**

Can any of the options be screened out?

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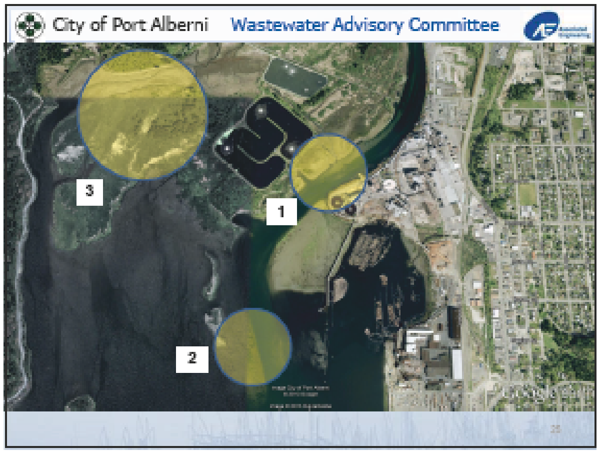

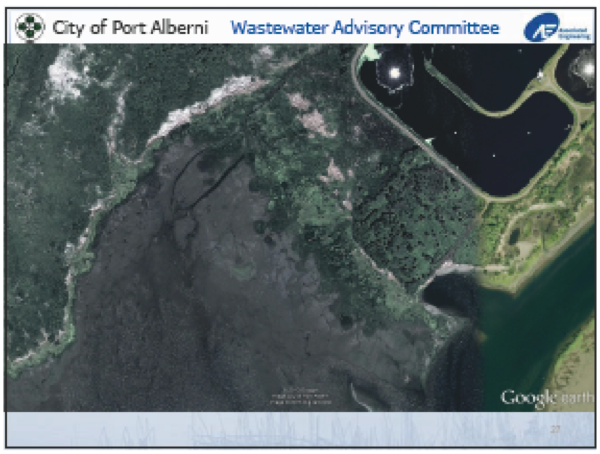

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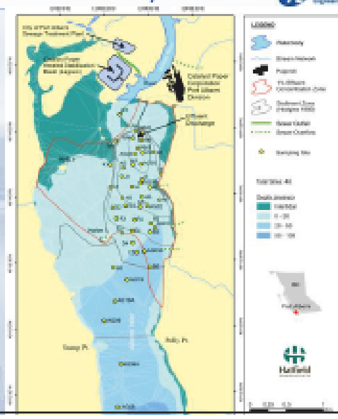
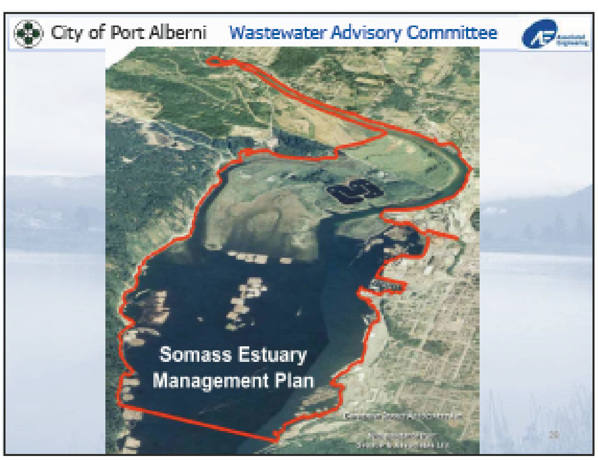
Lagoon location with respect to:

- Catalyst outfall
- Intertidal zone (green)
- EEM Cycle 5 Sampling Sites

Map courtesy Hatfield Consultants & Catalyst





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SEMP Habitat Value Ratings

Very High

- Permanent Tidal Channel (juvenile salmon, shorebirds, river otter, etc.)
- Tidal Marsh (as above, plus 7+ blue or red plant species)

High

- River Channel
- Mudflat

Moderate

- Shallow Subtidal

Low

- Deep Subtidal

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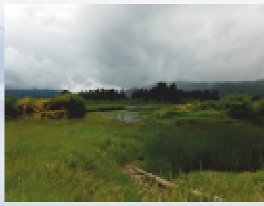
Result of Screening Alternative 3

- Recommend that Alternative 3 – Discharge to Intertidal Marsh – **not** be pursued any further
- High environmental sensitivity
- Would not meet intent of MWR for wetland discharge



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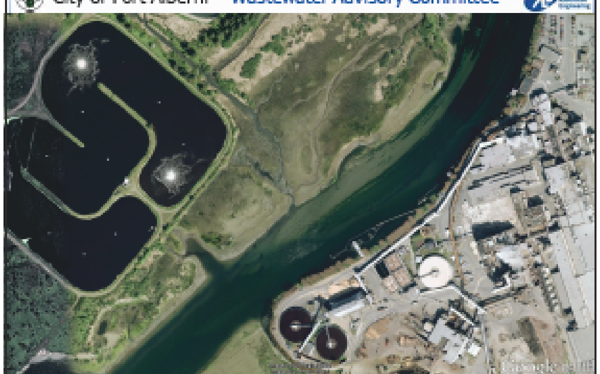

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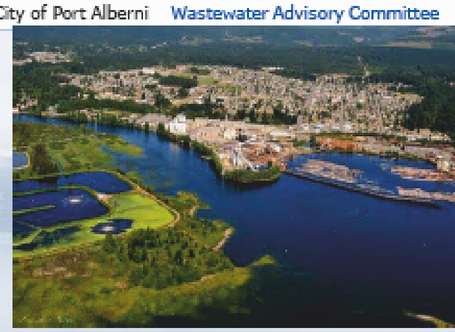

Somass Estuary Approaching High Tide

Photo: Long D. Nguyen (public domain)

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Screen the Feasibility of River Discharge

- Current "side channel" discharge through a vegetated ditch
- MWR approach to river discharge influenced by the Dilution Ratio (DR)

$$DR = \frac{Average\ annual\ 7-day\ Low\ Flow\ (7Q2)}{Maximum\ Weekly\ Average\ Wastewater\ Flow}$$

City of Port Alberni Wastewater Advisory Committee

MWR Dilution Ratio

- If >100:1 – treatment standards & EIS scope are normal
- If <100:1 EIS must determine if more stringent treatment standards are needed
- If <40:1 & used for recreation or domestic, only possible if no other option; advanced treatment required
- Prohibited if <10
- Somass River is used for recreation, so 40:1 is minimum acceptable

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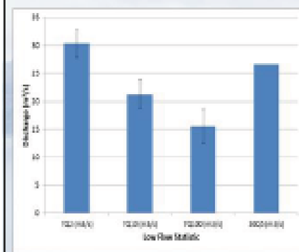
7-Day Low Flows & Dilution Ratio



- 7Q2 = 30.3 m^3/s
- Permit max. is currently 34,100 m^3/day (0.395 m^3/s)
- MWR DR is 77:1
- Average WW flow is 0.232 m^3/s; ∴ ratio is 131:1
- In estuaries only river flow is used for dilution calculation

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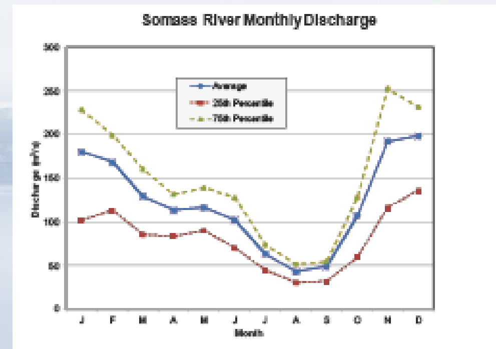

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Field Reconnaissance and Initial Sampling

- June 10-12 (i.e. 2 weeks ago)
- Sampled 7 sites; 5 across tidal cycle
- *Field measurements*: Specific conductance, water temperature, pH, DO, ORP
- *Lab analyses*: BOD_5, TSS, TP, TDP, TN, ammonia-N, nitrate-N, chloride, fecal coliforms, caffeine
- Also observations & photographs

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Sampling Locations

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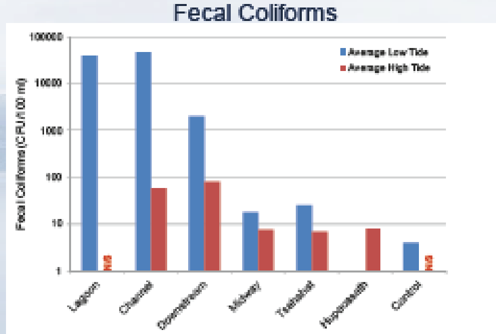
Fecal Coliforms



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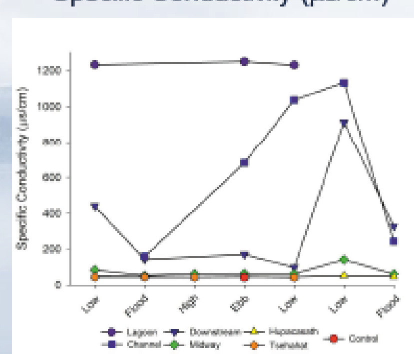
Specific Conductivity (µs/cm)



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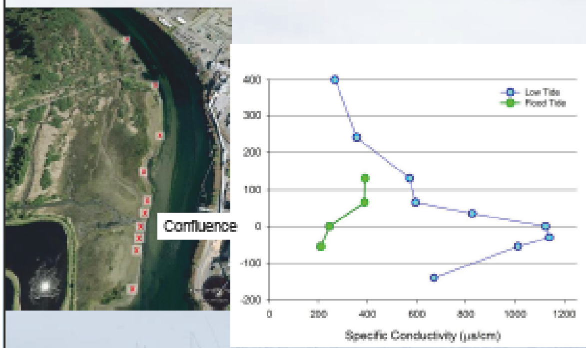

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Field Observation Highlights

- Conductivity is a good indicator of effluent plume
- Flood tide creates turbulence which enhances mixing near outfall
- Some evidence of plume at "Midway" site
- No evidence that it extends as far as Sites x and y at flood tide or slack high tide
- At low tide plume hugs the right bank

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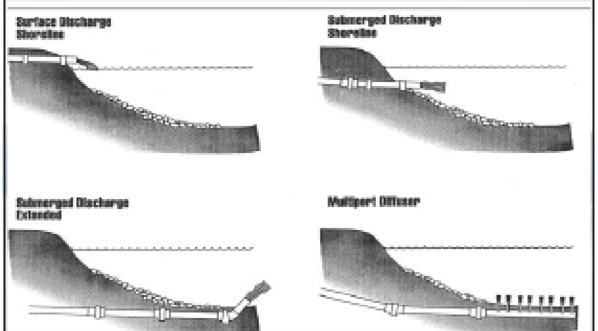

Effluent Diffusers

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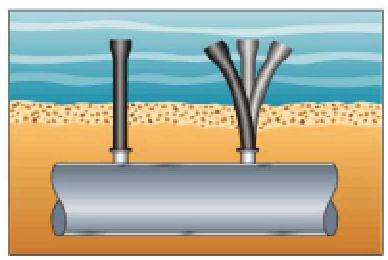
Example Diffuser – Navigable Channel

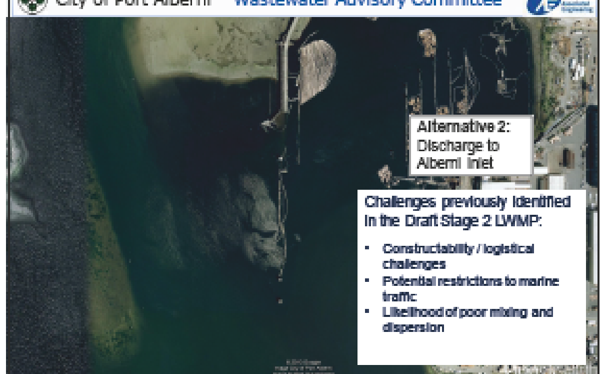
Tideflex Effluent Diffuser Systems



100% Elastomer Tideflex Diffusers are flexible, durable and are ideal for harsh marine environments

City of Port Alberni Wastewater Advisory Committee

City of Port Alberni Wastewater Advisory Committee



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Alberni Inlet

- Has been studied in detail for Catalyst EEM and for fisheries management
- Substantial database for water quality, sediment quality, fibre mat, & aquatic biota
- Dye study and modelling in 1990s looked at effluent plume dispersion
- Can use these data & reports to assess options within Alternative 2

City of Port Alberni Wastewater Advisory Committee

City of Port Alberni Wastewater Advisory Committee

Next Steps

City of Port Alberni Wastewater Advisory Committee

Next Steps

1. WAC accepts recommendation to Drop Alternative #3 (Release to Intertidal) or requests further study
2. Develop decision-making framework for effluent return location
   - WAC input into further data collection/analysis
   - Build on preliminary screening to define & assess remaining options (Discussion paper coming)
   - Enter a structured process for identifying the preferred solution

City of Port Alberni Wastewater Advisory Committee

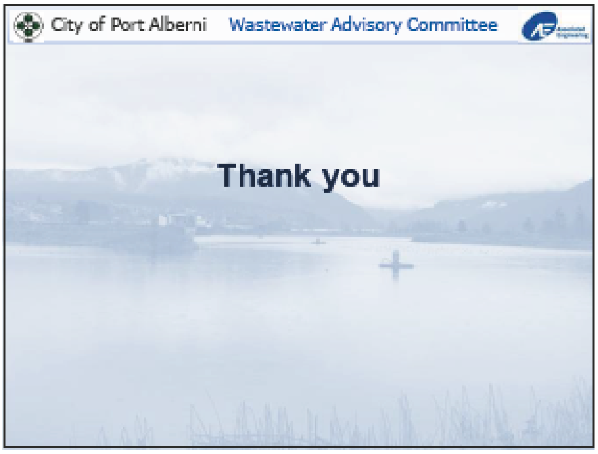
Next Steps

2. WAC Meeting #3
   - Further discussions and follow-through on the structured decision-making process

City of Port Alberni Wastewater Advisory Committee

Next Steps

3. Update Draft Stage 2 LWMP Document (ongoing)
   - Reflect acquisition and anticipated use of Catalyst Lagoon
   - Update effluent return-to-environment location options


City of Port Alberni
Wastewater Advisory Committee
Thank you

City of Port Alberni Wastewater Advisory Committee

October 1, 2013

City of Port Alberni Wastewater Upgrades – Stage 2 LWMP

Wastewater Advisory Committee

Meeting No. 3

City of Port Alberni Wastewater Advisory Committee

Agenda

1. Background & History – Brief Overview
2. Overall Objectives
3. Today's Objective – Identify 'show-stoppers'
   a) Somass River Discharge – Water Quality Survey
   b) Alberni Inlet Discharge – Summary of Prior Investigation
   c) Discharge System Concepts/Feasibility
   d) Discussion
4. Next Steps

City of Port Alberni Wastewater Advisory Committee

Introductions

City of Port Alberni Wastewater Advisory Committee

Background & (a short) History

City of Port Alberni Wastewater Advisory Committee

Background & History - Overview

Project start 1999

2002 Stage 1 LWMP Completed

Draft Stage 2 LWMP 2004

Further Investigations and development of options

Award of Gas Tax Funding & Acquisition of Catalyst Lagoons 2012

2013 Formation of WAC

City of Port Alberni Wastewater Advisory Committee

Alternative Locations for Treated Effluent Return to the Environment

City of Port Alberni Wastewater Advisory Committee

City of Port Alberni Wastewater Advisory Committee

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City of Port Alberni Wastewater Advisory Committee

Overall Objectives

City of Port Alberni Wastewater Advisory Committee

Project Definition

i. Establish discharge location
ii. Establish treatment objectives
iii. Establish effluent quality requirements
iv. Completion of Stage 2 LWMP

City of Port Alberni Wastewater Advisory Committee

Process for Selecting a Discharge Location

i. Screening of discharge alternatives
ii. Further investigations as needed to inform screening and subsequent evaluation/decision making
iii. Detailed evaluation and structured decision-making process
iv. Select alternative

City of Port Alberni Wastewater Advisory Committee

Process for Selecting a Discharge Location

i. Screening of discharge alternatives
ii. Further investigations as needed to inform screening and subsequent evaluation/decision making
iii. Detailed evaluation and structured decision-making process
iv. Select alternative

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Today's Objective:
Identify potential 'show stoppers' to inform screening of discharge alternatives

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Somass River Discharge – Water Quality Surveys

City of Port Alberni Wastewater Advisory Committee

Water Quality Survey - Work Plan

Key Objective:
Characterize river water quality upstream and downstream of the effluent channel across the daily tidal cycle to understand upstream effluent influences and current downstream effluent dilution.

Key Questions:
1) Does effluent discharged from the lagoon influence upstream water quality?
2) How does the tidal cycle influence downstream water quality?
3) What is the current effluent dilution and mixing dynamics at the edge of the initial dilution zone (IDZ)?

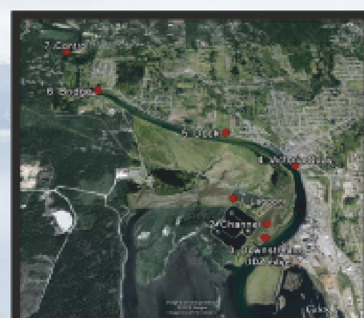
City of Port Alberni Wastewater Advisory Committee

Sample Locations

Sample Dates
- June 10-12, 2013
- Sept 9-11, 2013

Methods
- Wading and boat
- YSI, water samples, benthic algae

Parameters
- Dissolved oxygen, pH, salinity, specific conductivity, temperature
- Total dissolved solids, biological oxygen demand, phosphorous (total and dissolved), nitrogen (total, ammonia, nitrate, nitrite), chloride, coliforms (total, fecal, E. coli), chlorophyll-a



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General Hydrology

Low Tide

High Tide

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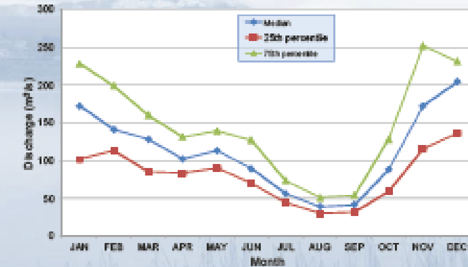
Somass River Discharge: 1957 - 2002

- Discharge June 10 to 12, 2013 = 81 m^3/s
- Discharge September 8 to 10, 2013 = 60 m^3/s



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Depth Profile of Somass River

Low Tide
- Transect: non-uniform
- Profile: un-stratified

Flood Tide
- Transect: uniform
- Profile: stratified

Ebb Tide
- Transect: uniform
- Profile: stratified

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Local Hydrology

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Hydrology: Key Points

- Saline water from the inlet flows along the bottom of river channel, and freshwater flows on top.
- High water forms a natural barrier that prevents effluent release into the Somass River during flood tide and high-water slack.

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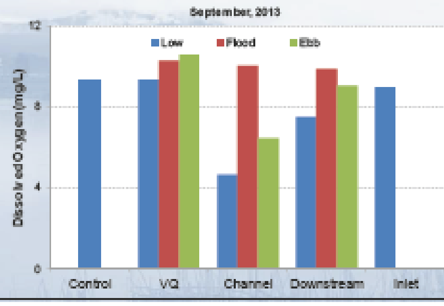
Water Quality

City of Port Alberni Wastewater Advisory Committee

Dissolved Oxygen

- DO increases by 30% between the channel and downstream site during low and ebb tide

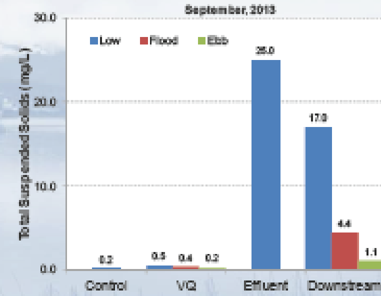


City of Port Alberni Wastewater Advisory Committee

Total Suspended Solids

Low Tide
- TSS decreases by 32% at edge of IDZ

Ebb Tide
- TSS decreases by 96% at edge of IDZ

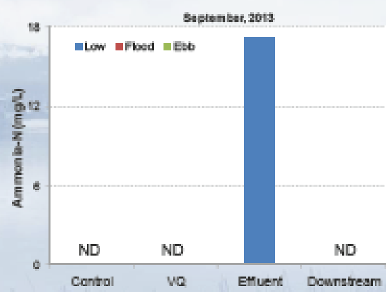


City of Port Alberni Wastewater Advisory Committee

Ammonia-N (NH_3)

Low Tide
- NH_3-N decreases by 100% at edge of IDZ

Ebb Tide
- NH_3-N decreases by 100% at edge of IDZ

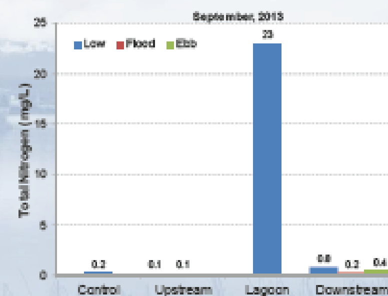


City of Port Alberni Wastewater Advisory Committee

Total Nitrogen

Low Tide
- TN decreases by 97% at edge of IDZ

Ebb Tide
- TN decreases by 98% at edge of IDZ



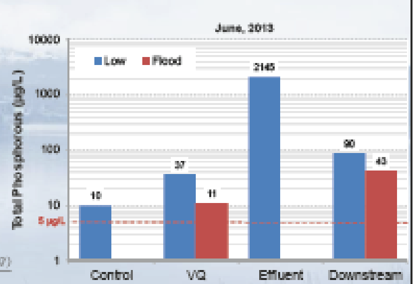
City of Port Alberni Wastewater Advisory Committee

Total Phosphorous

Low Tide
- TP decreases by 96% at edge of IDZ
- Dilution ratio = 40:1

Flood Tide
- TP decreases by 99% at edge of IDZ
- Dilution ratio = 67:1

$$Dilution = \frac{(Downstream - VQ)}{Effluent}$$

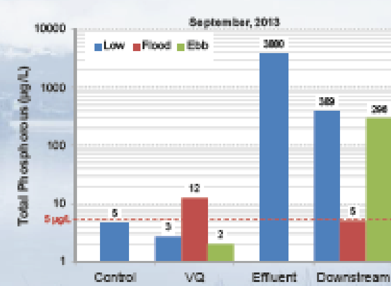


City of Port Alberni Wastewater Advisory Committee

Total Phosphorous

Low Tide
- TP decreases by 90% at edge of IDZ
- Dilution ratio = 10:1

Ebb Tide
- TP decreases by 92% at edge of IDZ
- Dilution ratio = 13:1

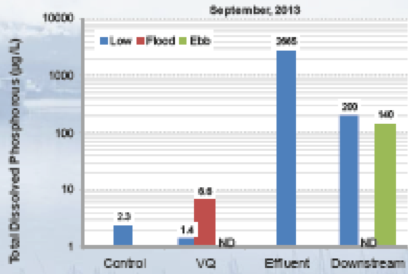


City of Port Alberni Wastewater Advisory Committee

Total Dissolved Phosphorous

Low Tide
- TP decreases by 92% at edge of IDZ
- Dilution ratio = 13:1

Flood Tide
- TP decreases by 91% at edge of IDZ
- Dilution ratio = 19:1



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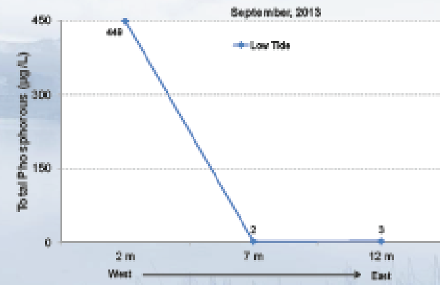
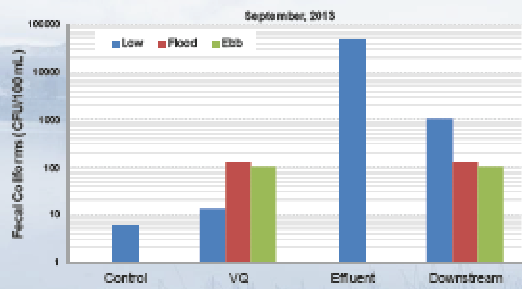
Total Phosphorus – IDZ Transect



City of Port Alberni Wastewater Advisory Committee

Fecal Coliforms



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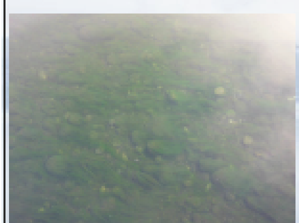
Aquatic Ecology



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Conclusion

- Wastewater effluent does not impact upstream water quality.
- Water quality downstream displays variability related to the tidal cycle.
- Dilution capacity of the current discharge ranges between 10:1 to 67:1.
- Available dilution capacity of the river discharge option, based on current water quality conditions, is highly variable at the edge of the IDZ.

City of Port Alberni Wastewater Advisory Committee

Alberni Inlet Discharge – Summary of Prior Investigation

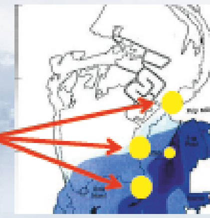
City of Port Alberni Wastewater Advisory Committee

4.2 Alberni Inlet Discharge: Summary of Prior Investigations

- "Mill Effluent Dispersion Study"
- conducted by Seaconsult in 1993 for Alberni Pulp & Paper
- dye tracer field program
- conducted to design the EEM program
- intent in City / LWMP context:
  - review for information purposes with a particular focus on near-field dilution and dispersion

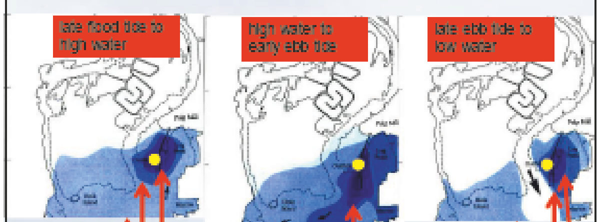
City of Port Alberni Wastewater Advisory Committee

City outfall locations under consideration



City of Port Alberni Wastewater Advisory Committee

mill effluent flow rate = 115,000 m^3/d
Somass River flow rate = 4,320,000 m^3/d (50 m^3/s), June 1993



< 100:1 dilution
< 10:1 dilution
< 5:1 dilution

< 100:1 dilution
< 10:1 dilution
< 5:1 dilution

< 100:1 dilution
< 10:1 dilution
< 5:1 dilution

source: Seaconsult (1993)

City of Port Alberni Wastewater Advisory Committee

4.2 Alberni Inlet Discharge: Summary of Prior Investigations

- "merits of locating a new outfall to the west side of the Somass River"
- conducted by Seaconsult in 1991 for Sandwell
- brief letter report / analysis
- key conclusions:
  - no significant benefits relative to existing east side outfall in terms of mixing / flushing through to Polly Point
  - measurements / modelling required to inform improvements to existing outfall

City of Port Alberni Wastewater Advisory Committee

4.2 Alberni Inlet Discharge: Summary of Prior Investigations

- relevance to City / LWMP context:
  - inlet discharge likely would likely provide limited initial dilution of effluent within the IDZ because of effluent ponding during flood tide and high water
  - outside the IDZ the near- and far-field dispersion may be relatively insensitive to effluent discharge location

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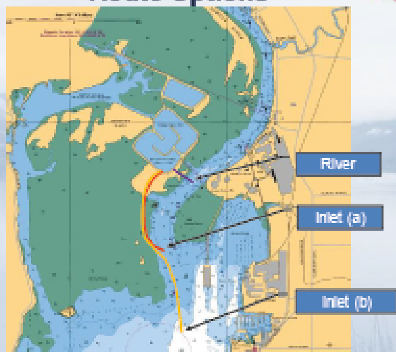
Discharge System Concepts / Feasibility

City of Port Alberni Wastewater Advisory Committee

WorleyParsons

Route Options



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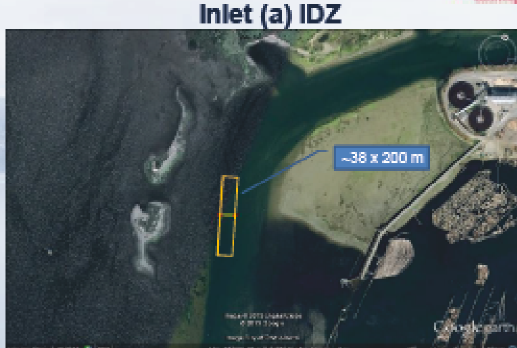
WorleyParsons

River IDZ

City of Port Alberni Wastewater Advisory Committee

WorleyParsons

Inlet (a) IDZ



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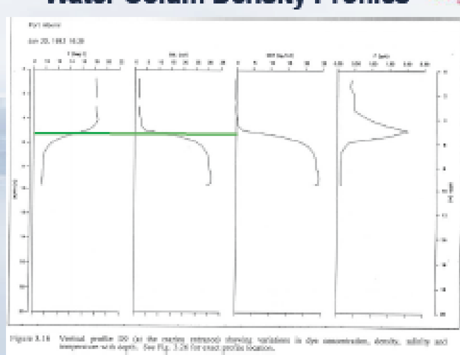
WorleyParsons

River Plume Example

City of Port Alberni Wastewater Advisory Committee

WorleyParsons

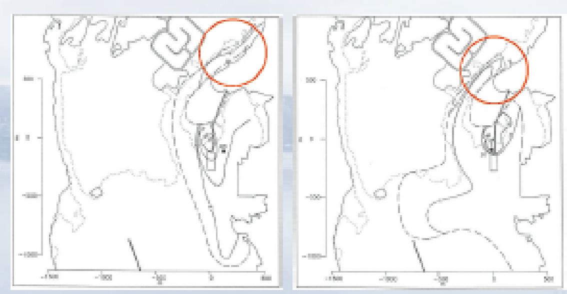
Water Colum Density Profiles

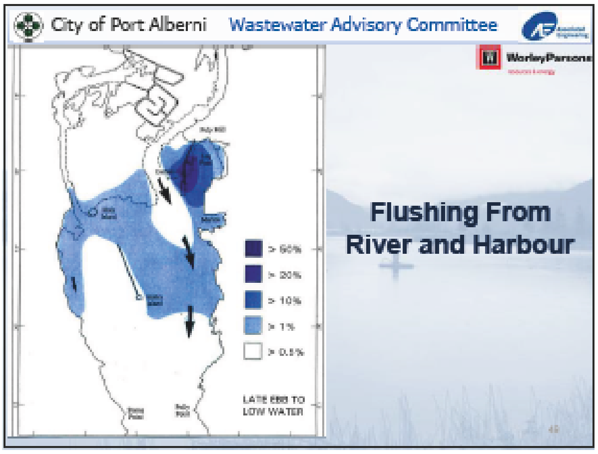


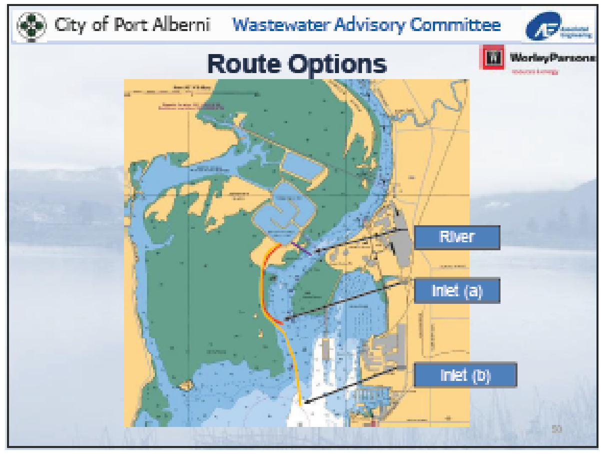
City of Port Alberni Wastewater Advisory Committee

WorleyParsons

Intrusion of Inlet Water




City of Port Alberni
Wastewater Advisory Committee
WorleyParsons
Flushing From River and Harbour
> 50%
> 20%
> 10%
> 1%
> 0.5%
LATE EBB TO LOW WATER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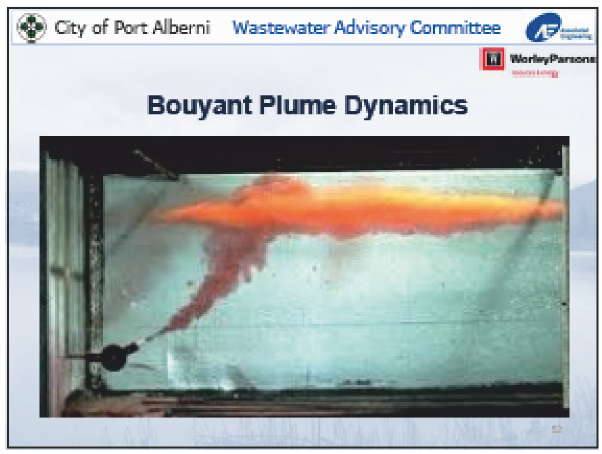
Wastewater Advisory Committee
WorleyParsons
Route Options
River
Inlet (a)
Inlet (b)


City of Port Alberni
Wastewater Advisory Committee
WorleyParsons
Marine Inlet (b) IDZ
100 m radius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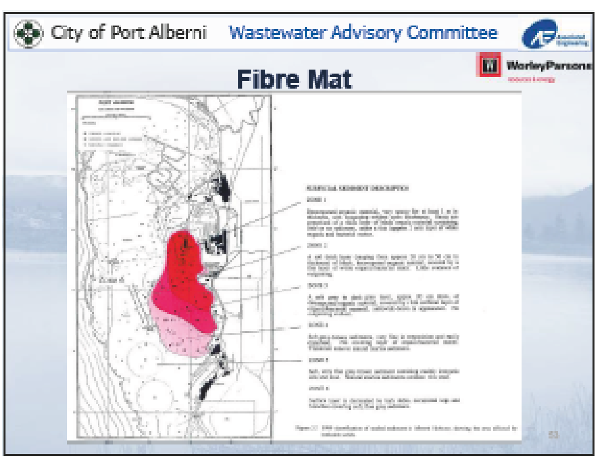
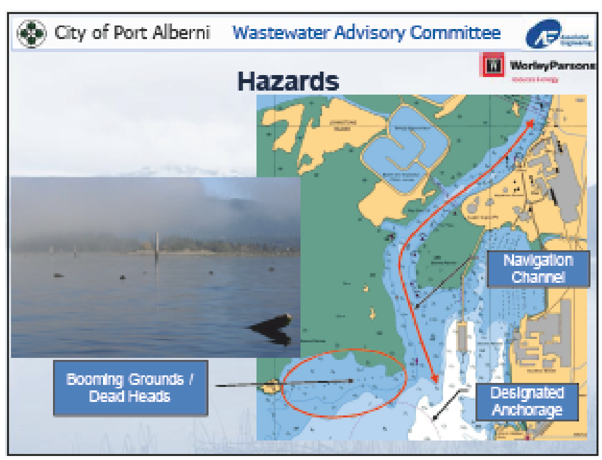
Wastewater Advisory Committee
WorleyParsons
Bouyant Plume Dynamics


City of Port Alberni
Wastewater Advisory Committee
WorleyParsons
Fibre Mat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Wastewater Advisory Committee
WorleyParsons
Hazards
Navigation Channel
Booming Grounds / Dead Heads
Designated Anchorage

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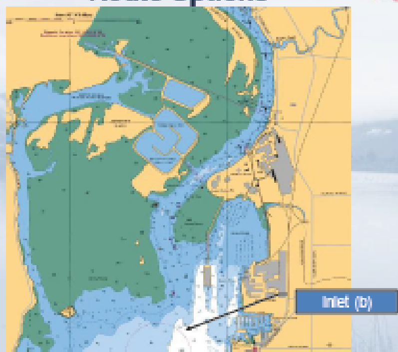
Route Options



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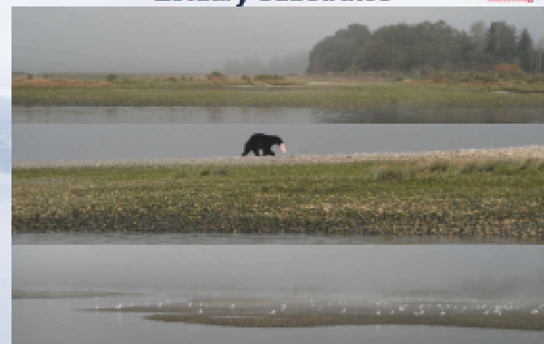
Estuary Substrates



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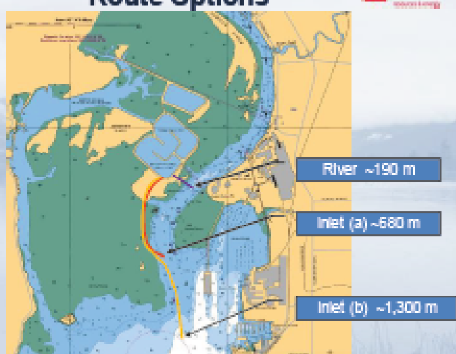
Route Options



City of Port Alberni Wastewater Advisory Committee

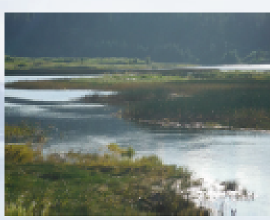
Review & Discussion

- Dilution
- Key issues identified
- Show stoppers?
- Alternatives to carry forward

City of Port Alberni Wastewater Advisory Committee

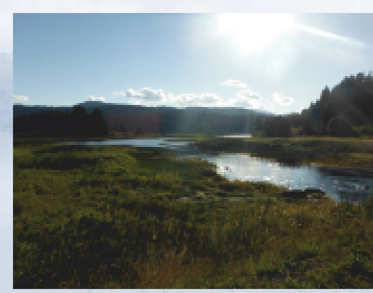
Next Steps

- Milestone dates
- Decision-making framework
- Draft Stage 2 LWMP document
- WAC Meeting #4



City of Port Alberni Wastewater Advisory Committee

Thank you



City of Port Alberni Wastewater Advisory Committee

November 12, 2013

City of Port Alberni Wastewater Upgrades – Stage 2 LWMP

Wastewater Advisory Committee

Meeting No. 4

City of Port Alberni Wastewater Advisory Committee

Agenda

1. Background & History – Brief Overview
2. Overall Objectives
3. Today's Objective – Screening of Options
4. Next Steps

City of Port Alberni Wastewater Advisory Committee

Introductions

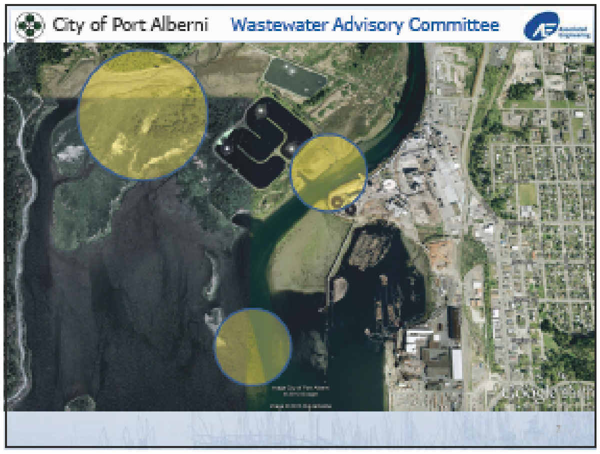
City of Port Alberni Wastewater Advisory Committee

Background & (a short) History

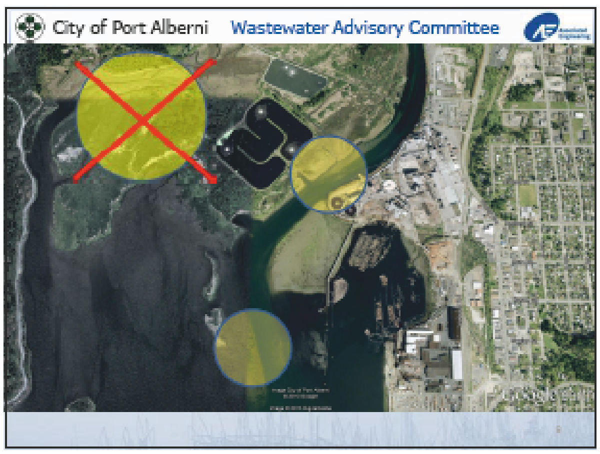
City of Port Alberni Wastewater Advisory Committee

Alternative Locations for Treated Effluent Return to the Environment

City of Port Alberni Wastewater Advisory Committee


City of Port Alberni
Wastewater Advisory Committee


City of Port Alberni
Wastewater Advisory Committee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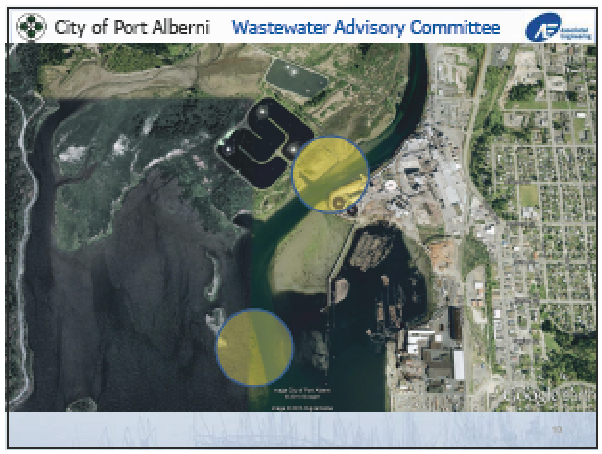
Wastewater Advisory Committee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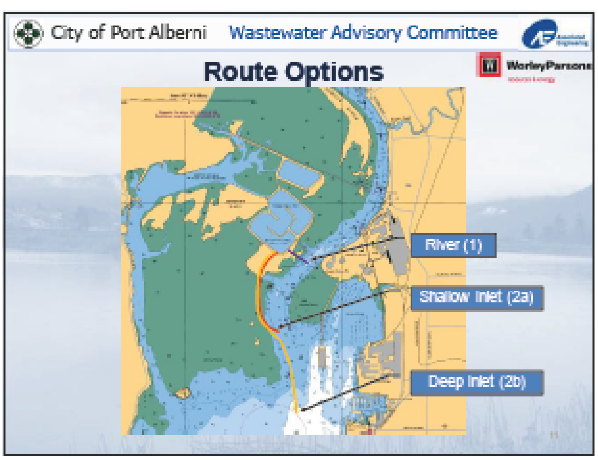
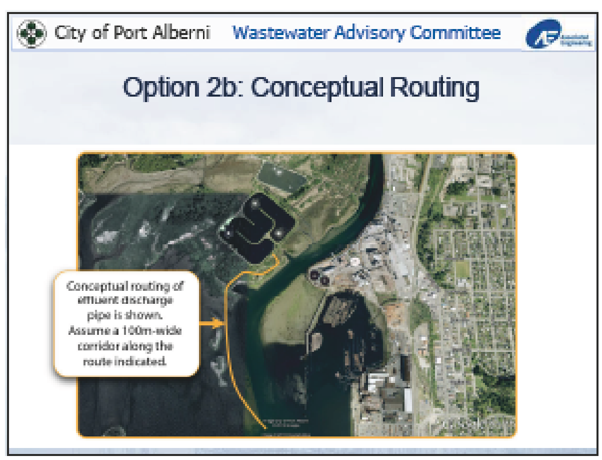

City of Port Alberni
Wastewater Advisory Committee
Route Options
WorleyParsons
River (1)
Shallow Inlet (2a)
Deep Inlet (2b)


City of Port Alberni
Wastewater Advisory Committee
Option 2b: Conceptual Routing
Conceptual routing of effluent discharge pipe is shown. Assume a 100m-wide corridor along the route indicated.

City of Port Alberni Wastewater Advisory Committee

Overall Objectives

City of Port Alberni Wastewater Advisory Committee

Project Definition

i. Establish discharge location
ii. Establish treatment objectives
iii. Establish effluent quality requirements
iv. Completion of Stage 2 LWMP

City of Port Alberni Wastewater Advisory Committee

Effluent Discharge Location Screening Exercise

purpose

review alternative outfall discharge locations and identify any "show stopper" attributes that on their own would eliminate an alternative from any further consideration in terms of advancing it to a short-list of alternatives that would be subjected to a comparative evaluation (i.e. triple bottom line + risk)

City of Port Alberni Wastewater Advisory Committee

Effluent Discharge Location Screening Exercise

today's intent

- walk the WAC through the screening exercise
- vet the judgments made with the WAC to receive feedback
- confirm the screening exercise outcomes and next steps

City of Port Alberni Wastewater Advisory Committee

City of Port Alberni Wastewater Advisory Committee

Effluent Discharge Location Screening Exercise

methodology - screening categories

- archeological considerations
- construction permitting / mitigations
- wastewater treatment implications
- Municipal Wastewater Regulation requirements conformance

→ various specific "attributes" under each category

City of Port Alberni Wastewater Advisory Committee

Effluent Discharge Location Screening Exercise

methodology – judgements

- (green) sufficient information exists at this time to make a PASS judgement on this alternative attribute and a PASS has been assigned
- (yellow) insufficient information exists at this time to make either a PASS or FAIL judgement on this alternative attribute
- (red) sufficient information exists at this time to make a FAIL judgement on this alternative attribute and a FAIL judgement has been assigned

City of Port Alberni Wastewater Advisory Committee

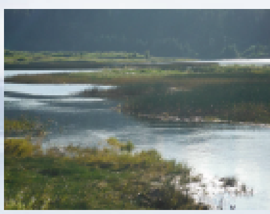
Effluent Discharge Location Screening Exercise

let's get to work!

City of Port Alberni Wastewater Advisory Committee

Next Steps

- Archeological Investigations
- Sediment Investigation
- Stage 1 EIS for Location 2b
- Draft Stage 2 LWMP
- WAC Meeting #5



City of Port Alberni Wastewater Advisory Committee

Thank you

City of Port Alberni Wastewater Advisory Committee

Process for Selecting a Discharge Location

i. Screening of discharge alternatives
ii. Further investigations as needed to inform screening and subsequent evaluation/decision making
iii. Detailed evaluation and structured decision-making process
iv. Select preferred alternative

City of Port Alberni Wastewater Advisory Committee

Today's Objective:
Finalize screening of discharge alternatives

City of Port Alberni Wastewater Advisory Committee

December 12, 2013

City of Port Alberni Wastewater Upgrades – Stage 2 LWMP

Wastewater Advisory Committee

Meeting No. 5

City of Port Alberni Wastewater Advisory Committee

Agenda

1. Introductions
2. Background
   - Objective: to establish the preferred discharge location
3. Effluent Discharge Location Screening Exercise
4. LWMP Stage 2 Document
5. EIS Part 1 Document
6. Next Steps

City of Port Alberni Wastewater Advisory Committee

Introductions

City of Port Alberni Wastewater Advisory Committee

Background

Alternative Locations for Treated Effluent Return to the Environment

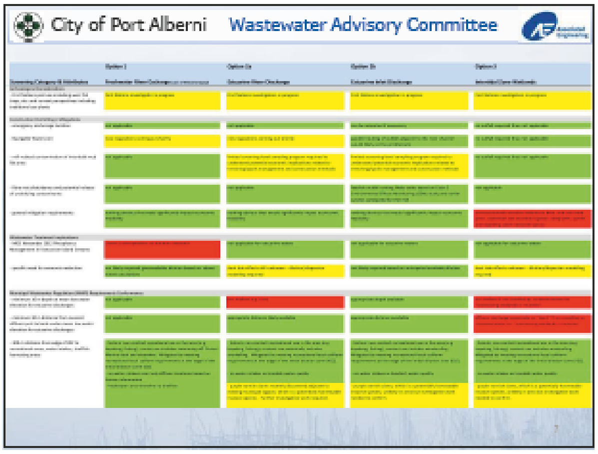
City of Port Alberni Wastewater Advisory Committee

City of Port Alberni Wastewater Advisory Committee

Overall Objective

Project Definition

i. Establish discharge location
ii. Establish treatment objectives
iii. Establish effluent quality requirements
iv. Completion of Stage 2 LWMP



City of Port Alberni — Wastewater Advisory Committee

Effluent Discharge Location Screening Exercise

methodology – judgements

- (green) sufficient information exists at this time to make a PASS judgement on this alternative attribute and a PASS has been assigned
- (yellow) insufficient information exists at this time to make either a PASS or FAIL judgement on this alternative attribute
- (red) sufficient information exists at this time to make a FAIL judgement on this alternative attribute and a FAIL judgement has been assigned

City of Port Alberni — Wastewater Advisory Committee

Screen Category & Attribute	Option 2b Estuarine Inlet Discharge
First Nations past use including weir fish traps, etc. and current perspectives including traditional use plants	First Nations investigation in progress
Mill related contamination of intertidal mud flat areas	Limited screening-level sampling program required to understand potential economic implications related to trenching/spoils management and construction methods
300 m distance from edge of IDZ to recreational areas, water intakes, shellfish harvesting areas	Purple varnish clams, which is a potentially harvestable invasive species, unlikely in area but investigative work needed to confirm.

City of Port Alberni — Wastewater Advisory Committee

Upcoming Investigations

- Archaeological Investigations
  - Led by Denis St. Claire and Nicole Smith
  - Waiting to receive comments back on the proposal
  - Planned for January 26-28, 2014
    - Archaeological Permit required
- Sediment Investigation and Shellfish Survey
  - Planned for the same time as the archaeological investigations

City of Port Alberni — Wastewater Advisory Committee

Today's Objective:

Discuss the content of the LWMP Stage 2 Document and the EIS Part 1 Document

City of Port Alberni — Wastewater Advisory Committee

Liquid Waste Management Plan process

- Engineering planning document meant to provide direction
- Consensus required with community stakeholders, First Nations, and the general public

Stage 1: Identification of key wastewater management issues → Stage 2: Evaluation and selection of the preferred liquid waste management strategy → Stage 3: Implementation of the preferred wastewater management strategy

City of Port Alberni Wastewater Advisory Committee

Stage 2 LWMP Overview

City of Port Alberni Wastewater Advisory Committee

Table of Contents LWMP Stage 2
(1 of 2)

City of Port Alberni Wastewater Advisory Committee

Table of Contents LWMP Stage 2
(2 of 2)

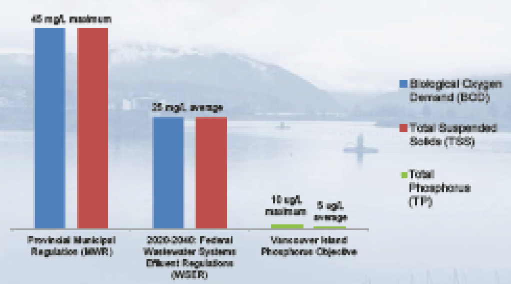
City of Port Alberni Wastewater Advisory Committee

Section 1: Introduction

- Background and history
- Updates and upgrades since Stage 1 LWMP
  - Acquiring of the Industrial Lagoon by the City
  - Community population projections
  - Reduced impact of non-domestic wastewater discharge

City of Port Alberni Wastewater Advisory Committee

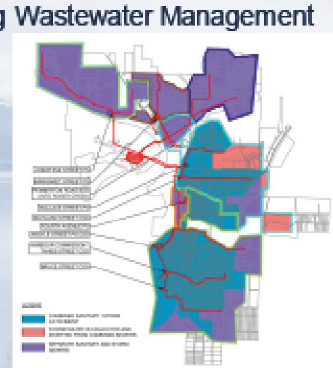
Section 2: Regulatory Framework

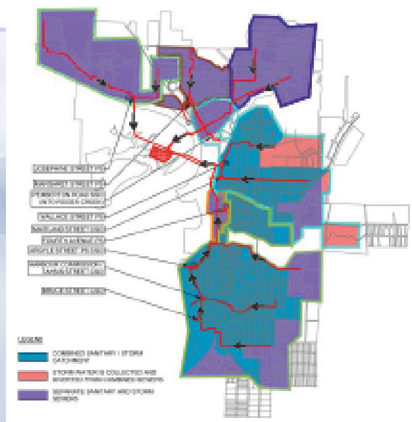


City of Port Alberni Wastewater Advisory Committee

Section 3: Existing Wastewater Management

Collection and conveyance system





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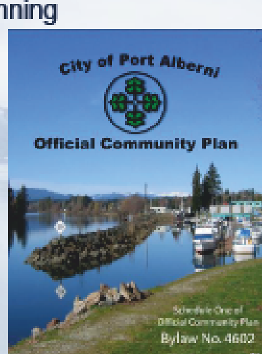
Section 3: Existing Wastewater Management

Separate Flumes:
- Upper Johnston Gravity Force main
- Josephine St. PS
- Margaret St. PS
- Wallace St. PS
- Argyle St./4th Ave PS
- Leachate

City of Port Alberni Wastewater Advisory Committee

Section 4: Basis for Planning

- Planning Horizon
- Community Development



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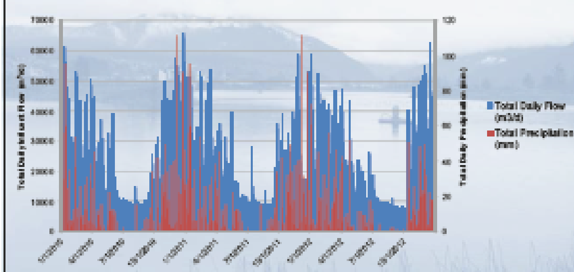
Section 4: Basis for Planning

- Wastewater flows and loads



City of Port Alberni Wastewater Advisory Committee

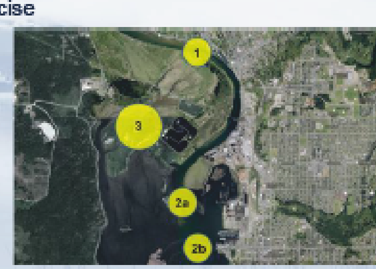
Section 5: Source Control

- Purpose of source control
  - Protect the collection system, the treatment facility, and the receiving environment
- The City's existing By-Law No. 3224
  - Sewer Connection and Regulation By-Law
  - Fish processing factory is no longer a concern

City of Port Alberni Wastewater Advisory Committee

Section 6: Effluent Discharge

- Effluent discharge location
- Screening exercise
- Effluent dilution
- Cost estimates



City of Port Alberni Wastewater Advisory Committee

Section 7: Wastewater Treatment

- Effluent quality requirements
  - BOD, TSS, Ammonia
- Treatment process configuration
- Disinfection
- Cost estimates

City of Port Alberni Wastewater Advisory Committee

Section 8: Combined Sewer Overflows

- Upgrades to date
  - Wallace Pump Station (2001): $0.34 Million
  - North Port Sewer Abatement Project (2006): $2.3 Million
  - Argyle St. Pump Station (2009): $1.2 Million
  - Additional upgrades include new storm drainage installations and sanitary and storm water upgrades: $1.85 Million
- Planned Upgrades
  - Continued separation of combined sewer system

City of Port Alberni Wastewater Advisory Committee

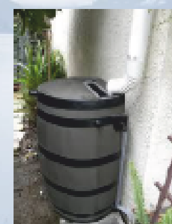
Section 9: Sustainability and Resource Recovery

- Biosolids production and reuse
- Effluent reuse
- Heat recovery

City of Port Alberni Wastewater Advisory Committee

Section 10: Urban Stormwater Management

- The City had a trial for a rainwater harvesting program
- The City is in favour of low impact developments
  - Green roofing
  - Permeable pavement



City of Port Alberni Wastewater Advisory Committee

Section 11: Public and Agency Consultation

- Wastewater Advisory Committee (WAC)
- First Nations Consultation
- Ministry of the Environment (MOE) – Advisory role
- Future public consultation
  - Open house
  - Mail outs
  - Web-based communications

City of Port Alberni Wastewater Advisory Committee

Section 12: Summary and Next Steps

Stage 1: Identification of key wastewater management issues → Stage 2: Evaluation and selection of the preferred liquid waste management strategy → Stage 3: Implementation of the preferred wastewater management strategy

City of Port Alberni — Wastewater Advisory Committee

Part 1 EIS Overview

City of Port Alberni — Wastewater Advisory Committee

Part 1 EIS Progress Update

- As per EIS Guidelines (MELP 2000; Section 5.2), EIS is being done in 2 Steps (Stages)
- Step 1 underway – *Assessment of Available Data*
- Will be provided as a draft for WAC review in January

City of Port Alberni — Wastewater Advisory Committee

Part 1 EIS Progress Update

- Part 1 includes:
  - Brief description of project & baseline environment
  - Preliminary dilution/dispersion modelling & guideline comparisons
  - Recommended pre-discharge monitoring plan
  - Recommended scope of work for Part 2

City of Port Alberni — Wastewater Advisory Committee

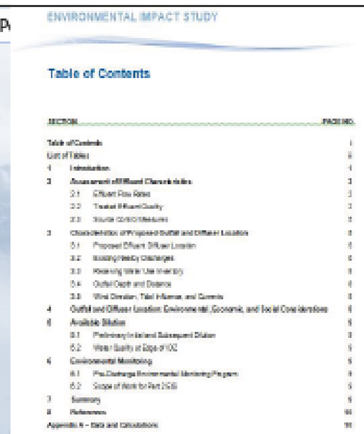
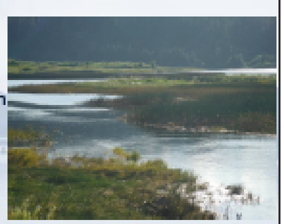

ENVIRONMENTAL IMPACT STUDY

Table of Contents

City of Port Alberni — Wastewater Advisory Committee

Next Steps

- Part 1 EIS
- Part 2 EIS
  - Archaeological investigation
  - Sediment investigation
  - Shellfish survey
  - Dilution modeling
  - Baseline monitoring
- Draft Stage 2 LWMP
  - To be provided to the WAC for review
- WAC Meeting #6



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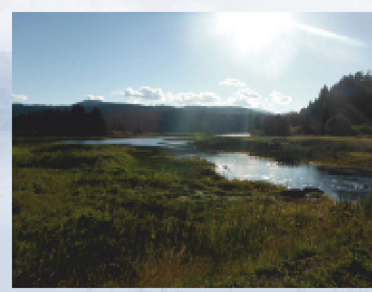
Thank you



City of Port Alberni Wastewater Advisory Committee

October 29, 2014

City of Port Alberni Wastewater Upgrades – Stage 2 LWMP

Wastewater Advisory Committee

Meeting No. 6

City of Port Alberni Wastewater Advisory Committee

Agenda

1. Introductions
2. Overall Objective
3. Summary of Effluent Discharge Location Screening Exercise
4. Work Progress Since WAC Meeting #5
5. LUNCH BREAK
6. Scenario Development
7. Comparative Evaluation Using a TBL Analysis
8. Evaluation of Importance/Weighting of Quantifiable Attributes
9. Next Steps
10. Questions

City of Port Alberni Wastewater Advisory Committee

Introductions

City of Port Alberni Wastewater Advisory Committee

Overall Objective

City of Port Alberni Wastewater Advisory Committee

Project Definition

1. Establish discharge location
2. Establish effluent quality requirements
3. Establish treatment objectives
4. Completion of Stage 2 LWMP

City of Port Alberni Wastewater Advisory Committee

Summary of Effluent Discharge Location Screening Exercise

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City of Port Alberni Wastewater Advisory Committee

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Effluent Discharge Location Screening Exercise

Methodology – Judgments

- (Green) Sufficient information exists at this time to make a PASS judgment on this alternative attribute and a PASS has been assigned
- (Yellow) Insufficient information exists at this time to make either a PASS or FAIL judgment on this alternative attribute
- (Red) Sufficient information exists at this time to make a FAIL judgment on this alternative attribute and a FAIL judgment has been assigned

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Screen Category & Attribute	Option 2b Estuarine Inlet Discharge
First Nations past use including weir fish traps, etc. and current perspectives including traditional use plants	Archaeological investigation in progress
Mill related contamination of intertidal mud flat areas	Limited screening-level sampling program required to understand potential economic implications related to trenching/spoils management and construction methods
300 m distance from edge of IDZ to recreational areas, water intakes, shellfish harvesting areas	Purple varnish clams, which is a potentially harvestable invasive species, unlikely in area but investigative work needed to confirm.

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Work Progress Since WAC Meeting #5

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Feedback from the MOE

- An unofficial Draft LWMP Stage 2 Report was sent to the MOE
- The purpose was to have productive dialogue for development of point of discharge
  - Meeting regulatory requirements while considering engineering implications

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Findings from Investigations

- Archaeological Investigations
  - Proposed date: TBD
- Sediment Investigation and Shellfish Survey
  - Conducted February 26 and 27, 2014
- Current, Tide & Water Quality Survey
  - Conducted September 2014

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Screen Category & Attribute	Option 2b Estuarine Inlet Discharge
First Nations past use including weir fish traps, etc. and current perspectives including traditional use plants	Archaeological investigation in progress
Mill related contamination of intertidal mud flat areas	Sediment sampling demonstrated very low potential for contamination
300 m distance from edge of IDZ to recreational areas, water intakes, shellfish harvesting areas	Investigative work illustrated that a harvestable population of purple varnish clams was not found in the intertidal area within 400 m of the proposed diffuser location

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Update on EIS Part 1

- Desktop review and use of background information
- EIS Part 1 Report was submitted and accepted by the MOE in July 2014

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Update on EIS Part 2

- The field program was conducted in September 2014 to support EIS Part 2
  - This time period considered most sensitive for Pacific salmon due to low Somass River flow & warm water
  - Drogue & current studies to support effluent plume modelling
  - Baseline water & sediment quality sampling
  - DO/salinity profiles to support DO effects assessment

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Discharge at Depth

- Dissolved oxygen (DO) = a measure of the amount of oxygen present in the water
- Biological oxygen demand (BOD) = a measure of the strength of organic material, relating to the quantity of oxygen required to breakdown organic matter by aerobic microorganisms

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Discharge at Depth (cont.)

- Raised by the WAC members as a topic that should be investigated with respect to aquatic life
- Key Fisheries Issue: Low DO levels (i.e. below ~5 mg/L) at depths below the halocline pose risk to holding salmon in Alberni Inlet

City of Port Alberni Wastewater Advisory Committee

Discharge at Depth (cont.)

- Effluent BOD requirements from a wastewater treatment plant:
  - Average: 25 mg/L
  - Maximum: 45 mg/L
- MWR: Discharge into an estuary requires an outfall at a minimum depth of 10m

City of Port Alberni Wastewater Advisory Committee

Discharge at Depth (cont.)

- ***Will change in the outfall location increase frequency, magnitude or duration of low DO conditions in lower layer?***
- AE retained Seaconsult to develop an order of magnitude DO model for this system to address this question
- Based on model developed and tested in Alberni Inlet in 1990s – mill effluent is included

City of Port Alberni Wastewater Advisory Committee

Discharge at Depth (cont.)

- Conservative inputs used in the Seaconsult model:
  - A flow of **30 ML/d** was used in the model – a conservative assumption as typical summer flows will be 10 ML/d
  - "Worst case" BOD of 45 mg/L was applied

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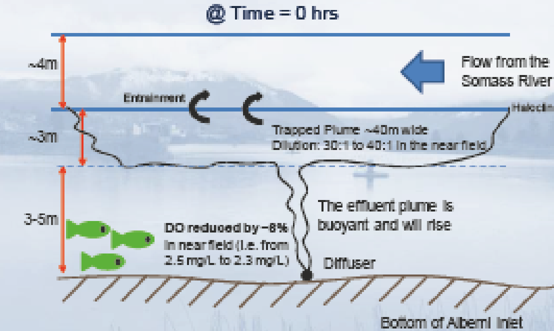
Preliminary Results from Seaconsult Model

@ Time = 0 hrs



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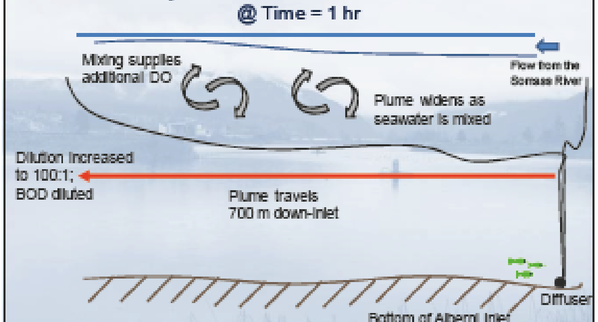
Preliminary Results from Seaconsult Model

@ Time = 1 hr



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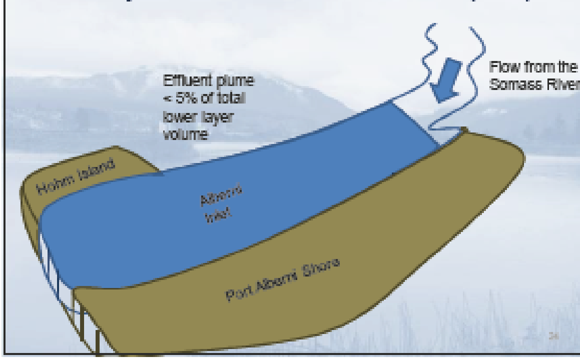
Preliminary Results from Seaconsult Model (cont.)



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Preliminary Results from Seaconsult Model (cont.)

- *Preliminary Findings*
  - It is unlikely that the City's final effluent effects on DO in lower layer would be significant
  - Preliminary DO model will be re-run to examine different combinations of wastewater flow, river flow, and ambient conditions

25

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Lunch Break!

26

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Scenario Implications

- Flows rates requiring conveyance: up to 60 ML/d
- Gravity flow vs. pumping
  - Energy is required to convey water through a pipe
  - Gravity flow:
    - Simple
    - Larger pipe diameter required
  - Pumping:
    - Smaller pipe diameter required
    - Associated operational and maintenance costs
    - Backup energy source
- Construction implications
  - Laying a pipe in tidal areas and at depth is not straight forward

27

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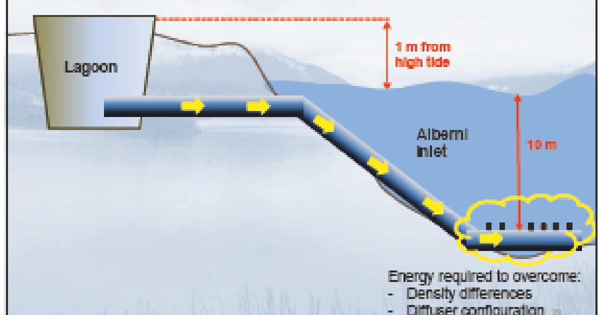

28

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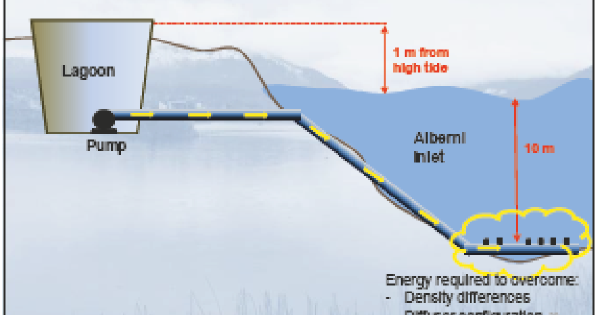

29

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Scenario Development

- Based on preferred discharge location from the Screening Table
- Partial Draft LWMP was submitted to the BC MOE, to get comments specific to the concepts being developed prior to presentation to the WAC:
  - Is use of the existing lagoon possible?
  - How is the elimination of CSOs incorporated?

30

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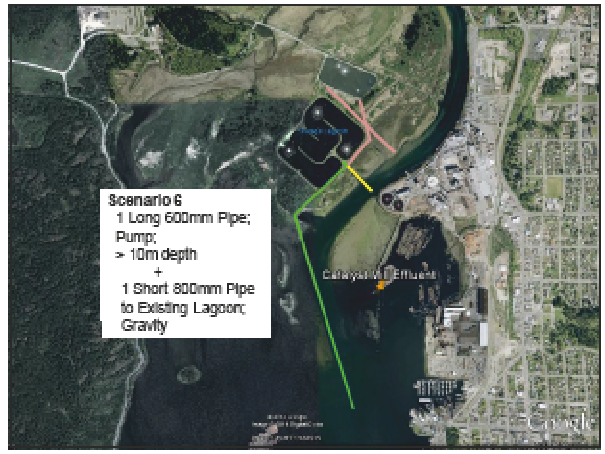
	Scenario 1	Scenario 2a	Scenario 2b	Scenario 3	Scenario 4	Scenario 5	Scenario 6
Flows	The entire flow discharged by gravity through a single pipe and discharged at a 10m depth in the estuary.	The flow is split between two large pipes, both discharged by gravity at a depth of 10m in the estuary.	The flow is split between two pipes, one of which discharges by gravity and the other is pumped. Both pipes discharge at a depth of 10m in the estuary.	The flows are split between two gravity pipes, with Pipe #1 discharging at a depth of 10m in the estuary, and Pipe #2 discharging adjacent to the lagoons. Flows up to 30 ML/d will be discharged through Pipe #1. The excess flow will be discharged through a short Surplus Effluent Discharge (SED) (Pipe #2) near the existing City effluent channel.	The flows are split between two gravity pipes, with Pipe #1 discharging at a depth of 10m in the estuary, and with Pipe #2 discharging into Lagoon A. Flows up to 30 ML/d will be discharged through Pipe #1. The excess flow (during wet weather flow events) flows through Lagoon A before being discharged through the existing effluent channel.	The entire flow is pumped (using a low head high flow pump) through a single pipe and discharged at a 10m depth in the estuary.	The entire flow is pumped (using a large pump) through a single pipe and discharged at a 10m depth in the estuary.
Lagoon A (Existing City Lagoon)	Lagoon A is decommissioned and restored as a natural habitat area.	Lagoon A is decommissioned and restored as a natural habitat area.	Lagoon A is decommissioned and restored as a natural habitat area.	Lagoon A is decommissioned and restored as a natural habitat area.	Lagoon A is utilized downstream of the upgraded lagoon to handle wet weather flows.	Lagoon A is decommissioned and restored as a natural habitat area.	Lagoon A is decommissioned and restored as a natural habitat area.
Long term strategy when peak flows are reduced to < 30 ML/d	No change	Once flows are reduced to 30 ML/d, Pipe #2 can be decommissioned.	Once flows are reduced to 30 ML/d, Pipe #2 can be decommissioned.	Once flows are reduced to 30 ML/d, Pipe #2 to the SED can be decommissioned.	Once flows are reduced to 30 ML/d, Pipe #2 to Lagoon A can be decommissioned.	No change	No change



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Comparative Evaluation using a Triple Bottom Line (TBL) Analysis

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Triple Bottom Line

City of Port Alberni Wastewater Advisory Committee

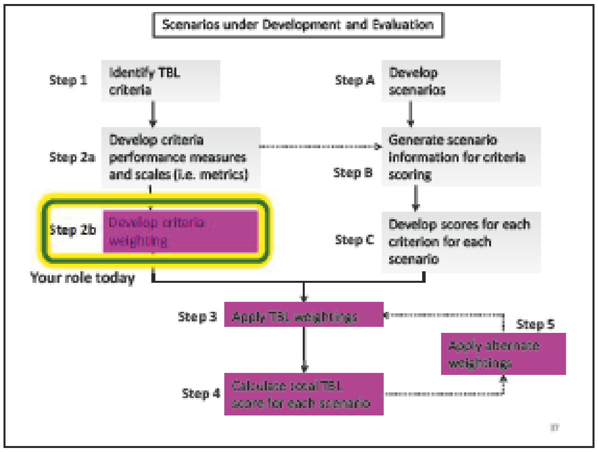
Comparative Evaluation

- TBL results <u>inform</u> discussion / decision(s)
- <u>Simple-as-defendable</u> is best
- Methodology <u>nuances</u> are important

City of Port Alberni Wastewater Advisory Committee

Multi-Criteria Analysis

- Choosing a scenario based on how well it scores/rates against a chosen set of criteria/attributes
- The criteria are weighted in terms of importance
- The total score of an scenario is the weighted sum of its rating against each criteria
- Results sort scenario by preference
- An important nuance: inventories vs. impacts



City of Port Alberni Wastewater Advisory Committee

Environmental Quantifiable Attributes

City of Port Alberni Wastewater Advisory Committee

Physical Footprint Disturbance

- Quantified by: Amount of disturbed terrestrial + foreshore / estuary area during construction
- Units: Area in m^2
- Relevance: The estuary and the surrounding area is known to be sensitive and valuable

City of Port Alberni Wastewater Advisory Committee

Carbon Footprint

- Quantified by: Greenhouse Gas (GHG) emissions associated with operations over an analysis horizon from Year 2015 to 2035
- Units: tonnes of Carbon Dioxide (CO_2) emissions
- Relevance: Sustainability is important to the City

City of Port Alberni Wastewater Advisory Committee

Aquatic Life

- Quantified by: The Biochemical Oxygen Demand (BOD) discharged through the outfall(s) using Maximum Month Flows (MMF)
- Units: kilograms of BOD discharged per day
- Relevance: DFO has expressed concern regarding the effects of a discharge at depth (>10m) on the oxygen levels necessary for fish in the Alberni Inlet

City of Port Alberni Wastewater Advisory Committee

Natural Habitat Restoration

- Quantified by: Footprint of restored area (i.e. the existing City lagoon)
- Units: Area in m^2
- Relevance: The Somass Estuary Management Plan has habitat restoration as an objective if possible

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Social Quantifiable Attributes

43

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Recreational Water Use

- Quantified by: Fecal coliform concentration at the edge of the IDZ using Maximum Month Flows (MMF)
- Units: Coliform Forming Units (CFU) per 100mL
- Relevance: The Alberni Inlet is widely used by the population for recreational purposes. Public health safety must be ensured.

44

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Economic Quantifiable Attributes

45

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Capital Costs

- Quantified by: Capital costs for construction and implementation
- Units: Cost in 2014 $
- Relevance: Project affordability

46

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Life Cycle Costs

- Quantified by: Total Net Present Value (NPV) of all construction and Operations and Maintenance (O&M) costs over an analysis horizon from Year 2015 to 2035
- Units: Cost in 2014 $
- Relevance: Project affordability over the 20 year time period

47

The Populated Table

Attribute	Metric	Units	Scenario 1	Scenario 2a	Scenario 2b	Scenario 3	Scenario 4	Scenario 5	Scenario 6
Environmental									
Physical footprint disturbance	Disturbed terrestrial + foreshore / estuary area in locations	m^2	7,200	7,200	6,300	6,120	7,580	5,400	4,300
Carbon footprint	GHG emissions associated with operations over an analysis horizon from Year 2015 to 2035	t CO2e	2,777	2,777	3,840	2,777	2,777	3,908	3,448
Aquatic life	The Biochemical Oxygen Demand discharged through the outfall(s) using Maximum Month Flows (MMF)	kg BOD/day	1075	1075	1075	750	750	1075	1075
Natural habitat restoration area	Footprint of restored area (i.e. existing City lagoon)	m^2	50000	50000	50000	50000	0	50000	50000
Social									
Recreational water use	Fecal coliform concentration at the edge of the IDZ using Maximum Month Flows (MMF)	CFU/100mL	1	1	1	7	7	2	2
Economic									
Capital cost	Initial capital costs incurred for works constructed in the first 5 years of implementation	2014 $	$18,410k	$17,330k	$16,314k	$15,846k	$15,861k	$15,585k	$14,804k
Life-cycle cost	Total NPV of all construction and O&M costs over an analysis horizon from Year 2015 to 2035	2014 $	$26,900k	$25,700k	$24,470k	$23,400k	$23,860k	$23,440k	$23,300k

48

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Today's Objective:

Evaluate the Importance / Weighting of the Quantifiable Attributes

City of Port Alberni Wastewater Advisory Committee

Considerations in Coming Up with Weightings

- Participation: For this group (members of the WAC)
- Context: the City of Port Alberni's LWMP
- Who do you represent as a member of the WAC?

City of Port Alberni Wastewater Advisory Committee

Start with a sub criterion...

	Ballot Number
Objective: Weight relative importance of sub-criteria	
Instructions: Highest value (i.e. most important) sub-criteria in each main category to be weighted = 100. Other sub-criteria to be weighted < or = 100	
Criterion	Sub Criterion
Environmental	
Physical footprint disturbance	
Carbon footprint	
Aquatic life	
Natural habitat restoration area	

Your Numbers Here

Repeat for Social and Economic Criteria

City of Port Alberni Wastewater Advisory Committee

Start with a sub criterion...

Objective: Summarize sub-criteria weightings

Ballot Number

Criterion	1	2	3	4	5	6	7	8	Average	Maximum	Minimum	Consensus
Environmental												
Physical footprint disturbance									#DIV/0!	0	0	
Carbon footprint									#DIV/0!	0	0	
Aquatic life									#DIV/0!	0	0	
Natural habitat restoration area									#DIV/0!	0	0	

Repeat for Social and Economic Criteria

City of Port Alberni Wastewater Advisory Committee

Move on to the main categories...

	Ballot Number
Objective: Weight relative importance of main criteria	
Instructions: Highest value (i.e. most important) main criteria category to be weighted = 100. Other main criteria to be weighted < or = 100	
Criterion	Main Criteria Weight
Environmental	
Social	
Economic	

Your Numbers Here

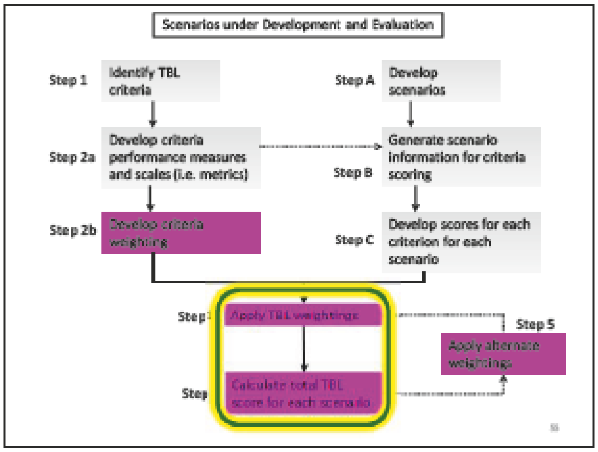
City of Port Alberni Wastewater Advisory Committee

Move on to the main categories...

Objective: Summarize main criteria weightings

Ballot Number

Criterion	1	2	3	4	5	6	7	8	Average	Maximum	Minimum	Consensus
Environmental									#DIV/0!	0	0	
Social									#DIV/0!	0	0	
Economic									#DIV/0!	0	0	



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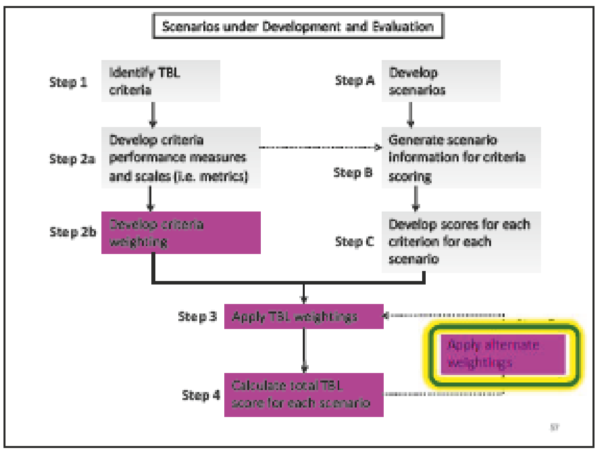
Let's turn to the software…



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TBL vs. Mitigation Strategies

- The attributes in the TBL will assist **in selecting a preferred scenario**
- Mitigations will be considered in the **implementation and design process**

City of Port Alberni Wastewater Advisory Committee

Examples of Mitigation Strategies

- Treatment and design
- Operations procedures
- Physical footprint
- Diffuser design

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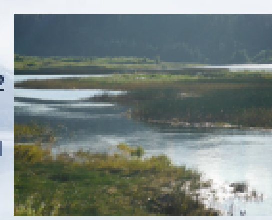
Next Steps

- Confirm preferred scenario
- Complete Draft Stage 2 LWMP Report
- Conduct archaeological investigations
- Complete EIS Part 2
- Submit Draft Stage 2 LWMP Report to the WAC for comments



City of Port Alberni Wastewater Advisory Committee

Thank You

City of Port Alberni Wastewater Advisory Committee

February 24, 2015

City of Port Alberni Wastewater Upgrades – Stage 2 LWMP

Wastewater Advisory Committee

Meeting No. 7

City of Port Alberni Wastewater Advisory Committee

Agenda

1. Introductions
2. LWMP Framework
3. Recap of WAC Meeting #6
4. Progress Since WAC Meeting #6
   a. Development of Scenario #7
   b. Technical Meeting – Jan. 15, 2015
5. Comparative Evaluation
   a. TBL
   b. Risk
   c. TBL + Risk
   d. Confirm preferred Scenario
6. Next Steps

City of Port Alberni Wastewater Advisory Committee

Introductions

City of Port Alberni Wastewater Advisory Committee

LWMP Framework

City of Port Alberni Wastewater Advisory Committee

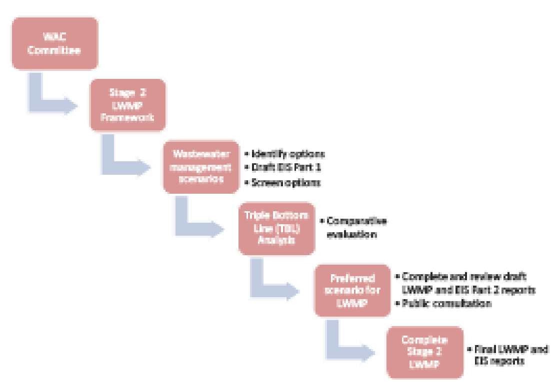
Liquid Waste Management Plan (LWMP) Process

- Engineering planning document meant to provide direction
- Consensus required with community stakeholders, First Nations, and the general public

Stage 1
Identification of key wastewater management issues

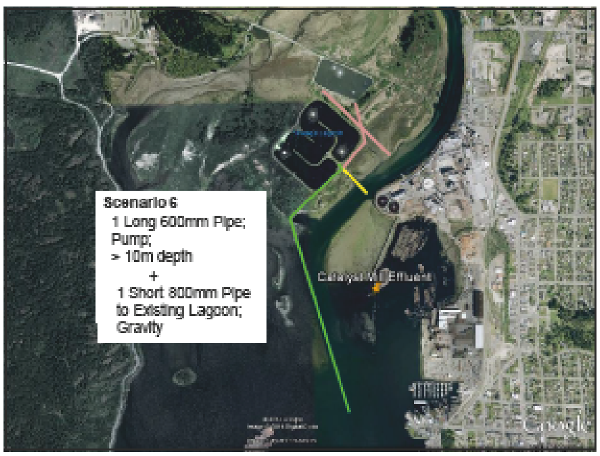
Stage 2
Evaluation and selection of the preferred liquid waste management strategy

Stage 3
Implementation of the preferred wastewater management strategy



Recap of WAC Meeting #6

	Scenario 1	Scenario 2a	Scenario 2b	Scenario 3	Scenario 4	Scenario 5	Scenario 6
Flows	The entire flow discharged by gravity through a single pipe and discharged at a 10m depth in the estuary.	The flow is split between two large pipes, both discharged by gravity at a depth of 10m in the estuary.	The flow is split between two pipes, one of which discharges by gravity and the other is pumped. Both pipes discharge at a depth of 10m in the estuary.	The flows are split between two gravity pipes, with Pipe #1 discharging at a depth of 10m in the estuary, and Pipe #2 discharging adjacent to the lagoons. Flows up to 30 ML/d will be discharged through Pipe #1. The excess flow will be discharged through a short Surplus Effluent Discharge (SED) (Pipe #2) near the existing City effluent channel.	The flows are split between two gravity pipes, with Pipe #1 discharging at a depth of 10m in the estuary, and with Pipe #2 discharging into Lagoon A. Flows up to 30 ML/d will be discharged through Pipe #1. The excess flow (during wet weather flow events) flows through Lagoon A before being discharged through the existing effluent channel.	The entire flow is pumped (using a low head high flow pump) through a single pipe and discharged at a 10m depth in the estuary.	The entire flow is pumped (using a large pump) through a single pipe and discharged at a 10m depth in the estuary.
Lagoon A (Existing City Lagoon)	Lagoon A is decommissioned and restored as a natural habitat area.	Lagoon A is decommissioned and restored as a natural habitat area.	Lagoon A is decommissioned and restored as a natural habitat area.	Lagoon A is decommissioned and restored as a natural habitat area.	Lagoon A is utilized downstream of the upgraded lagoon to handle wet weather flows.	Lagoon A is decommissioned and restored as a natural habitat area.	Lagoon A is decommissioned and restored as a natural habitat area.
Long term strategy when peak flows are reduced to < 30 ML/d	No change.	Once flows are reduced to 30 ML/d, Pipe #2 can be decommissioned.	Once flows are reduced to 30 ML/d, Pipe #2 can be decommissioned.	Once flows are reduced to 30 ML/d, Pipe #2 to the SED can be decommissioned.	Once flows are reduced to 30 ML/d, Pipe #2 to Lagoon A can be decommissioned.	No change.	No change.



Triple Bottom Line

Comparative Evaluation

- TBL results **inform** discussion / decision(s)
- **Simple-as-defendable** is best
- Methodology **nuances** are important

Multi-Criteria Analysis

- Choosing a scenario based on how well it scores/rates against a chosen set of criteria/attributes
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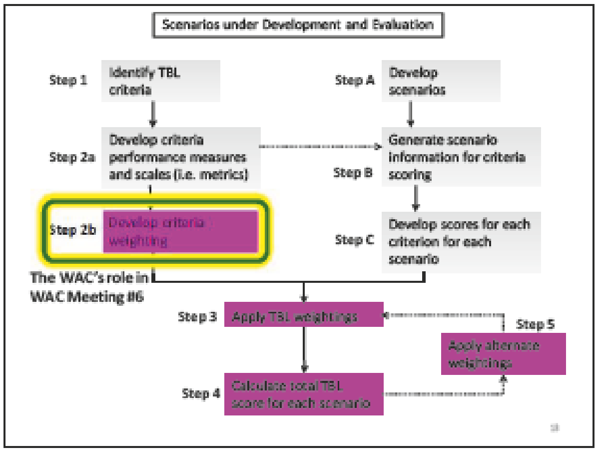
- Results sort scenario by preference
- An important nuance: inventories vs. impacts



The Populated Table

Attribute	Metric	Units	Scenario 1	Scenario 2a	Scenario 2b	Scenario 3	Scenario 4	Scenario 5	Scenario 6
Environmental									
Physical footprint disturbance	Disturbed terrestrial + foreshore / estuary area in locations	m^2	7,200	7,200	6,300	6,120	7,580	5,400	4,500
Carbon footprint	GHG emissions associated with operations over an analysis timeframe from Year 2015 to 2035	tCO2e	2,777	2,777	2,840	2,777	2,777	2,868	3,448
Aquatic life	The Biochemical Oxygen Demand discharged through the outfall(s) using Maximum Month Flows (MMF)	kg BOD/day	1075	1075	1075	750	750	1075	1075
Natural habitat restoration area	Footprint of restored area (i.e. existing City lagoon)	m^2	80000	80000	80000	80000	0	80000	80000
Social									
Recreational water use	Fecal coliform concentration at the edge of the IDZ using Maximum Month Flows (MMF)	CFU/100mL	3	3	3	7	7	2	2
Economic									
Capital cost	Initial capital costs incurred for works constructed in the first 5 years of implementation	2014$	$18,410k	$17,392k	$16,504k	$15,946k	$15,861k	$15,965k	$14,804k
Life - cycle cost	Total NPV of all construction and O&M costs over an analysis timeframe from Year 2015 to 2035	2014$	$26,900k	$25,700k	$24,470k	$20,490k	$25,860k	$20,440k	$21,500k

City of Port Alberni Wastewater Advisory Committee

Consensus of Weightings

Criterion	Consensus	
Environmental	100	
Physical footprint disturbance		50
Carbon footprint		50
Aquatic life		100
Natural habitat restoration area		50
Social	50	
Recreational water use		100
Economic	75	
Capital cost		100
Life - cycle cost		90

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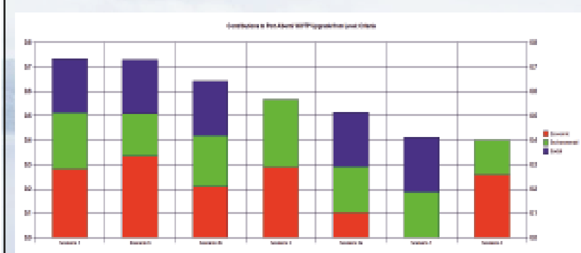
Results from the TBL Analysis



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Progress Since WAC Meeting #6 (October 29, 2014)

City of Port Alberni Wastewater Advisory Committee

Development of Scenario #7

- Scenario #7 was an outcome of WAC Meeting #6
- Description
  - Final treated effluent is pumped through a single pipe to an engineered diffuser at a depth of 3m at low tide (elevation of -3m chart datum)
  - Dilution ratio: varies from 48:1 to 190:1
  - The existing City lagoon is decommissioned and restored as a natural habitat

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Technical Meeting – Jan. 15, 2015

- Included representation from MOE and DFO
- Presentation of Scenario #7 to the MOE
- The city will request a substitution of the minimum depth requirement in the MWR
- MOE has agreed to consider the substitution.
- Of key importance to the MOE will be ensuring adequate protection of human health
- AE to provide addendum to EIS Part 1 report

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Discharge to Marine Estuary – Brief Summary of the MWR Requirements

- To protect public health
  - Outfall at a minimum depth of 10m
  - Disinfection requirements
  - Dilution requirements
  - Setback distance from recreational and shellfish areas
- Additional Requirements
  - Back-up generator required
  - Redundancy in process units

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Other Possible Scenarios

- Could all of the requirements of the MWR be met with a deeper and longer outfall?
- AE retained Seaconsult to develop an order of magnitude DO model for this system to address the question of DO conditions for a discharge beneath the halocline
  - No benefit relative to additional cost
  - Plume trapping in the lower layer is prolonged

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Comparative Evaluation

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Triple Bottom Line (TBL) Analysis

The Populated Table

Attribute	Metric	Units	Scenario 1	Scenario 2a	Scenario 2b	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
Environmental										
Physical footprint disturbance	Disturbed terrestrial + foreshore / estuary area in locations	m²	7,200	7,200	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Carbon footprint	GHG emissions associated with operations over an analysis horizon from Year 2015 to 2035	tCO2e	2,777	2,777	[illegible]	2,777	2,777	[illegible]	[illegible]	[illegible]
Aquatic life	The Biochemical Oxygen Demand discharged through the outfall(s) using Maximum Month Flows (MMF) at a 10m depth	kg BOD/day	1075	1075	1075	750	750	1075	1075	0
Natural habitat restoration area	Footprint of restored area (i.e. existing City lagoon)	m²	50000	50,000	50,000	50,000	0	50000	50000	50000
Social										
Recreational water use	Fecal coliform concentration at the edge of the IDZ using Maximum Month Flows (MMF)	CFU/100 mL	2	2	1	7	7	2	2	6
Economic										
Capital cost	Initial capital costs incurred for works constructed in the first 5 years of implementation	2014 $	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Life - cycle cost	Total NPV of all construction and O&M costs over an analysis horizon from Year 2015 to 2035	2014 $	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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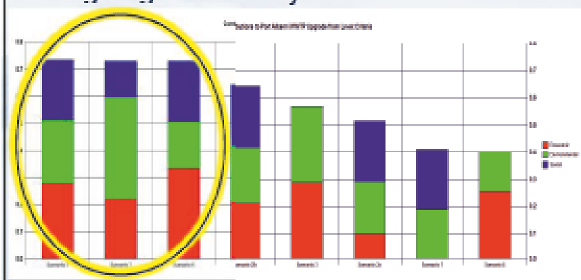
Results of the TBL Analysis using the Weighting Reached by Consensus



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Summary of Short Listed Scenarios

- Scenario 5:
  - 32" pipe, pumped, ~11m depth at low tide (elevation of -11m chart datum)
- Scenario 6:
  - 24" pipe, pumped, ~11m depth at low tide (elevation of -11m chart datum)
- Scenario 7:
  - 36" pipe, pumped, ~3m at low tide (elevation of -3m chart datum), ~5m at mean tide, ~7m at high tide

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Summary of Weightings

Criterion	Consensus		Keep in the evaluation
Environmental	100		YES
Physical footprint disturbance		50	YES
Carbon footprint		50	YES
Aquatic life		100	YES
Natural habitat restoration area		50	NO
Social	50		YES
Recreational water use		100	YES
Economic	75		NO
Capital cost		100	NO
Life - cycle cost		90	NO

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Summary of Weightings

Criterion	Consensus		Keep in the evaluation
Environmental	100		YES
Physical footprint disturbance		50	YES
Carbon footprint		50	YES
Aquatic life		100	YES
Social	50		YES
Recreational water use		100	YES

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Let's turn to the software…

Summary of Weightings

Criterion	Consensus		Keep in the evaluation
Environmental	100		YES
Physical footprint disturbance		50	YES
Carbon footprint		50	YES
Aquatic life		100	YES

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Let's turn to the software…

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Risk Factors

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Triple Bottom Line

+ Risk

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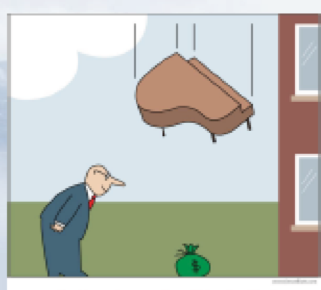
Why?



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Risk Assessment

- Subjective nature → more complex
- **Individual risk factor =**
  Likelihood of occurrence x Severity of impact
- **Sum of individual risk factor =**
  Total risk consequence score
  → into the TBL + Risk model

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Risk Factor Evaluation

Risk Factor Consequence (Probability x Severity)			
Negligible (Workable)	Medium (Tolerable)	High (Undesirable)	Critical (Unacceptable)

	Severity				
Probability	Insignificant	Minor	Moderate	Major	Extreme
Rare	5	15	50	200	700
Unlikely	50	150	500	2,000	7,000
Possible	125	375	1,250	5,000	17,000
Likely	250	750	2,500	10,000	35,000
Almost Certain	500	1,500	5,000	20,000	70,000

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Summary of Risk Factors

- Risk Factor 1: Receiving Water Dissolved Oxygen Levels
- Risk Factor 2: Receiving Water Fecal Coliforms Levels

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Risk Factor 1 – Receiving Water Dissolved Oxygen Levels

- Considers potential effluent-related effects on in-situ DO levels

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Risk Factor 1: Receiving Water Dissolved Oxygen Levels

Probability of Occurrence based on:

The probability that the discharge of City effluent , under normal operating conditions, will result in a reduction of in-situ dissolved oxygen levels to below the threshold where adverse effects on Pacific salmon have been historically experienced

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Risk Factor 1: Receiving Water Dissolved Oxygen Levels

Probability of Occurrence	Description	Value
Rare	Possible but surprising	1
Unlikely	Not expected	10
Possible	Less than 50-50 chance	25
Likely	More than 50-50 chance	50
Almost Certain	Expected	100

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Risk Factor 1: Receiving Water Dissolved Oxygen Levels

Severity of Impact based on:

Both the anticipated extent of the potential reduction in in-situ DO levels and the volume of the affected area relative to that of known salmon habitat in Upper Alberni Inlet;

Includes consideration of both acute (mortality) and chronic (reproduction and survival) effects.

6.5 mg/L instantaneous minimum and 9 mg/L 30-day mean DO values

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Risk Factor 1: Receiving Water Dissolved Oxygen Levels

Severity of Impact	Description	Value
Insignificant	No change in magnitude of low DO events (i.e. below criteria) outside IDZ compared to baseline	5
Minor	Slight increase in magnitude of low DO events (Δ < 0.3 mg/L)	15
Moderate	Measureable increase in magnitude of low DO events (Δ = 0.3 to 1.0 mg/L)	50
Major	Significant increase in magnitude of low DO events (Δ >1.0 mg/L)	200
Extreme / catastrophic	A major fish kill event	700

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Risk Factor 1: Receiving Water Dissolved Oxygen Levels

Scenario	Probability	Severity	Consequence
Scenario 5	25	50	1,250
Scenario 6	25	50	1,250
Scenario 7	25	15	375

Risk Factor Consequence (Probability x Severity)			
Negligible (Workable)	Medium (Tolerable)	High (Undesirable)	Critical (Unacceptable)

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Risk Factor 2 – Receiving Water Fecal Coliforms Levels

- Considers potential effluent-related effects on in-situ fecal coliform levels

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Risk Factor 2: Receiving Water Fecal Coliform Levels

Probability of Occurrence based on:

The probability that the City will experience a short-duration "failure event" that results in an effluent-related exceedence of the recreational water quality guideline of 200 cfu/100 mL (geometric mean) at the edge of the initial dilution zone

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Risk Factor 2: Receiving Water Fecal Coliform Levels

Probability of Occurrence	Description	Value
Rare	Possible but surprising	1
Unlikely	Not expected	10
Possible	Less than 50-50 chance	25
Likely	More than 50-50 chance	50
Almost Certain	Expected	100

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Risk Factor 2: Receiving Water Fecal Coliform Levels

Severity of Impact based on:

Based on the anticipated fecal coliform levels at the edge of the IDZ in the Scenario and relative to those measured (i.e. existing conditions) per the field programs conducted in the months of June and September 2013.

With lagoon effluent fecal coliform levels in the order of 10^4 CFU/100 mL the concentrations approximately 100 m downstream of the existing effluent channel confluence with the Somass River were in the order of 10^3 CFU/100 mL in June/September 2013 at low tide

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Risk Factor 2: Receiving Water Fecal Coliform Levels

Severity of Impact	Description	Value
Insignificant	Fecal Coliform concentrations 1 order-of-magnitude lower than existing condition	5
Minor	Fecal Coliform concentrations same order-of-magnitude as existing condition	15
Moderate	Fecal Coliform concentrations 1 order-of-magnitude higher than existing condition	50
Major	Fecal Coliform concentrations 2 order-of-magnitude higher than existing condition	200
Extreme / catastrophic	Fecal Coliform concentrations 3 order-of-magnitude higher than existing condition	700

City of Port Alberni Wastewater Advisory Committee

Risk Factor 2: Receiving Water Fecal Coliform Levels

Scenario	Probability	Severity	Consequence
Scenario 5	25	5	125
Scenario 6	25	5	125
Scenario 7	25	15	375

Risk Factor Consequence (Probability x Severity)			
Negligible (Workable)	Medium (Tolerable)	High (Undesirable)	Critical (Unacceptable)

50

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Total Scores from the Risk Factors

Scenario	RF 1: DO Levels	RF 2: Fecal Coliforms	Total
Scenario 5	1,250	125	1,375
Scenario 6	1,250	125	1,375
Scenario 7	375	375	750

Input into the TBL + Risk

51

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Combined TBL + Risk

52

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Summary of Weightings

Criterion	Consensus	
Environmental	100	
Physical footprint disturbance		50
Carbon footprint		50
Aquatic life		100
Risks	100	
Total risk severity score		100

53

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Let's turn to the software…

54

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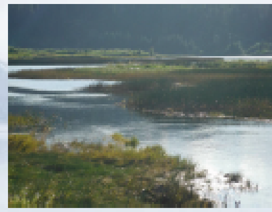
Next Steps

- Confirm preferred scenario
- Conduct archaeological investigations
- Public consultation
- Complete Draft Stage 2 LWMP Report and EIS Part 2 Report
- Submit Draft Stage 2 LWMP Report to the WAC for comments



City of Port Alberni Wastewater Advisory Committee

Thank You

City of Port Alberni Wastewater Advisory Committee

October 6, 2016

City of Port Alberni Wastewater Upgrades – Stage 2 LWMP

Wastewater Advisory Committee

Meeting No. 8

City of Port Alberni Wastewater Advisory Committee

Agenda

1. Introductions
2. Review LWMP Framework
3. Recap of WAC Meeting #7
4. Draft Environmental Impact Study (EIS) Part 2
   - Summary Presentation
   - Discussion
5. Project Components for Preferred Scenario
6. Next Steps

City of Port Alberni Wastewater Advisory Committee

Introductions

City of Port Alberni Wastewater Advisory Committee

LWMP Framework

City of Port Alberni Wastewater Advisory Committee

Liquid Waste Management Plan (LWMP) Process

- Engineering planning document meant to provide direction
- Requires the input of community stakeholders, First Nations, and the general public

Stage 1: Identification of key wastewater management issues → **Stage 2**: Evaluation and selection of the preferred liquid waste management strategy → **Stage 3**: Implementation of the preferred wastewater management strategy

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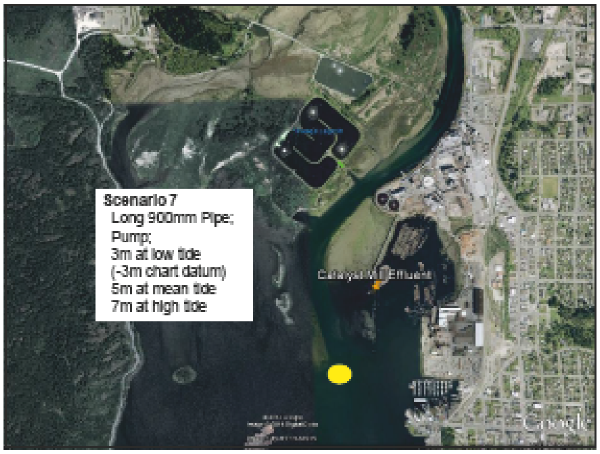
Recap of WAC Meeting #7

Preferred Wastewater Management Scenario



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Key Issues: What the WAC has told us …

- System should protect quality of environment for adult & juvenile fish
  - ➢ *Key parameters*, Dissolved Oxygen (DO), Ammonia, Fecal Coliforms
- Habitat restoration is desired
- Consider climate change
- Environmental monitoring is needed

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Protection of Human Health

- The final effluent will be disinfected
- Recreational and fishing activities will be safer
- Current standards will be met

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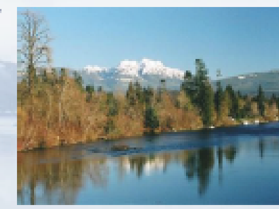
Discharge Considerations

- BOD loads will be reduced, but …..
- Risks to salmon from low dissolved oxygen levels
  - ➢ Cumulative effect if loading is below halocline
- Improve treated effluent quality to protect the receiving environment



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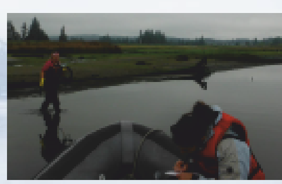
Environmental Impact Study (EIS)

Part 1 (Complete)
- Field investigations
- Preliminary modelling
- Develop scope for Part 2

Part 2 (Draft Submitted)
- Field data collection
- Dilution modelling
- Effects assessment
- Mitigation plan
- Design of pre-discharge & operational monitoring programs



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Outfall Effluent Dispersion Modelling

- Model - Visual Plumes (USEPA)
- Model initially used to find optimal location & determine basic MWR compliance
- For selected outfall site, model used to:
  - Determine that Water Quality Guidelines are met at edge of Initial Dilution Zone
  - Determine treatment levels for bacteria & ammonia
  - Assess effects on DO and potential effects on fish (adults and juveniles)

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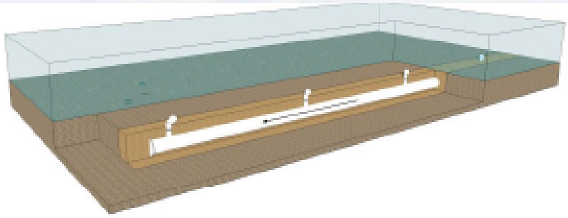
Outfall System



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Findings from Outfall Modelling

- Summer dilution at edge of IDZ range from 16:1 (worst case) to 140:1
- Winter dilution 20:1 to 401:1
- "Worst case" conditions occur relatively infrequently (e.g. low slack tide)
- During flood and ebb tides, which is about 75% of time, dilutions range from 61:1 to 106:1 in summer
- Effluent plume is buoyant, rises up through water column

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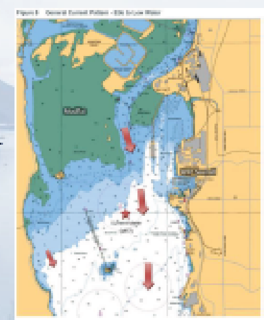
Findings from Outfall Modelling (cont.)

- Effluent plume "traps" below surface
- Water Quality Guidelines will be met under all conditions
- Determined the required "end-of-pipe values" for fecal bacteria and ammonia-N
- Design can achieve those targets
- Low risk to human health



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Dissolved Oxygen (DO) Assessment

- Baseline – Low DO conditions occur now, but Catalyst's monitoring suggests improving trend
- Will the change in outfall location change the magnitude, frequency & duration of low DO events?

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DO Assessment Summary

- Negligible change in DO in the top 4 m in summer
- Decrease of about 0.24 mg/L in the 4 m to 6 m depth
- Negligible change below 6 m depth (plume is buoyant)

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Nutrient Loading

- Baseline situation – nutrients (N and P) released to Somass River. Evidence of algal buildup along right bank
- Reason for upgrade – to bring Port Alberni into compliance with WSER and MWR
- New system will likely reduce total N and P loads compared to baseline
- Note of caution: Lagoons have limited capability to remove nutrients, so nutrient load reduction could be small (but still represents an improvement)

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EIS - Potential Effects on Fish

- Low probability of effects on returning adult salmon in most years
- **But, the potential for more frequent warm conditions warrants caution & monitoring**
- Also low potential for effects on smolts and juveniles:
  - Magnitude & spatial extent of DO change is low; and
  - these fish tend to move away from unfavourable conditions
- Results reviewed with DFO & AVEA on August 29, 2016
- Draft reports submitted to MoE on August 30

City of Port Alberni Wastewater Advisory Committee

EIS – Monitoring Recommendations

- Two components – End-of-pipe (final effluent) and Receiving Environment
- End of pipe – sampling for WSER and WMR parameters including acute toxicity (rainbow trout)
- Receiving Environment (draft – comments welcome!)
  - 2 reference (control) sites and 4 "downstream" sites
  - Water quality, DST profile, sediment quality and benthic community at 5 sites; WQ & DST only at one
  - Additional, more frequent DO profiles along transects during critical late summer period and in warm, dry years

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Possible Coordination with Catalyst

- Data from Catalyst's work supported the outfall modelling studies
- Mill does extensive monitoring as required by *Fisheries Act* and BC *Environmental Management Act*
- There are potential benefits to the City and the mill from working together on monitoring water quality, DO & biota (e.g., lower cost, better science)
- Local Monitoring Committee (LMC) in place

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Key Project Elements

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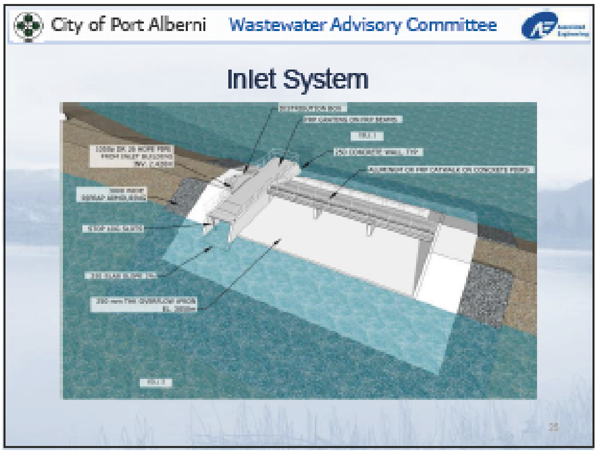
Screening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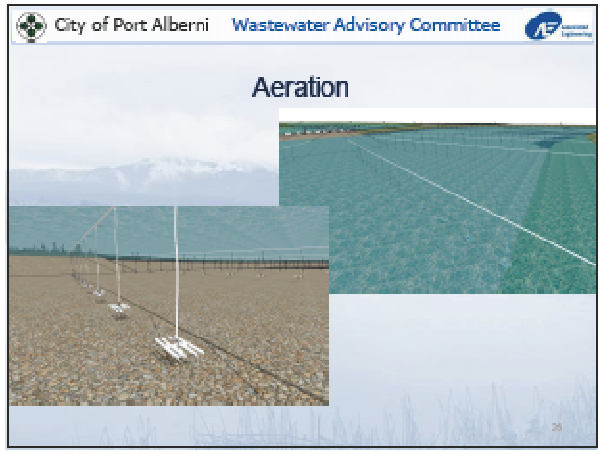
Wastewater Advisory Committee
Inlet System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Aeration


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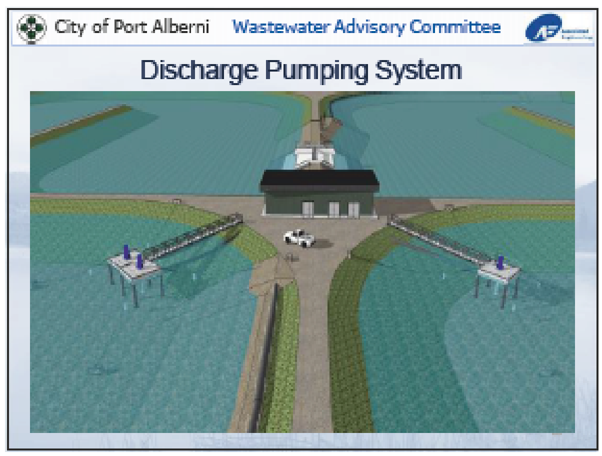
UV Disinfection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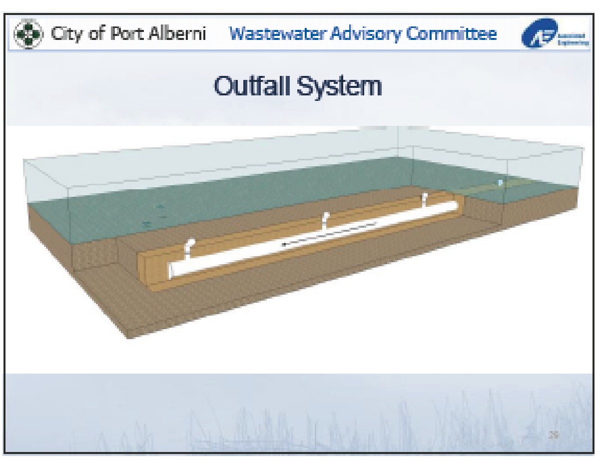
Discharge Pumping System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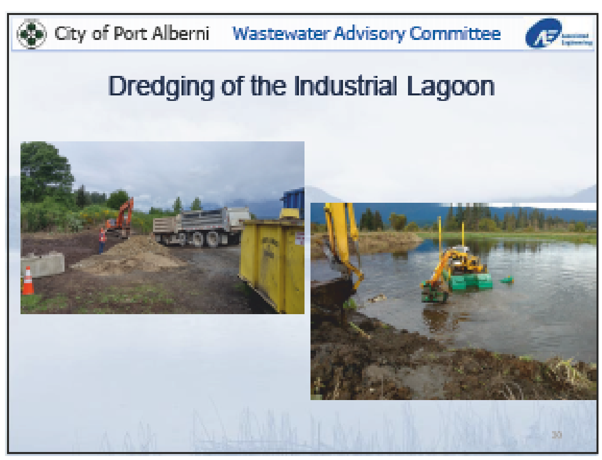
Wastewater Advisory Committee
Outfall System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Wastewater Advisory Committee
Dredging of the Industrial Lagoon

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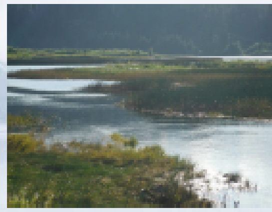
Next Steps

- Complete archaeological investigations
- Public consultation
- Complete Draft Stage 2 LWMP Report (WAC Meeting #9)
- Submit Draft Stage 2 LWMP Report to the WAC for comments



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Thank You

City of Port Alberni | Wastewater Advisory Committee

February 14, 2017

City of Port Alberni Wastewater Upgrades – Stage 2 LWMP

Wastewater Advisory Committee

Meeting No. 9

City of Port Alberni | Wastewater Advisory Committee

Agenda

1. Introductions
2. Today's Objectives
3. LWMP Stage 2 Document
4. Lagoon Restoration Plan
5. Next Steps

City of Port Alberni | Wastewater Advisory Committee

Introductions

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Today's Objective

Discuss the content of the LWMP Stage 2 Document

City of Port Alberni | Wastewater Advisory Committee

Liquid Waste Management Plan process

- Engineering planning document meant to provide direction
- Consensus required with community stakeholders, First Nations, and the general public

Stage 1: Identification of key wastewater management issues → Stage 2: Evaluation and selection of the preferred liquid waste management strategy → Stage 3: Implementation of the preferred wastewater management strategy

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Stage 2 LWMP Overview

City of Port Alberni Wastewater Advisory Committee

Table of Contents LWMP Stage 2 (1 of 2)

City of Port Alberni Wastewater Advisory Committee

Table of Contents LWMP Stage 2 (2 of 2)

City of Port Alberni Wastewater Advisory Committee

Section 1: Introduction

- Background and project history
- Updates and upgrades since Stage 1 LWMP
  - Acquiring the Industrial Lagoon
  - Community population projections
  - Closure of fish processing plant reduces non-domestic wastewater
  - Elimination of the Pemberton sanitary sewer overflow (SSO)

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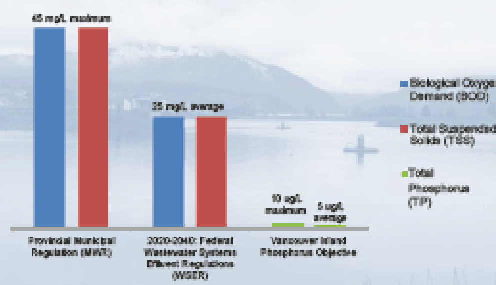
Section 2: Regulatory Framework



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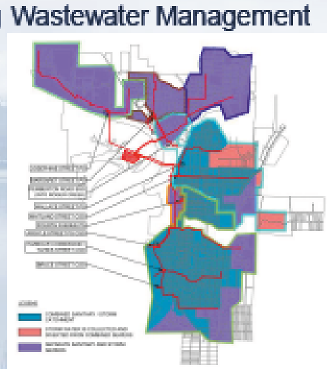
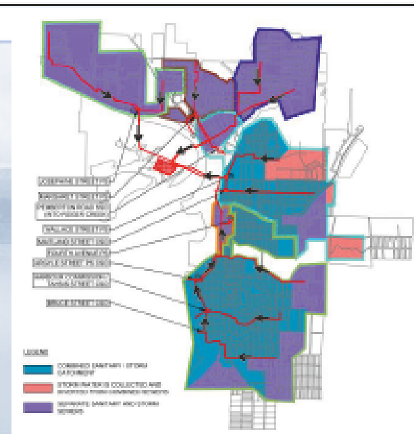
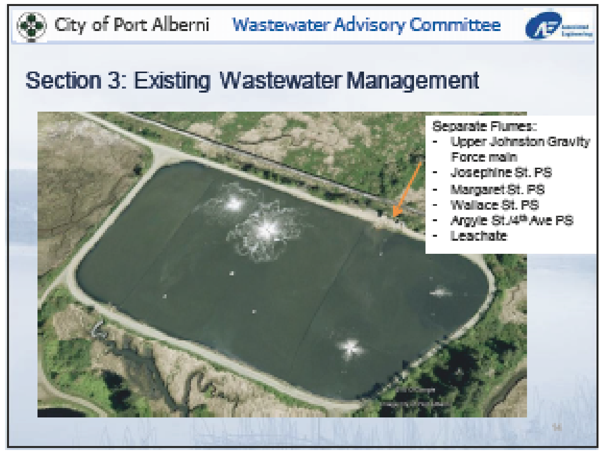
Section 3: Existing Wastewater Management

Collection and conveyance system






Existing
City
Lagoon
Catalyst Lagoon
Acquired by City
Catalyst
Mill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Wastewater Advisory Committee
Section 3: Existing Wastewater Management
Separate Flumes:
- Upper Johnston Gravity Force main
- Josephine St. PS
- Margaret St. PS
- Wallace St. PS
- Argyle St./4th Ave PS
- Leachate


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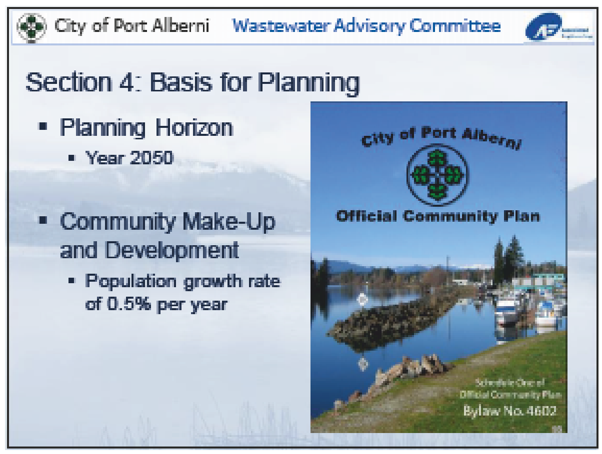
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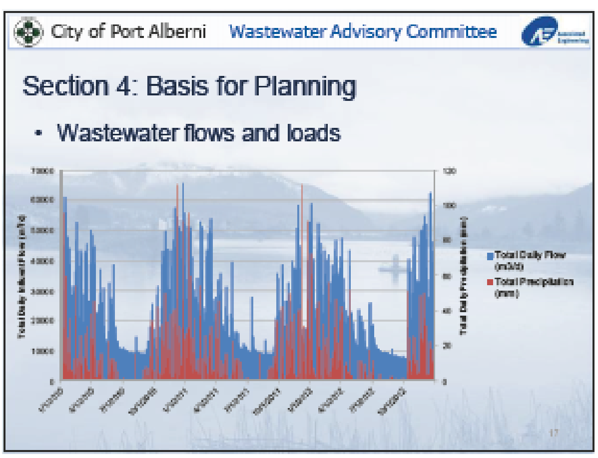
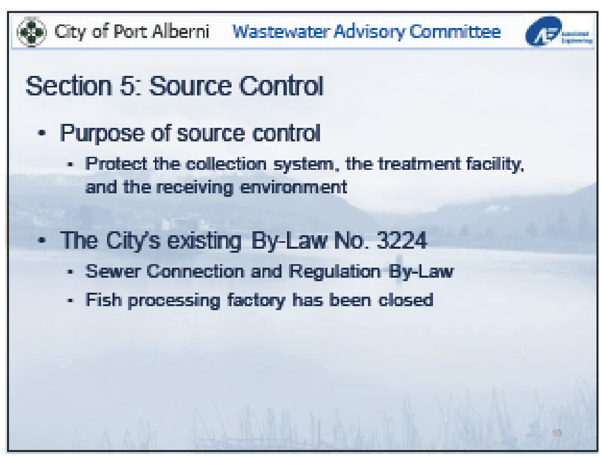
Section 4: Basis for Planning
▪ Planning Horizon
▪ Year 2050
▪ Community Make-Up and Development
▪ Population growth rate of 0.5% per year
City of Port Alberni
Official Community Plan
Bylaw No. 4602


City of Port Alberni
Wastewater Advisory Committee
Section 4: Basis for Planning
• Wastewater flows and loads
Total Daily Flow (m3/d)
Total Precipitation (mm)


City of Port Alberni
Wastewater Advisory Committee
Section 5: Source Control
• Purpose of source control
• Protect the collection system, the treatment facility, and the receiving environment
• The City's existing By-Law No. 3224
• Sewer Connection and Regulation By-Law
• Fish processing factory has been closed

City of Port Alberni | Wastewater Advisory Committee

Section 6: Effluent Discharge

- Identification of potential effluent discharge locations
- Screening exercise for effluent discharge locations
- Effluent dilution investigations were the focus of the Environmental Impact Study (EIS)

19

City of Port Alberni

20

City of Port Alberni | Wastewater Advisory Committee

21

City of Port Alberni | Wastewater Advisory Committee

Section 7: Wastewater Treatment

- Effluent quality requirements
  - BOD, TSS, Ammonia
- Treatment process configuration
- Cost estimates

22

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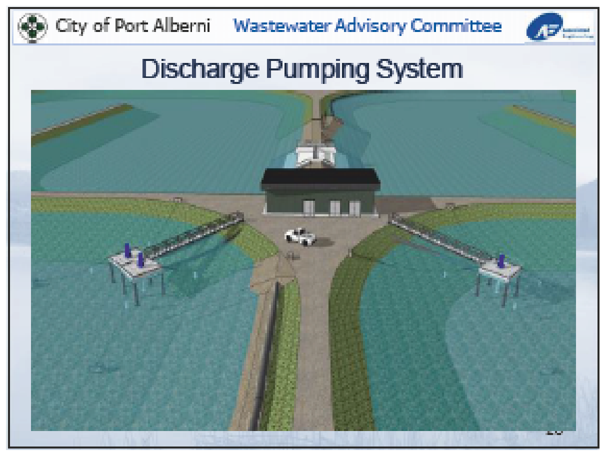
Key Project Elements

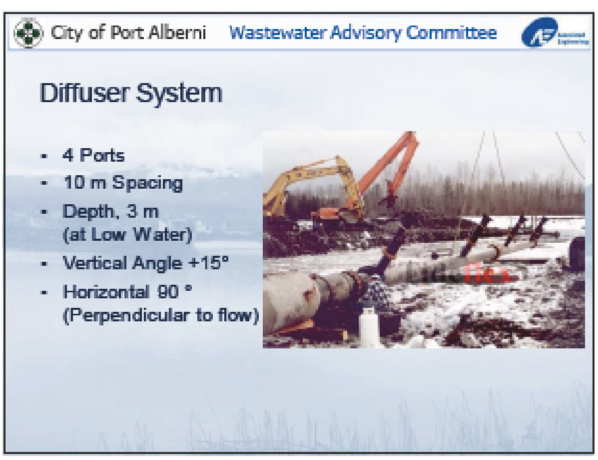
23

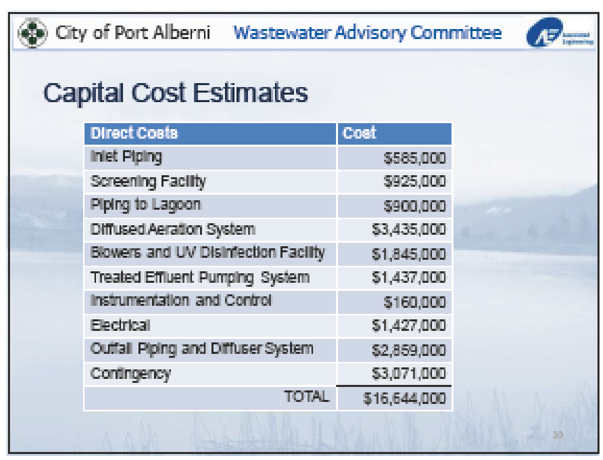
City of Port Alberni | Wastewater Advisory Committee

Screening

24






City of Port Alberni Wastewater Advisory Committee

Capital Cost Estimates

Direct Costs	Cost
Inlet Piping	$585,000
Screening Facility	$925,000
Piping to Lagoon	$900,000
Diffused Aeration System	$3,435,000
Blowers and UV Disinfection Facility	$1,845,000
Treated Effluent Pumping System	$1,437,000
Instrumentation and Control	$160,000
Electrical	$1,427,000
Outfall Piping and Diffuser System	$2,859,000
Contingency	$3,071,000
TOTAL	$16,644,000

City of Port Alberni Wastewater Advisory Committee

Capital Cost Estimates

Indirect Costs	Cost
Environmental Impact Study Completion	$65,000
Permitting including approval of LWMP	$100,000
Engineering	$1,664,000
Administration	$333,000
Miscellaneous	$333,000
TOTAL	$2,495,000
TOTAL ESTIMATED CAPITAL COSTS	**$19,139,000**

City of Port Alberni Wastewater Advisory Committee

Effects on Fish

- Low probability of effects on returning adult salmon in most years
- The potential for more frequent warm conditions warrants caution & monitoring
- Also low potential for effects on smolts and juveniles:
  - Magnitude & spatial extent of DO change is low and these fish tend to move away from unfavourable conditions

City of Port Alberni

Protection of Human Health

- Final effluent will be disinfected using ultraviolet (UV) to reduce the potential for human contact with pathogens

City of Port Alberni Wastewater Advisory Committee

Section 8: Combined Sewer Overflows

- Major Sanitary and Storm Upgrades

Year	Location	Cost ($)
2001	Wallace Sewage Pump House Upgrade	$345,000
2008	North Port Sewer Abatement Project	$2,281,000
2008	Argyle Pump House Emergency Bypass Connection	$60,000
2009	Argyle Pump House Upgrade	$1,200,000
2011	Argyle Street - Kingsway to Outfall (Outfall & Separator)	$114,000
2011	Wood Avenue Interceptor (600 m of 600 mm)	$300,000

- Planned Upgrades
  - Continued separation of combined sewer system

City of Port Alberni Wastewater Advisory Committee

Section 9: Sustainability and Resource Recovery

- Effluent reuse → Not feasible
- Heat recovery → Not feasible
- Biosolids composting and reuse
- Decommission and restore existing City lagoon

City of Port Alberni Wastewater Advisory Committee

Section 10: Urban Stormwater Management

- City trialed a rainwater harvesting program
- City is in favour of low impact developments
  - Green roofing
  - Permeable pavement

City of Port Alberni Wastewater Advisory Committee

Section 11: Public and Agency Consultation

- Wastewater Advisory Committee (WAC)
- First Nations Consultation
- Ministry of the Environment (MOE) – Advisory role
- Public Consultation
  - Open house
  - Mail outs
  - Web-based communications

City of Port Alberni Wastewater Advisory Committee

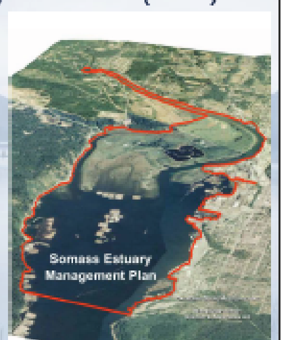
Section 12: Summary and Next Steps

Stage 1: Identification of key wastewater management issues → Stage 2: Evaluation and selection of the preferred liquid waste management strategy → Stage 3: Implementation of the preferred wastewater management strategy

City of Port Alberni Wastewater Advisory Committee

Somass Estuary Management Plan (2004)

- Endorsed by City of Port Alberni, DFO, Tseshaht, Hupacasath, DFO, MoE, and stakeholders
- *Vision: To maintain and enhance the productivity and diversity of the natural resources in the estuary with consideration for social and economic returns and benefits to the community ...*
- Objective #7 – Work with others on management of discharges to continue to improve the water quality in the estuary.



City of Port Alberni Wastewater Advisory Committee

Old Lagoon Decommissioning & Restoration

- Somass Estuary Plan promotes restoration of this "Very High Value" habitat type
- Grant funding to plan & begin restoration (Environment Canada)
- Develop conceptual plan by March 31, 2017
  - Note: Enough $$ in place to get started; need flexible plan that enables natural process and allows more work later
- Inviting interested WAC members to attend a scoping workshop before end of February 2017

City of Port Alberni Wastewater Advisory Committee

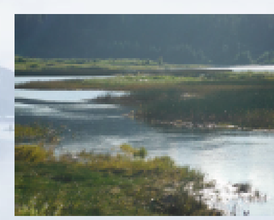
Lagoon Restoration

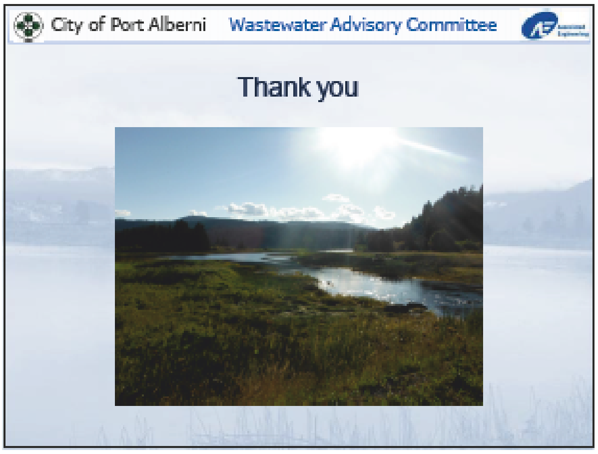
- The goal is to restore the old City lagoon to become tidal marsh habitat.
- The process must be: **effective, efficient** and **engaging**.
- Ecological restoration making use of natural recovery processes has repeatedly proven **effective and efficient**.
- **Engagement** begins through meeting with stakeholders and rights holders to outline: costs, timelines, issues and restoration targets.

City of Port Alberni Wastewater Advisory Committee

Next Steps

- WAC to provide comments before Feb. 27 Council Meeting
- Public Event: March 8, 2017
- Incorporate comments from the WAC and the public
- Submit Stage 2 LWMP Document to the MOE
- Initiate Stage 3 LWMP




City of Port Alberni
Wastewater Advisory Committee
Thank you

Plan Monitoring Committee – Meeting 1

City of Port Alberni
Combined Stage 2 / 3 LWMP

Tom Robinson, M.A.Sc., P.Eng

June 2, 2020

1

Outline

- Introductions
- Today's Objectives
- Update on Construction of Wastewater Treatment Upgrades
- Combined Stage 2 / 3 LWMP Document
- Next Steps

2

Introductions

3

Today's Objective

4

Today's Goals

- For PMC Members to:
  1. Understand the purpose of the Plan Monitoring Committee and how it fits in with the LWMP process
  2. Become familiar with the work that has been completed since the last WAC Meeting

5

High-Level Objectives

- For PMC Members to:
  1. Provide input and support into the City's commitment as part of the LWMP process

6

Liquid Waste Management Plan Process

- Engineering planning document meant to provide direction
- Consultation required with community stakeholders, First Nations, and the general public

Stage 1
Identification of key wastewater management issues

→ **Stage 2**
Evaluation and selection of the preferred liquid waste management strategy

→ **Stage 3**
Implementation of the preferred wastewater management strategy

7

Completing the LWMP

- Two pathways for provincial "authorization" of WWTF and effluent discharge
  - LWMP
  - MWR Registration (ultimate requirement)
- Other regulatory requirements:
  - Federal WSER (under the Federal *Fisheries Act)*
  - Vancouver Island Phosphorus Objective
  - Environmental Assessment Act

8

Completing the LWMP Continued

- From 2000-2017 the City was following the LWMP pathway. In 2018, the City began registration under the MWR.
- Given the complex regulatory landscape, the City has decided to complete the LWMP, which provides a holistic framework for the entire sewerage system.
- The outcome is that the City will be registered under the MWR <u>and</u> have an approved LWMP

9

Why PMC and Not WAC?

- The purpose of the PMC will be to monitor the plan after it has been approved by City Council and the BC MOE.
- The City is calling on the previous WAC to form the PMC to provide input and support on what Implementation and Monitoring will look like

10

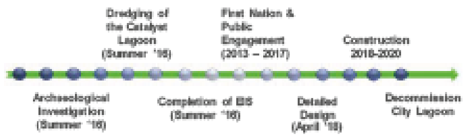
Background and Project History

11

Existing Wastewater Treatment System

12

Project History



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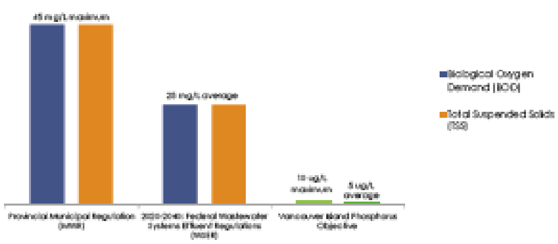
Dredging of Industrial Lagoon

14

Regulatory Framework



15

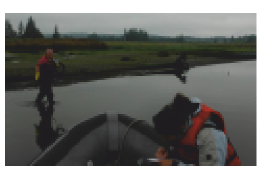
Key Issues: What the WAC has told us …

- System should protect quality of environment for adult & juvenile fish
  - ➢*Key parameters*, Dissolved Oxygen (DO), Ammonia, Fecal Coliforms
- Habitat restoration is desired
- Consider climate change
- Environmental monitoring is needed
- Protect Human Health (e.g. fishers & kayakers)

16

Environmental Impact Study (EIS)

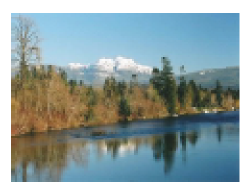
- Field investigations
- Preliminary dilution modelling
- Field data collection
- Effluent plume dispersion modelling
- Effects assessment
- Mitigation plan
- Design of pre-discharge & operational monitoring programs



17

Discharge Considerations

- BOD loads will be reduced, but …..
- Risks to salmon from low dissolved oxygen levels
  - ➢ Potential cumulative effects if BOD load below halocline
- Improve treated effluent quality to protect the receiving environment



18

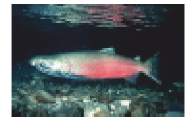
Outfall Modelling

- *Visual plumes* numerical model
- Supported by field measurements of tides & currents and water quality

19

Potential Effects on Fish

- Low probability of significant effects on returning adult salmon in most years
- The likelihood of more frequent warm conditions warrants caution & monitoring
- Also low potential for effects on smolts and juveniles:
  - Magnitude & spatial extent of DO change is low and these fish tend to move away from unfavourable conditions



20

Protection of Human Health

- Final effluent will be disinfected using ultraviolet (UV) light
- Will significantly reduce risk from human contact with pathogens

21

Monitoring Plan

- "End of Pipe" final effluent sampling
- Receiving environment monitoring
  - ➢ ***5 "downstream" sites and 2 reference sites***
  - ➢ ***Water & sediment quality***
  - ➢ ***Benthic invertebrates***
  - ➢ ***Pre-discharge monitoring began 2018***

➢New! - shallow piezometers (3) & intertidal channel DO

22

Update on Construction of Wastewater Treatment Facility Upgrades

23

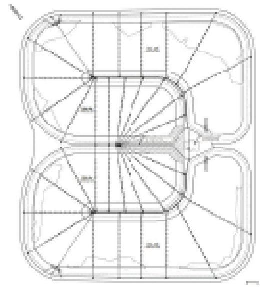
Wastewater Treatment Facility Upgrades

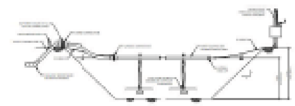
24

Process Unit - Screens

25

Process Unit – Diffused Aeration



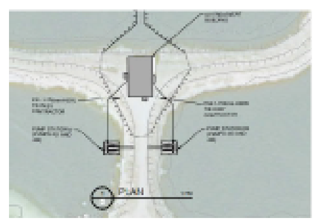


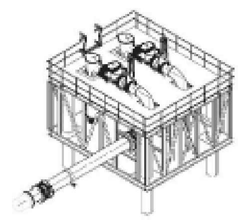
26

Process Unit – Ultraviolet Disinfection

27

Process Unit - Effluent Pumping System

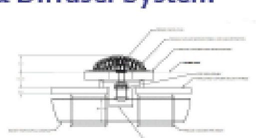


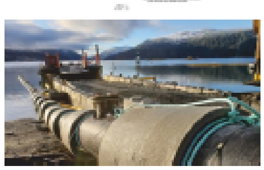


28

Process Unit – Outfall & Diffuser System

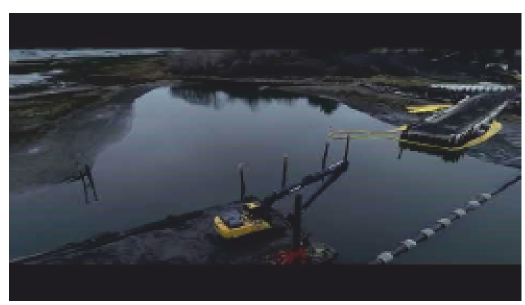
- 5 Ports
- Depth, 3 m (at Low Water)
- 11 m Spacing
- Vertical Angle +15°
- Horizontal 235° (from true north) (Approximately 55° to flow)





29

Outfall and Diffuser Installation



30

Combined Stage 2 / 3 LWMP

31

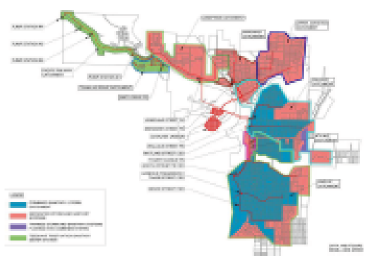
Source Control and Volume Reduction

- Purpose of source control
  - Protect the collection system, the treatment facility, and the receiving environment
- The City's existing By-Law No. 3224
  - Sewer Connection and Regulation By-Law
  - Universal Water Metering
  - Fish processing factory has been closed

32

Combined Sewer Overflows

- Combined sewers make up ~50% of the collection and conveyance system
- There are 4 CSOs in the combined system



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Inflow & Infiltration

- The City experiences inflow and infiltration in all areas of the wastewater collection system (both combined and separated sewers)
- Linear infrastructure replacement is helping to minimize I&I

34

Sustainability & Resource Recovery

- Effluent reuse → Not feasible
- Heat recovery → Not feasible
- Biosolids composting and reuse
- Decommission and restore existing City lagoon

35

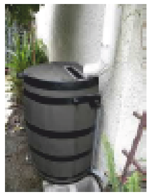
Lagoon Restoration

- Goal: to restore the old City lagoon to become tidal marsh habitat
- Ecological restoration by making use of natural recovery processes has repeatedly proven to be effective and efficient
- City intends to complete under separate contract, once the existing lagoon is decommissioned

36

Urban Stormwater Management Plan

- City trialed a rainwater harvesting program
- City is in favour of low impact developments
  - Green roofing
  - Permeable pavement



37

Next Steps

38

Next Steps

- Develop Implementation and Monitoring Plan
- Consultation with Tseshaht
- Consultation with Hupacasath
- Public Consultation
  - Virtual engagement open house
  - Web-based communications
- Update and complete Stage 2 / 3 LWMP Report

39

Questions?

40

Plan Monitoring Committee – Meeting 2

City of Port Alberni
Combined Stage 2 / 3 LWMP

Tom Robinson, M.A.Sc., P.Eng

June 16, 2020

1

Outline

- Introductions
- Today's Objectives
- Implementation Plan
- Monitoring Plan
- Public Consultation Activities
- Next Steps

2

Introductions

3

Today's Objective

4

Today's Goals

- For PMC Members to:
  1. Provide input and support into the City's commitment as part of the LWMP process
     1. Implementation Plan
     2. Monitoring Plan

5

Implementation Plan

6

Implementation Plan Part 1

LWMP Component	Description	Estimate	Schedule	Funding Source
Wastewater Treatment	Commission the New WWTP (as part of the current construction project)	N/A	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	Continued Separation of storm and sanitary sewers	$6.5+ million	Ongoing	City O&M budget
Resource Recovery & Sustainability	Beneficial Reuse of Dewatered Solids from Old City Lagoon	TBD	2022-2024	TBD

7

Implementation Plan Part 2

LWMP Component	Description	Estimate	Schedule	Funding Source
Resource Recovery & Sustainability	Lagoon Restoration and Rehabilitation	$400,000	2022-2024	TBD; Governmental Grants
Urban Stormwater	Urban Stormwater Management Plan	$70,000	2025	City O&M budget
Monitoring	Post-Discharge Monitoring	$30,000-45,000	Ongoing	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

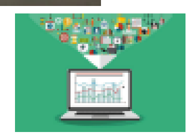
8

Monitoring Plan

9

Monitoring through Data Collection Overview

1) Receiving Environment
   - Post Discharge Monitoring
2) Collection System Monitoring
   - Influent Data
   - CSO Monitoring Program
3) Wastewater Treatment Plant Monitoring
   - Effluent Quality and Quantity
   - Operational Data



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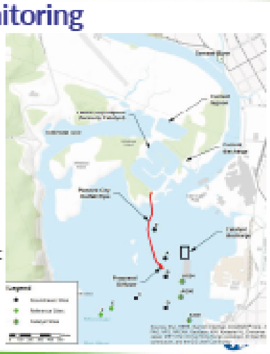
1) Receiving Environment Monitoring

- Operational Quarterly Sampling:
  - 7 monitoring sites within the Alberni Inlet: 5 "downstream" and 2 reference sites.
  - 3 groundwater sites (drive-point piezometers) around the lagoon, to monitor seepage that may occur through lagoon bottom
- Information/resource sharing with Catalyst & DFO Programs
- Regular reporting to MoE & PMC



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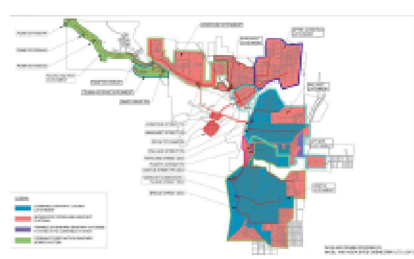
2) Collection System Monitoring

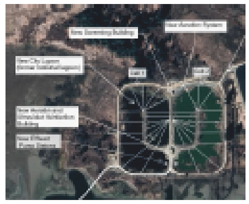


- CSO monitoring program to better quantify the flows through the City's active CSOs.

12

3) Wastewater Treatment Plant

- WWTF influent flow data, from six new flowmeters on each of the influent forcemain and gravity sewer lines.
- "End-of-Pipe" final effluent quantity and quality data (as required by regulatory agencies)
- Daily treatment plant operational monitoring throughout the wastewater treatment facility to evaluate the effectiveness of the treatment.



13

Monitoring through the PMC

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 3	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. It is proposed this meeting include an on-site tour of the upgraded WWTF.
PMC Meeting 4	Following Results Received from Second Round of Post-Discharge Monitoring. (Summer 2021).	Update the PMC on the second round of Post-Discharge Monitoring.
PMC Meeting 5	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 6	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 7	October 2022	Annual Review of the LWMP
PMC Meeting 8	October 2023	Annual Review of the LWMP
PMC Meeting 9	October 2024	Annual Review of the LWMP
PMC Meeting 10	October 2025	Five-Year Review and Update

14

Public Consultation Activities

15

Public Consultation Campaign

- June 16-June 30, 2020
  - Advertised on radio, newspaper and social media
- Community Survey
- Reference Materials
  - Project timeline
  - Fact Sheets
  - Glossary

16

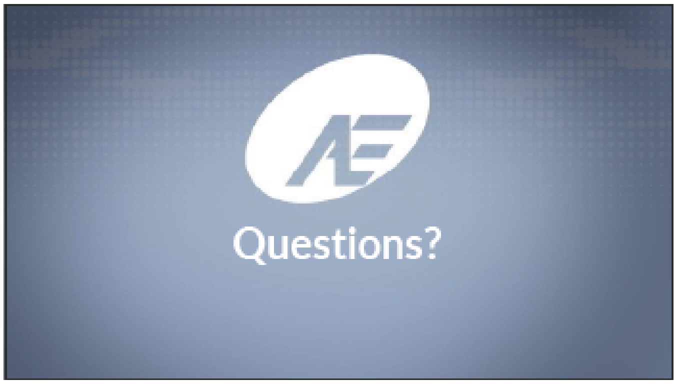
Next Steps

17

Next Steps

- Consultation with Tseshaht
- Consultation with Hupacasath
- Public Consultation
  - Virtual engagement campaign
- Incorporate Feedback from PMC and Public
- Complete Stage 2 / 3 LWMP Report

18



19

APPENDIX F - FIRST NATIONS CONSULTATION

Appendix F1 – Letters of Support from the Tseshaht First Nations and the Hupačasath First Nations

Hupacasath First Nation

5500 Ahahswinis Drive
PO Box 211
Port Alberni, BC V9Y 7M7
Tel: 250-724-4041
Fax: 250-724-1232

April 10, 2017

Timothy Pley, CAO
City of Port Alberni
4850 Argyle Street
V9Y 1V8

Dear Mr. Pley,

Re: Liquid Waste Management Plan (LWMP)

I am writing to you in regards to the City of Port Alberni's Liquid Waste Management Plan (LWMP).

I understand the City is preparing to submit the LWMP to the Ministry of Environment for approval of the proposed long-term plan to address sanitary sewerage and other liquid waste issues.

We appreciate the City's efforts to work collaboratively with Hupacasath First Nation on this plan. As the Ahahswinis Reserve is fully serviced by the City's sewer and treatment facility, we share the need for comprehensive wastewater management system that can accommodate our community's growth and responsibly dispose of treated waste water.

It is important to state that the location of this project lies within the Hupacasath First Nation Territory and an area that is frequently used for fish harvesting. As such, we are encouraged by the plan to improve the effluent quality in the Alberni Harbour and conduct ongoing operational monitoring programs.

Please accept this letter as confirmation of Hupacasath First Nation's support for the proposed wastewater treatment improvements. We look forward to our continued cooperation regarding this and other community projects.

Sincerely,

Steven Tatoosh
Chief Councillor

Tseshaht First Nation

January 12, 2018

VIA EMAIL

Timothy Pley, CAO
City of Port Alberni
4850 Argyle Street
V9Y 1V8

Dear Mr. Pley,

Re: Port Alberni Liquid Waste Management Plan

Thank you for attending the April 6, 2017 meeting of Tseshaht First Nation Council to discuss the City's Liquid Waste Management Plan (LWMP). As well as your letter dated January 5, 2018 Re: Liquid Waste Management Plan-Commitments to Tseshaht First Nation.

Please accept this letter as confirmation of Tseshaht Council's support for the proposed wastewater treatment improvements outlined in the LWMP.

The Alberni Harbour and the Somass Estuary are highly productive and diverse natural areas that have long been key harvesting areas for Tseshaht First Nation. This use is of significant social, cultural and economic value, and as such, our Nation supports the priority placed on fish health and habitat, the specific works planned to minimize the possibility of adverse effects to fish, and the commitment to pre-discharge and operational monitoring programs.

We appreciate the City's longstanding efforts to work with Tseshaht First Nation on this community infrastructure project. As an important harvesting area in close proximity to our Tsahaheh reserve, Tseshaht Council expects that the City will continue to consult with us throughout the process.

On behalf of Tseshaht Council, thank you for your ongoing engagement regarding this initiative.

Sincerely,

Tseshaht First Nation

Per: Cynthia Dick

Cynthia Dick
Chief Councillor

5091 Tsuma-as Drive, Port Alberni, BC, Canada V9Y 8X9
Tel: 250.724.1225 Fax: 250.724.4385
Website: www.tseshaht.com

Appendix F2 – Records of Meetings with Tseshaht First Nations

Associated Engineering GLOBAL PERSPECTIVE. LOCAL FOCUS.

Date:	April 16, 2013	**File:**	20132344.00.A.04.01
Time:		**Page:**	1 of 2
Project:	Liquid Waste Management Planning		
Subject:	Wastewater Treatment Upgrades		
Client:	City of Port Alberni		
Location:	Tseshaht		
Present:	Guy Cicon - City of Port Alberni Cindy Stern - Tseshaht Lisa Gallant - Tseshaht Deb Foxcroft - Tseshaht Tom Robinson - Associated Engineering (AE)		
Distribution:	Those Present		

RECORD OF MEETING

This Record of Meeting is considered to be complete and correct. Please advise the writer within one week of any errors or omissions, otherwise this Record of Meeting will be considered to be an accurate record of the discussions.

<u>Action By:</u>	<u>Discussion:</u>

The City of Port Alberni is undertaking upgrades to its wastewater treatment system. The City has acquired the surplus wastewater treatment lagoon belonging to Catalyst Paper, which has a greater treatment capacity than the City lagoon, because it is substantially larger.

The City is re-starting the Liquid Waste Management Planning process, which was stalled back in 2009, when the alternatives available were deemed unaffordable.

A key consideration of the reconfigured wastewater system is the discharge of treated effluent back to the environment. Tidal interactions between the Somass River and the Alberni Inlet marine environment are complex. Three concepts have been identified:

1. A discharge into the Somass River adjacent to the Catalyst lagoon (similar to the existing discharge from the City's wastewater lagoon system).
2. A discharge into Alberni Inlet approximately 850 m south of the south corner of the Catalyst lagoon.
3. A discharge of high-quality treated effluent into the estuary if this approach provides the opportunity to enhance the existing estuary habitat.

The new provincial Municipal Wastewater Regulation (MWR) and the new federal Wastewater System Effluent Regulation (WSER) will both have a bearing on the effluent requirements and the final treatment scheme.

The Tseshaht own property upstream from the City's lagoon on the west side of the Somass River. There is also an archaeologically significant site upstream from the City's lagoon on the west side of the Somass River. None of the participants in the meeting could pinpoint the exact

Action By:	Discussion:
	locations of these two areas. For the next meeting, it would be helpful to have a more comprehensive poster that clearly shows the Tseshaht property and the archaeological site.
	Tseshaht would like the City to investigate the tidal influence in the Somass River for the purpose of knowing the upstream extent of the City's discharge.

Prepared by:

Tom Robinson, M.A.Sc., P.Eng.
Project Manager

TR/lp

Associated Engineering | GLOBAL PERSPECTIVE. LOCAL FOCUS.

Date:	June 25, 2013	**File:**	20132344.00.A.04.01
Time:	10:00 a.m.	**Page:**	1 of 2
Project:	Liquid Waste Management Planning		
Subject:	Wastewater Treatment Upgrades		
Client:	City of Port Alberni		
Location:	Tseshaht First Nation		
Present:	Guy Cicon – City of Port Alberni Lisa Gallant – Tseshaht First Nation Deb Foxcroft – Tseshaht First Nation Tom Robinson – Associated Engineering (AE) Hugh Hamilton – Associated Engineering (AE)		
Distribution:	Those Present Darrell Ross – Tseshaht First Nation Denis St. Claire - archaeologist		

RECORD OF MEETING

This Record of Meeting is considered to be complete and correct. Please advise the writer within one week of any errors or omissions, otherwise this Record of Meeting will be considered to be an accurate record of the discussions.

Action By:	**Discussion:**
	Record of Meeting #1 (April 16, 2013) was briefly reviewed and discussed.
	In response to LG's request to have a more comprehensive map of the project in relation to the Tsashaht's traditional lands, TR presented a new aerial photo poster that shows a wider area around the Catalyst Lagoons, extending further north into the Tseshaht's land holdings. The photo identified several of the known archeological sites.
	DF and LG believe that there are additional archeological sites that are not yet identified, and indicated that Darrell Ross would be able to assist. Denis St. Claire is the archeological consultant that most often assists the Tseshaht and may also be called upon for assistance.
	HH suggested that AE will first update the map by downloading from the British Columbia Archaeological Site Inventory database, and subsequently call upon Darrell Ross to assist by filling in the additional known archeological sites.
	LG asked to have the water supply issue linked to this project and included in any ongoing discussions. GC assured LG that the Tseshaht's future development/expansion plans will also require a connection to the City's wastewater system and the City would give its approval to a formal request from the Tseshaht to amend the current agreement to meet future development needs.
	In response to LG's request in Meeting #1 for investigations into how far upstream the tidal influences in the Somass River may carry effluent from the City's treatment lagoon discharge,

Action By: | **Discussion:**

HH presented some preliminary results from field investigations carried out on June 10 to 12, 2013.

HH indicated that conductivity measurements indicate that evidence of the treated effluent could not be detected at Victoria Quay or upstream of Victoria Quay. Additional sampling is planned for late August or September to confirm this observation.

As discussed in our Meeting #1, a key consideration of the reconfigured wastewater system is the discharge of treated effluent back to the environment. Three concepts have been identified:

1. A discharge into the Somass River adjacent to the Catalyst lagoon (similar to the existing discharge from the City's wastewater lagoon system).
2. A discharge into Alberni Inlet approximately 850 m south of the south corner of the Catalyst lagoon.
3. A discharge of high-quality treated effluent into the estuary if this approach provides the opportunity to enhance the existing estuary habitat.

Indications from the Wastewater Advisory Committee (WAC) on April 16, 2013 are that Concept 3, although interesting and well intentioned, may not be a preferred solution for several reasons. Most importantly, the discharge of high-quality treated effluent would nevertheless be a new discharge which may impact the estuary through the introduction of water chemistry changes.

On the basis of the WAC discussion Associated Engineering would recommend that this Concept be dropped from further consideration in the next WAC meeting, later in the afternoon.

Investigations would continue on Concepts 1 and 2.

Prepared by:

Tom Robinson, M.A.Sc., P.Eng.
Project Manager

TR/lp

Associated Engineering GLOBAL PERSPECTIVE. LOCAL FOCUS.

Date:	October 1, 2013	**File:**	20132344.00.A.04.01
Time:	10:00 a.m.	**Page:**	1 of 3
Project:	Liquid Waste Management Planning		
Subject:	Wastewater Treatment Upgrades		
Client:	City of Port Alberni		
Location:	Tseshaht First Nation		
Present:	Guy Cicon (GC) – City of Port Alberni Wendy Gallic (WG) – Tseshaht First Nation Lisa Gallic (LG) – Tseshaht First Nation Darrell Ross (DR) – Tseshaht First Nation Denis St. Claire (DSC) – Tseshaht Archaeologist Andrew Olson (AO) – Tseshaht Fisheries Tom Robinson (TR) -- Associated Engineering (AE)		
Distribution:	Those Present Kirsten White (KW) – Ministry of Environment		

RECORD OF MEETING

This Record of Meeting is considered to be complete and correct. Please advise the writer within one week of any errors or omissions, otherwise this Record of Meeting will be considered to be an accurate record of the discussions.

Action By: **Discussion:**

Since there were a number of newcomers who had not been present at previous meetings, TR and GC started the meeting by explaining the Port Alberni WW upgrade project at a high level:

- The existing municipal wastewater treatment lagoon discharges to the Somass River through a side bank discharge, as it has done for approximately 60 years.
- The upgrade project is needed to meet new Provincial and Federal regulations, and to improve the river and estuary environment.
- Port Alberni has been fortunate to receive $11.2 M in grant funding from the Provincial Gas Tax program.
- The City is presently working to complete their Liquid Waste Management Plan (LWMP), after this was stalled in the mid-2000s when the City felt that there were no affordable alternatives to the City's existing lagoon treatment system.
- The LWMP process involves working with a group of volunteer stakeholders called the Wastewater Advisory Committee (WAC) who have met two times previously, following our meetings with the Tseshaht.

Meetings with the Tseshaht are intended to provide for open communication and identify opportunities to make the project even better.

Action By: **Discussion:**

DR asked for clarification of what the City is asking from the Tseshaht. DR wanted to know why the City was coming for approval or support at the "eleventh hour". Specifically, DR asked whether the City was asking the Tseshaht to support any of the following:

- The land transfer of the Catalyst lagoon to the City.
- The expansion of the wastewater treatment system (capacity).
- The discharge point.
- The value of the Somass River system, which is extremely high to the Tseshaht people.

GC explained that the City is specifically asking the Tseshaht to assist with decisions regarding item iii – the discharge point.

As discussed in our Meetings #1 and #2, a key consideration of the reconfigured wastewater system is the discharge of treated effluent back to the environment. At this point, three concepts are under active consideration:

- Location 1 -- A discharge into the Somass River upstream of the Catalyst lagoon (location similar to the discharge from the City's existing wastewater lagoon system).
- Location 2a -- A discharge into Alberni Inlet approximately 650 m south of the south corner of the Catalyst lagoon.
- Location 2b -- A discharge into Alberni Inlet approximately 1300 m south of the south corner of the Catalyst lagoon.

WG, LG, DR and AO all explained that the Somass River is very important to the Tseshaht people. For their ancestors, it was their life-blood, and the Tsashaht's attachment and reliance on the Somass River fishery remains very strong.

GC mentioned that the Tseshaht were supportive of the Gas Tax Grant Application in 2011, and that Cindy Stern had provided a letter of support that had accompanied the application documents. WG requested a copy of the letter. (*Post Meeting Note: Letter is attached*)

LG and AO would like the City to consider opportunities to make the City's wastewater upgrade project even better than the regulations alone would require. Modern technology provides more options than ever before. Which of these could make sense for this project? Which would provide the best overall environmental benefit and the best improvement for the salmon?

DSC provided a brief history of the Tseshaht and their connection to the Somass River estuary. The Tseshaht used the lower reaches of the river for fishing salmon. Fish weirs were built in the many

Action By: **Discussion:**

natural side channels of river bank. The Tseshaht also built additional side channels for this purpose. The remnants of many of these fish weirs are still visible today along the western bank of the river in the area of the two wastewater treatment lagoons.

DSC would like to have a tour of the subject area for the Tseshaht. GC agreed and will facilitate a site visit. DR and AO would like to participate, and DSC would like to have an archeologist colleague Nicole Smith join the group also.

TR provided a quick review of the PowerPoint slides that have been prepared for the WAC Meeting #3. AO will join the WAC starting immediately, and will attend the WAC Meeting #3 scheduled for the afternoon of October 1. GC and TR are very happy to have his contributions at the WAC table.

NEXT STEPS

AE is continuing the process of screening the "point-of-discharge" alternatives, with the participation and input from the Tseshaht and the WAC committee.

If more than one discharge alternative passes the screening, AE will provide a formal decision analysis process to select the preferred alternative.

The Stage 2 and 3 LWMP Reports will be written around the preferred alternative, as will the Environmental Impact Study (EIS) required under the MWR.

Prepared by:

Tom Robinson, M.A.Sc., P.Eng.
Project Manager

TR/lp

Associated Engineering | GLOBAL PERSPECTIVE. LOCAL FOCUS.

Date:	December 2, 2013	**File:**	20132344.00.A.04.01
Time:	1:30 p.m.	**Page:**	1 of 6
Project:	Liquid Waste Management Planning		
Subject:	Wastewater Treatment Upgrades		
Client:	City of Port Alberni		
Location:	Tseshaht First Nation		
Present:	Guy Cicon (GC) – City of Port Alberni Chief Councillor Hugh Braker (HB) -- Tseshaht First Nation Wendy Gallic (WG) – Tseshaht First Nation Lisa Gallic (LG) – Tseshaht First Nation Darrell Ross (DR) – Tseshaht First Nation Denis St. Claire (DSC) – Tseshaht Archaeologist Andrew Olson (AO) – Tseshaht Fisheries Dwayne Hearn (DH) – Tseshaht Forestry Keith Hunter (KH) – Tseshaht First Nation Tom Robinson (TR) -- Associated Engineering (AE)		
Distribution:	Those Present Kirsten White (KW) – Ministry of Environment		

RECORD OF MEETING

This Record of Meeting is considered to be complete and correct. Please advise the writer within one week of any errors or omissions, otherwise this Record of Meeting will be considered to be an accurate record of the discussions.

<u>Action By:</u>	<u>Discussion:</u>

HB opened the meeting and welcomed all. HB referred to a letter sent in the morning from Tseshaht to the City of Port Alberni explaining that the Somass River and Estuary is very important to the Tseshaht people. Throughout our history it has been our life-blood, providing an abundant fishery and a reliable source of food and medicinal plants. Our attachment to the Somass River remains very strong. *The letter is attached.*

GC provided a high level summary of the Port Alberni WW upgrade project for newcomers:

- This is our fourth meeting with Tseshaht to discuss the Port Alberni WW upgrade project. Our first meeting was on April 16, 2013.
- The existing municipal wastewater treatment lagoon discharges to the Somass River through a side bank discharge, as it has done for approximately 60 years.
- The upgrade project is needed to meet new Provincial and Federal regulations.
- Port Alberni has been fortunate to receive $11.2 M in grant funding from the Provincial Gas Tax program.
- The City is presently working to complete their Liquid Waste Management Plan (LWMP), after this was stalled in the mid-2000s when the City felt that there were no affordable alternatives to the City's existing lagoon treatment system.

Action By: **Discussion:**

- The LWMP process involves working with a group of volunteer stakeholders called the Wastewater Advisory Committee (WAC) who have met four times, most recently on November 12, 2013.
- The City's plan to bring wastewater treatment into compliance is based on utilizing the Catalyst lagoons, together with additional process upgrades as needed.
- The reconfigured wastewater treatment system will need a new discharge pipeline and diffuser.
- GC explained that the project is at the information gathering stage. Environmental sampling was conducted in July and September 2013 to better understand the background water quality in the Somass river/estuary receiving environment, tidal saltwater intrusion, and to determine the presence or absence of signature wastewater constituents (i.e. caffeine and ibuprofen).
- An archeological survey is being scoped now, and a permit application being submitted to the Province.
- GC is interested also in removing Scotch broom (*Cytisus scoparius*) and possibly planting some root stock for wild onions, and other traditional food plants.
- Ongoing discussions with the Tseshaht are intended to provide for open communication and identify opportunities to make the project even better.

GC clarified the land parcel(s) that City acquired from Catalyst, and provided a cadastral map showing a legal survey of the four small irregular-shaped "titled" pieces of land inside the rectangular Catalyst lagoon shape. These four "titled" pieces make up approximately one fifth of the total lagoon area. He explained that the remaining land inside the rectangular lagoon is Crown land, which Catalyst actually leased from the Port Authority to form the contiguous piece of property on which the lagoon is constructed. The leased land makes up the other four fifths of the lagoon area, and is under the management of the Port Authority. This lease has been transferred to the City along with the four smaller "titled" pieces of land.

DSC discussed the significance of the Somass estuary (particularly Johnson Island). It contains many rare plant species which are very important to the Tseshaht. Since the arrival of the first Europeans in 1860, the Somass estuary has seen a farm, an airport, and wastewater treatment facilities for the City and the pulp and paper mill.

GC mentioned that the Alberni Valley Enhancement Association has received funding for improving two bridges in the intertidal zone. Phil Edgell recently met with GC to discuss how best to collaborate with the City on next steps.

HB indicated that Ducks Unlimited has met recently with the Tseshaht to discuss plans to return more of the intertidal and estuary areas to a natural ecosystem, and provide more natural habitat for ducks.

Action By: **Discussion:**

Other activities in the general area affecting the Somass estuary include the City's north port site (east bank of the river) and Island Timber's claims.

HB reminded attendees that the Tseshaht use this entire area continuously for harvesting food and medicinal plants, and for the Somass fishery.

HB asked GC whether the City had any plans to acquire more land in the estuary area. GC indicated that the City had no such plans at this time.

TR briefly reviewed the regulatory context, including the Provincial Liquid Waste Management Planning process (LWMP), the new Provincial Municipal Wastewater Regulation (MWR), the new Federal Wastewater Wastewater System Effluent Regulation (WSER). This included a discussion of effluent Biological Oxygen Demand (BOD) and effluent Total Suspended Solids (TSS) and how the these limits have been reduced from 70/70 under the initial permit, to 25/25 (avg) under the new WSER.

As discussed in each of our previous meetings, a key consideration of the reconfigured wastewater system is the discharge of treated effluent back to the environment. TR explained that the existing side-bank discharge no longer meets the MWR requirements, and reviewed the MWR's requirements for a new discharge.

A total of three different discharge locations have been explored: :

- Location 1 -- A discharge into the Somass River upstream of the Catalyst lagoon.
- Location 2a -- A discharge into Alberni Inlet approximately 650 m south of the south corner of the Catalyst lagoon.
- Location 2b -- A discharge into Alberni Inlet approximately 1300 m south of the south corner of the Catalyst lagoon.
- Location 3 – The intertidal area southwest of the Catalyst lagoon

Location 1 (Somass River) would require an outfall pipeline in the order of 1,900 m to reach upstream to an area around the Clutesi Marina, upstream of the where salt water was detected in our sampling program. In addition, a new provincial phosphorus objective for Vancouver Island streams would require costly phosphorus removal. For these reasons, this alternative is not being pursued further.

Location 2a (shallow estuary) does not meet the MWR's depth requirements for a estuarine discharge.

Location 3 (intertidal zone) was rejected by the WAC in our April 17, 2013 meeting, owing to the fact that a new freshwater discharge in this area could affect fish and other aquatic life that use the multiple small

Action By:	Discussion:

channels in the area; and could sufficiently alter the water chemistry to result in changes to the existing ecosystem.

Location 2b (deep estuary) is the preferred alternative.

Based on Location 2b, a new discharge pipeline from the lagoon to the discharge point will be required to return the treated effluent to the environment. The concept under consideration at this time would be for a pipeline to be buried along the beach/intertidal zone. A few hundred metres from the discharge point the pipeline would transition from a buried pipeline to a pipeline weighted with concrete collars laid on the bottom, below the low tide mark. The discharge point itself would consist of a multi-port diffuser.

To support the development of the discharge pipeline, various investigations will be carried out along the proposed alignment. This includes the following:

- Archeological investigations: Denis St. Claire and Nicole Smith have scoped an archeological field investigation.
- Soil/sediment sampling investigations: As a precaution, the City will take soil/sediment samples at multiple depths within the intertidal/beach area. The objective of the soil/sediment investigations is to confirm that there are no legacy industrial contaminants in the sediments that could potentially be released during construction of a discharge pipeline.
- Shellfish investigations: Although there is no knowledge of a traditional or commercial shellfish harvest in the Somass estuary area, the presence of purple varnish clams in the area has been noted in recent years. The location and relative quantity of these and other harvestable shellfish will be investigated to ensure that there is an adequate buffer between the outfall and any such areas.

There are obvious synergies in carrying out these investigations simultaneously. The tides are most favourable on January 26-28, 2014. Efforts are being made to submit the formal application for an archeological investigation permit as soon as possible. Hopefully, with letters of support from both the Tseshaht and the Hupacasath, the permit will be received in advance of January 26, 2014.

HB recalled a letter that the Tseshaht received from MacMillan Bloedel advising the Tseshaht not to harvest ducks, wild onions, and other edible plants from the estuary. This may have been in the 1980s.

Post Meeting Note: If the letter was received in the late 1980s it may have been related to dioxins and furans which were recognized as an environmental and human health concern at that time. With the permanent closure of the kraft mill and related bleaching processes in 1993, there is no longer any release of dioxins and furans.

Action By: **Discussion:**

DSC would like the City to consider an ethno-botany survey be done in the spring when the plants emerge. The Somass estuary has previously been identified as a unique habitat on the west coast of Vancouver Island because of the large number of relatively rare plant species. Dr. Nancy Turner (University of Victoria) is a recognized expert in this area.

KH asked whether the *Canadian Environmental Assessment Act* (CEAA) review process applies to the Port Alberni wastewater upgrades project.

Post Meeting Note: CEAA was revised in 2012 and is now known as CEAA 2012. With the changes only projects listed in the regulations as "Physical Activities" are likely considered as "Designated Projects" and subject to environmental assessment under the Act. Municipal wastewater treatment is not listed in the regulation as a physical activity. This is consistent with the federal government's policy of minimizing duplication with provincial EA processes. The B.C. Environmental Assessment Act exempts municipal wastewater treatment facilities if they are part of a LWMP. Therefore the EIS is the only form of EA for the Port Alberni LWMP and upgrade project.

KH asked whether the Environmental Impact Study would consider cumulative effects of the discharge with other environmental impacts arising from the Catalyst mill discharge or the new Raven Coal development. In the Raven Coal "intergovernmental work group" meeting considering cumulative effects last week attended by KH there was no mention of the City's wastewater project.

Post Meeting Note: The provincial guidelines for EIS under the MWR state that cumulative effects should be assessed, and the City will describe the proposed approach to cumulative effects in the first phase of the EIS that will submitted in draft in early 2014. Raven Coal's omission of the City's plans is likely an oversight on their part. The City welcomes Tseshaht's input on identifying existing or reasonably foreseeable future projects with cumulative effects potential.

KH also asked about the potential impact of nutrients arising from the proposed discharge location. "Might we just be moving the existing problem to a new location ?"

Post Meeting Note: Comparison of the projected future condition to the existing ("baseline") condition will be part of the EIS.

HB indicated that the Tseshaht are pleased that the City is seeking to upgrade their wastewater treatment and discharge. That being said, he intends that the Tseshaht will take a hard look at the specific proposals before they "sign-off" on the project. HB will take this project to the Tseshaht council for discussion on December 12, and seek council's direction on ..."where they would like to go from here".

Action By:	**Discussion:**
	DR again indicated that he is unclear on exactly what the City is formally requesting of the Tseshaht. He also requested the available figures showing the location of the fibre mat in Alberni Inlet.
	Post Meeting Note: Catalyst has published the results of their investigations into the spatial distribution of the fibre mat in the Cycle 5 EEM report (2010), which is available through their web site (http://www.catalystpaper.com/sustainability/environmental-performance/environmental-effects-monitoring).
	KH wanted the City and Associated Engineering to be aware that the Tseshaht forestry group has knowledge, experience, and the capacity to assist the project with terrestrial investigations, if desired.
	In closing TR explained that at this early stage of the project the design is at the concept level. One of the specific reasons for discussions with the Tseshaht is to identify ideas for informing the design as it develops in the coming months.
	TR also asked for those present to review the draft Record of Meeting that would be forthcoming, and provide any feedback on key items of discussion, as needed.

Prepared by:

Tom Robinson, M.A.Sc., P.Eng.
Project Manager

TR/lp

Tseshaht First Nation
5091 Tsuma-as Drive
Port Alberni, B.C.
V9Y 8X9
Phone: (250) 724-1225
Fax: (250) 724-4385

Facsimile

To:	City Of Port Alberni	From:	Hugh Braker, Chief Councillor
Fax:	250-723-~~5851~~ 1003	Pages:	3
Phone:		Date:	Dec. 2, 2013
Re:	City Wastewater Treatment	cc:	

☐ Urgent ☒ For Review ☐ Please Comment ☐ Please Reply ☐ Please Recycle

SEE ATTACHED LETTER

Tseshaht First Nation

December 2, 2013

VIA FACSIMILE ONLY

City of Port Alberni
4850Argyle Street
Port Alberni, B.C.
V9Y 1V8

Attn.: City Manager

Dear Sirs:

Re: City Wastewater Treatment Plans

Firstly, we look forward to meeting with you this afternoon. I write this letter in preparation for that meeting.

As you are aware the entire Somass estuary was used by the Tseshaht historically and continues to be used by the Tseshaht today. The estuary is within the Tseshaht traditional territory and subject to our aboriginal title. We have exercised many aboriginal rights in the territory and continue to exercise those rights.

The Somass estuary is valuable to the Tseshaht for many reasons to numerous to recite in this letter but for example; as a fishing area (there are the remains of many fish weirs in the area), as a wild onion gathering area (a staple in Tseshaht historical foods), as a duck hunting area, as a rest area when fishing, as village sites (numerous in the immediate area), as a spiritual area (various Tseshaht legends recite the appearance of supernatural beings in the area, as a berry gathering area (again a staple in historical and modern Tseshaht diets), as an area for gathering medicines (for example wild crab apple). We continue to use the area today. For example, you will be well aware of the hundreds of Tseshaht fisher people who use the estuary in the months of May to August and even beyond every year. For many Tseshaht, the summer fishing is their biggest source of income each year. In 2012 the summer fishery earned the Tseshaht and Hupachasath members an estimated $4 million to $5 million.

The Tseshaht First Nation is understandably sensitive to any suggested changes to the Somass estuary. Our aboriginal title and rights, will, from our viewpoint, form the bedrock of our meeting today.

We have many questions we will be posing to you and we look forward to a constructive dialogue. Some of the questions are:

1) Where exactly will the discharge be for the new wastewater treatment facility?
2) Exactly which lands has the city acquired for this treatment facility?
3) What exactly are the plans for an archeological assessment? What will Tseshaht's role be in that study?
4) What exactly is Tseshaht being consulted on? Is it the expansion of the waste water treatment, the discharge location or the purchase of lands?

Tseshaht has had a good working relationship with the City of Port Alberni on waste water treatment in the past. As you are aware, we contract with Port Alberni for a number of matter including some Tseshaht wastewater treatment, fire protection and water.

Tseshaht are facing a number of issues we need to overcome as well, including, the provision of water and wastewater lines to our Polly's Point reserve, the ever expanding needs for a marina for our fisher people, and the rising costs of current Tseshaht water and wastewater services.

Again, we look forward to our meeting.

Yours truly,

Tseshaht First Nation

Per:

Hugh Braker,

Chief Councillor

c.c. Council, A. Olson, D. Ross, D. Hearn, W. Gallic, L. Gallic

Appendix F3 – First Nation Informational Handout

City of Port Alberni Liquid Waste Management Plan

The City of Port Alberni would like to inform the local First Nations in the vicinity of the City of Port Alberni of the City's recent developments related to its Liquid Waste Management Plan (LWMP).

The City currently treats wastewater for a population of approximately 18,000 people. The City's wastewater is not in compliance with current provincial and wastewater regulations. Making matters challenging are the City's high wastewater flows, which are the result of Port Alberni's wet climate and aging sewer system. To actively address this regulatory compliance issue, the City has been working to define a technically-feasible and affordable solution for upgrades to the City's wastewater treatment system. These upgrades are needed to comply with provincial and federal wastewater regulations.

By carrying out an LWMP, the City is committed to finding community-driven and cost-effective solutions to achieve the long-term management needs of Port Alberni.

The City is taking proactive efforts to ensure protection of public health and the environment through a comprehensive assessment of wastewater management solutions. As part of these efforts, the City initiated a three-stage LWMP in 1999 for approval by the BC Minister of Environment. The Stage 1 LWMP was completed in 2001. A Draft Stage 2 LWMP was completed in 2003; however, the wastewater treatment options were financially prohibitive for the City at the time. Since then, the City's LWMP has focused efforts on identifying more feasible opportunities, integrating the industrial lagoon acquired from Catalyst Paper into the City's wastewater treatment system along with other improvements, and reducing combined sanitary and combined sewer overflows within the collection system.

The LWMP process has entailed regular meetings with a Wastewater Advisory Committee (WAC), which includes technical advisors, First Nation and public representatives, and local stakeholders. Given the sensitivity of the Alberni Inlet with respect to the fish, a shallow discharge was determined to be the most favourable.

In conjunction with the LWMP, the City has undertaken an Environmental Impact Study (EIS) to help support the selection of the preferred discharge location. The EIS includes background and field investigations, modelling, and pre-discharge monitoring.

As the City continues to progress with the LWMP, archaeological investigations and dredging of the newly acquired industrial lagoon are required. Following completion of the LWMP, detailed design and construction for the upgraded City's wastewater treatment plant will occur.

For more information, visit the City of Port Alberni's LWMP website at www.portalberni.ca/liquid-waste-management-plan or contact City of Port Alberni Engineering at 250-720-2830.

APPENDIX G - PUBLIC ENGAGEMENT

Appendix G1 – Web-Based Material (Stage 2 Engagement 2013-2017)

Glossary

As you read the City of Port Alberni's Liquid Waste Management Plan Factsheets you may come across some technical terms. Some of these terms are explained below.

Biosolids: Stabilized and dewatered solids / biomass that results from wastewater treatment.

Carbonaceous 5-day biochemical oxygen demand (BOD): The rate that biological organisms use the oxygen in water or wastewater over a five day incubation period. This parameter is determined through laboratory testing and is typically used to understand how well a treatment system is working to clean up the wastewater.

Combined Sewer Overflow or CSO: Overflows that occur in sewer systems that collect both wastewater and storm water. During some rainfall events, the capacity of the sewer is exceeded and this results in the discharge of wastewater and storm water to the environment without treatment. **Disinfection:** A treatment process used to reduce levels of harmful pathogens.

Effluent: Treated wastewater, which is subsequently re-integrated with the watershed.

Environmental Impact Study (EIS): Desktop and field investigations that assess the possible impacts that a proposed project may have on the environment. In BC, provincial guidelines outline the information that must be included as part of an EIS for a new wastewater discharge.

Forcemain: Large sewer lines that convey and control the flow of wastewater to the treatment facility. This type of pipe is similar to an interceptor pipeline, except that it is typically located in low-lying areas. Wastewater in the low-lying areas must pass through a pumping station to move it along in the sewer system, rather than be moved along with the help of gravity.

Inflow and Infiltration (I&I): Inflow and infiltration is relatively clean water that enters the sanitary sewer system, mainly as a result of a rainfall event or snow melt. Inflow enters the system from the top, for example roof leaders that drain into the sewer system. Infiltration enters the system from below the ground, for example through leaky pipes or house sump pumps.

Interceptors: Large sewer lines that convey and control the flow of wastewater to the treatment facility. These pipes generally follow the natural slope of land, which relies on the help of gravity to move the wastewater along in the system. This type of pipe is similar to a forcemain, except that it is typically gravity-fed, not pressurized by pumping stations.

Wastewater Lagoon: A type of wastewater treatment facility that consists of one or more surface impoundments. Lagoons treat wastewater by a combination of biological and physical processes. Air can be added to a lagoon using an aeration system – this system is known as an aerated lagoon.

Ministry of Environment (MOE): The approving authority for the Liquid Waste Management Plan in the province of BC.

Municipal Wastewater Regulation (MWR): Provincial legislation that provides guidance on meeting the current standards and requirements for the treatment, reuse, and disposal of wastewater in British Columbia. The regulation applies to all discharges of domestic wastewater except those regulated under the Public Health Act's Sewerage System Regulation and discharges from single or multi-family dwellings. The MWR applies to discharges of wastewater to water bodies and to the ground. The requirements of the MWR are enforced by the BC Ministry of Environment.

Official Community Plan (OCP): A statement of objectives and policies to guide decisions on planning and land use management, within the area covered by the plan, respecting the purposes of local government.

Outfall: A pipe that transports effluent to its discharge location.

Pumping Station: A facility that uses the action of pumps to move wastewater within the sewer system, typically from a low-lying area to an area of higher elevation.

Reclaimed Water: Municipal wastewater that is treated and suitable for use in accordance with the BC Municipal Wastewater Regulation.

Resource Recovery: The practice of recovering material of value from waste resources. Practices to recover value from wastewater include reuse of treated effluent, heat recovery from wastewater, and recovery of nutrients from liquid and solid wastewater streams.

Secondary Treatment: Wastewater treatment (usually biological or physical-chemical) to remove organics which consistently produces an effluent quality with a carbonaceous 5-day biochemical oxygen demand (BOD 5) and total suspended solids (TSS) concentrations not more than 45 mg/L, as defined by the Municipal Wastewater Regulation.

Stage 1 (LWMP): a high-level investigation examining current wastewater management strategies. This stage identifies key wastewater management issues to develop wastewater management alternatives for more thorough consideration in Stage 2. The City's Stage 1 LWMP was completed in May 2001 and was approved by the BC MOE.

Stage 2 (LWMP): utilizes information developed in the previous stage, combined with supplemental studies, to evaluate specific questions related to future wastewater management strategies. The City's long-term wastewater management strategy will be selected following completion of this stage and will be carried forward to the Stage 3 LWMP.

Stage 3 (LWMP): utilizes information developed in previous stages to execute the implementation plan for the preferred wastewater management strategy. Stage 3 includes a wastewater management strategy that achieves provincial and federal regulatory objectives, an implementation schedule, and an Operational Certificate (OC) that will replace the City's existing discharge permit for the wastewater treatment facility.

Urban Stormwater: Precipitation including rainfall and snowmelt that runs off surfaces, such as rooftops, paved streets, highways, and parking lots. Stormwater can pick up and transport pollutants such as oil, trash, pesticides, soils, and other wastes to water bodies untreated.

Source Control: Includes practices that protect sewer and wastewater treatment infrastructure, the public, and the environment from discharges that may pose risks to safety and proper operation. These practices typically include laws and public education to limit potentially hazardous discharges.

Wastewater Systems Effluent Regulations (WSER): Federal legislation recently enacted under the Fisheries Act. The policy outlines minimum effluent quality standards that apply to wastewater management across Canada, specifically wastewater facilities that discharge to surface water. They include minimum effluent quality standards that can be achieved through biological or secondary wastewater treatment approaches. The requirements of WSER are enforced by Environment Canada.

Wastewater: The "used" water and the material that it carries. Basically, wastewater is a term that encompasses water flushed down the toilet or washed down the drain. Wastewater can also include rain water, groundwater, or snow melt (inflow and infiltration) that make their way into sewer pipes.

Factsheet #1

Wastewater Services for the Residents of Port Alberni

Wastewater Services

The City of Port Alberni (City) treats wastewater from approximately 18,000 people. To provide this service, the City uses a centralized wastewater treatment system that has been in place since the 1950's. This centralized system is made up of a number of elements as follows:

- An extensive collection system comprised of combined sanitary and stormwater sewer systems, sanitary sewer systems, and stormwater sewer systems;
- Five pump stations that move wastewater from low-lying areas to the treatment facility;
- A 5 hectare (50,000 m^2) earthen lagoon system, which treats the wastewater using biological activity with the help of added oxygen through aeration; and
- An overflow structure and swale that conveys treated wastewater (effluent) to the Somass River and thus re-integrates "used water" with the watershed from which it originated.

A small portion of the City is not serviced by the centralized wastewater treatment system and is managed by on-site septic systems.

Why Does the City of Port Alberni Need a Liquid Waste Management Plan (LWMP)?

In recent years, the City's lagoon system has not been able to achieve regulatory requirements due to high wastewater flows. These high wastewater flows are the result of Port Alberni's wet climate and an aging sewer system, which over time, has become leaky. To actively address this regulatory compliance issue, the City has been working to define a technically-feasible and affordable solution for upgrades to the City's wastewater treatment system. These upgrades are needed to comply with provincial and federal wastewater regulations.

Laws governing wastewater management in British Columbia require public health protection and, over time, achievement of a standard level of wastewater treatment. These laws also encourage resource recovery from wastewater. By carrying out an LWMP, the City is committed to finding community-driven and cost-effective solutions to achieve the long-term management needs of Port Alberni.

A Public LWMP Process is Underway

The City is taking proactive efforts to ensure protection of public health and the environment through a comprehensive assessment of wastewater management solutions. As part of these efforts, the City initiated a three-stage LWMP in 1999 for approval by the BC Minister of Environment. The Stage 1 LWMP was completed in 2001. A Draft Stage 2 LWMP was completed in 2003; however, the wastewater treatment options were financially prohibitive for the City at the time. Since then, the City's LWMP has focused efforts on identifying more feasible opportunities, integrating the acquired industrial lagoon into the City's wastewater treatment system along with other improvements, and reducing combined sanitary and combined sewer overflows within the collection system.

The City is currently undertaking Stage 2 of the BC Ministry of Environment's LWMP process.

For more information, visit the City of Port Alberni's LWMP website at www.portalberni.ca/liquid-waste-management-plan or contact City of Port Alberni Engineering at 250-720-2830.

Factsheet #2

Liquid Waste Management Plan Overview

The Liquid Waste Management Plan Process

The City of Port Alberni (the City) has initiated the development of a Liquid Waste Management Plan (LWMP). When completed, the LWMP will be a long-term plan to support sustainable wastewater management in Port Alberni. By carrying out an LWMP, the City is committed to finding community-driven and cost-effective solutions to continue to protect public health and the environment. The BC Ministry of Environment outlines a three stage process for Liquid Waste Management Plans (LWMPs), which includes comprehensive public involvement and consultation.

The three stages of a typical LWMP are outlined in the following sections.

Stage 1 of the LWMP is a broad investigation examining existing wastewater management strategies and community development plans. Key wastewater management challenges unique to the community are identified to develop alternatives for more thorough consideration in subsequent stages of the LWMP. The City's Stage 1 LWMP was completed and approved by the BC MOE in 2001.

Information developed during the Stage 1 LWMP is combined with additional studies to develop the **Stage 2** LWMP. The purpose of this stage is to develop a short-list of options, evaluate them, and identify preferred solutions. With the finalization of the Stage 2 LWMP, the City's preferred long-term wastewater management strategy is selected. This strategy will be carried forward to the City's Stage 3 LWMP. The City of Port Alberni is currently carrying out Stage 2 work.

Based on information developed in the previous stages, the **Stage 3** LWMP develops a plan for implementation of the preferred wastewater management strategy. This stage outlines a strategy that will achieve provincial and federal regulatory objectives, develops a financial plan, identifies an implementation schedule, and prepares a draft Operational Certificate (OC) that will replace the City's existing permit for the wastewater treatment facility. The OC will prescribe the requirements for operations and environmental monitoring for wastewater treatment.

Provincial and Federal Laws Require Secondary Wastewater Treatment or Better

Municipal wastewater treatment in BC is governed by the provincial Municipal Wastewater Regulation (MWR) and federal Wastewater Systems Effluent Regulations (WSER). These regulations inform LWMP development and include mandatory effluent quality standards that can be achieved through secondary wastewater treatment or better, particularly for facilities that discharge effluent to surface water such as lakes, rivers, or marine environment. These laws also include requirements for monitoring, record-keeping, reporting and toxicity testing during operation of the wastewater treatment facility.

Why is the Public Being Consulted on the Stage 2 LWMP?

The consultation process is important because an approved LWMP allows a local government to borrow money without going to referendum. Because public consultation and First Nations engagement are key components of the procedure, a LWMP encourages members of the community to be involved with the decision-making process and develop local wastewater management solutions.

Key Elements of the LWMP

Six issues make up the core elements of the City's LWMP and provide the tools to implement the plan. Each of these elements is described briefly in the sections below.

Source Control

Source control includes practices that protect sewer and wastewater treatment infrastructure, the public, and the environment from discharges that may pose risks to safety and proper operation of these systems. Source control practices often include laws and public education. The City already has a bylaw in place. To further improve source control practices, the City is proposing to update the existing sewer use bylaw to better align with anticipated community make-up and development.

Effluent Integration

Effluent integration describes the process of returning treated wastewater (effluent) to the environment. The City's current effluent integration approach no longer meets BC Ministry of Environment requirements. As part of the upgrades to the City's wastewater treatment facility, the City is proposing a new discharge to Port Alberni inlet. This proposed new discharge includes a weighted outfall pipe with a diffuser resting on the sea floor in the Port Alberni Inlet. An Environmental Impact

Study is being carried out by the City and their consultants to support the design and implementation of this new marine discharge.

Wastewater Treatment

The City's existing wastewater treatment system includes an earthen lagoon system with an aeration system that provides oxygen to the microorganisms in the lagoon. As part of the upgrades to the City's wastewater treatment system, the City is proposing to upgrade the infrastructure of the former Catalyst Paper lagoon system. These upgrades could include cleaning out the lagoon, repairing berms, adding a new aeration system, and adding an effluent disinfection system. At this time, this wastewater treatment option is most feasible for the City compared to other options evaluated over the years.

Combined Sewer Overflows

The City has both combined and separated sewers. During some rainfall events, extra water contributed to a combined sewer exceeds the sewer capacity. When this happens, wastewater and storm water are discharged to the environment without treatment – this is called a combined sewer overflow or CSO. The City currently has four CSOs within the collection and conveyance system. CSOs are no longer accepted industry practice and the BC Ministry of Environment's goal is to reduce and eliminate CSOs. As part of the LWMP, the City proposes to continue to twin sanitary and storm sewer systems to reduce and eventually eliminate CSO events.

Sustainability and Resource Recovery

Sustainability and resource recovery are important elements of a community's long-term wastewater management strategy. As part of the City's LWMP, the City proposes to continue to beneficially reuse solids periodically removed from the wastewater treatment system through composting activities. The City also proposes to reassess other feasible opportunities for wastewater resource recovery in the future. And, of course, the City will continue to re-integrate what is essentially "used water" back into the watershed from which it originated.

Urban Stormwater

Port Alberni's climate includes large amounts of rainfall during the year. Stormwater is precipitation, including rainfall and snow melt that runs off surfaces like rooftops, paved streets, highways, and parking lots. This runoff can pick up and transport pollutants, such as oil, trash, pesticides, soils, and other wastes. As part of the City's LWMP, the City proposes to continue to assess feasible approaches for controlling and reducing stormwater runoff. The City's proposed strategies introduce policies that encourage developers to implement stormwater management strategies for new developments in the community.

For more information, visit the City of Port Alberni's LWMP website at www.portalberni.ca/liquid-waste-management-plan or contact City of Port Alberni Engineering at 250-720-2830.

Factsheet #3

Wastewater Treatment Basics

Wastewater Treatment Processes

The City of Port Alberni's (the City) wastewater treatment facility consists of a 5 hectare earthen lagoon system. The lagoon was originally constructed in 1955, and has been used by the City as the method for wastewater treatment. Once treated, the effluent is discharged to the Somass Estuary and thus re-integrates "used water" with the watershed from which it originated.

Common stages of wastewater treatment include the following processes:

- Preliminary treatment
- Secondary treatment

Preliminary wastewater treatment involves screening followed by removal of sand and other gritty materials. Screening removes larger-sized solids found in wastewater such as sticks, rags, and plastics. The screening stage is often followed by calm conditions, often in a tank, that allow for settling out of other materials that may interfere with other treatment processes downstream. The City's existing wastewater treatment system does not include preliminary treatment. *As part of the City's Liquid Waste Management Plan (LWMP), the City's proposed wastewater treatment system will include preliminary treatment.*

The City's existing wastewater treatment facility treats wastewater exclusively using **secondary wastewater treatment**. Secondary wastewater uses bacteria and other microorganisms to breakdown organic materials in wastewater. This microbiological activity produces biomass that settles out of the water and must be periodically removed. Aerobic biological treatment (the addition of air to the treatment process) is currently used by the City's wastewater treatment facility to treat wastewater. *As part of the City's LWMP, the City's proposed wastewater treatment system will include secondary wastewater treatment.*

Prior to returning treated effluent back to the environment, a **disinfection** step may be added. Disinfection further reduces levels of potentially harmful pathogens in treated wastewater. An example of a common disinfectant for treated effluent is ultraviolet light or UV. *As part of the City's LWMP, the City's proposed wastewater treatment system will include UV disinfection.*

In addition to treatment of water before it is returned to the environment, solids should also be treated. Biosolids is a term typically used to describe biomass that has been stabilized and dewatered. As part of the City's LWMP, the City's wastewater treatment system will include periodic removal of biomass from the wastewater treatment facility. This biomass will be converted to biosolids, using composting with wood chips, for reuse as a valuable fertilizer at the Alberni Valley Landfill.

For more information, visit the City of Port Alberni's LWMP website at www.portalberni.ca/liquid-waste-management-plan or contact City of Port Alberni Engineering at 250-720-2830.

PORT ALBERNI SEWAGE TREATMENT FACILITY

Project Overview

One of the largest infrastructure projects in Port Alberni's history is being undertaken just across the Somass River. The expansion and redevelopment of the City's sewage treatment facility is part of a long-range, multi-phased effort to manage our city's wastewater (ie: sewage) to ensure protection of public health and the environment and achieve compliance with new federal and provincial regulatory requirements.

WHY IS AN UPGRADE TO THE SEWAGE TREATMENT FACILITY NEEDED?

Municipal sewage treatment is subject to regulations and standards set by the provincial government and, since 2012, now the federal government as well. Planning for the replacement of the City's current sewage treatment facility has been ongoing for many years due to persistent challenges with meeting the standards for discharge of treated wastewater. Aside from the regulatory requirements, properly collecting, treating and disposing of our community's wastewater is critical to our continued health and wellbeing. Untreated or undertreated wastewater can pose significant risks to our own health, local aquatic ecosystems and species, and can impact our quality of life through odors and other negative effects.

WHAT IS THE LIQUID WASTE MANAGEMENT PLAN (LWMP)?

The upgrade to the sewage treatment facility is part of a larger process set out by the province for communities across BC to establish comprehensive, long term strategies for dealing with all aspects of liquid waste. The planning process, known as a liquid waste management plan (LWMP), is a guidance document that details each community's solutions for managing wastewater. The plan is required to be developed in 3 stages: examine existing conditions and develop options; evaluate options and select preferred choice(s); and develop a plan with projected funding.

WHAT IS BEING PROPOSED FOR SEWAGE TREATMENT?

As part of the LWMP process the City developed and evaluated three options for future wastewater treatment. They included three different approaches that ranged in value (present day) from approximately $42 million to $60 million. The City felt strongly that a more cost-effective solution could be achieved by utilizing and upgrading the adjacent paper mill lagoon and so delayed a decision regarding the existing options to pursue discussions with the owners of the mill. An agreement in principle was reached with Catalyst Paper for the acquisition of the lagoon and other property in 2010, opening the door for the City to pursue its preferred option, a secondary aeration treatment system.

WHAT IS THE COST OF THE NEW SEWAGE TREATMENT FACILITY?

The total cost for the acquisition and upgrade of the sewage treatment facility is estimated at $27.7 million. While the capital improvements to the sewage treatment facility are still in the design phase, the City has spent: $5.3 million to purchase the lagoon; $1 million on engineering and environmental studies; and $1.9 million on the removal of sludge from the new lagoon facility.

In 2011 as part of preparation of a grant application, the total project was estimated at $14.2 million, which did not include the cost of purchasing the lagoon. This was based on early conceptual plans, senior government regulations at the time, and assessments of the infrastructure. The scope and cost of the project have increased significantly since that time due to requirements of new federal regulations and increased infrastructure acquisition costs. Infrastructure not originally budgeted for and now required includes the construction of a 1.2km long effluent discharge system.

WHO IS PAYING FOR THIS?

The Government of Canada and Province of BC are currently committed to provide 40% of the total project costs, with the City responsible for the balance.

In 2016 the City increased sewer and water rates for all customers. These changes were introduced to ensure the long term sustainability of these services by providing adequate funding to operate, repair, maintain and renew existing utility infrastructure. Revenues are not projected to cover the additional costs associated with the sewage treatment facility; however, the City is actively developing plans to address this matter.

CAN THE CITY GET MORE GRANT FUNDING FOR THE PROJECT?

In January of 2012 it was announced that the City was successful in achieving an $11.2 million grant for the project. This was the largest grant ever received by the City and one of the largest awards by the federal General Strategic Priorities Fund. In fact, of the 300 grants awarded under the first Gas Tax Agreement from 2005-2014, there were only three grants across the province that were larger.

The City will be pursuing further grant opportunities as they become available. City Council and staff are working closely with provincial and federal government representatives to identify and secure additional grants.

Project Overview

WHY DOES THIS UPGRADE COST SO MUCH?

Wastewater treatment facilities are complex and costly. Communities across the country are making significant investments to meet new regulations and guidelines. Within BC a number of communities have faced or are facing similar challenges, including: a $28 million upgrade in Cranbrook; $24 million upgrade in Penticton; a $43 million upgrade in Kamloops; and projected project costs of $22 million in Sechelt; $56 million in the Comox Valley; and $25 million in Powell River. The financial burden on communities is significant and only compounds the existing funding gap municipalities are facing in the replacement of roads, buildings, bridges and other infrastructure.

WHEN IS THE TREAMENT PLANT UPGRADE SCHEDULED TO BE COMPLETED?

Grant funding provided by the Government of Canada must be spent by March 2018 while new federal wastewater regulations require that the project be completed by 2020.

WILL THE NEW TREATMENT PLANT IMPROVE ENVIRONMENTAL CONDITIONS IN THE HARBOUR?

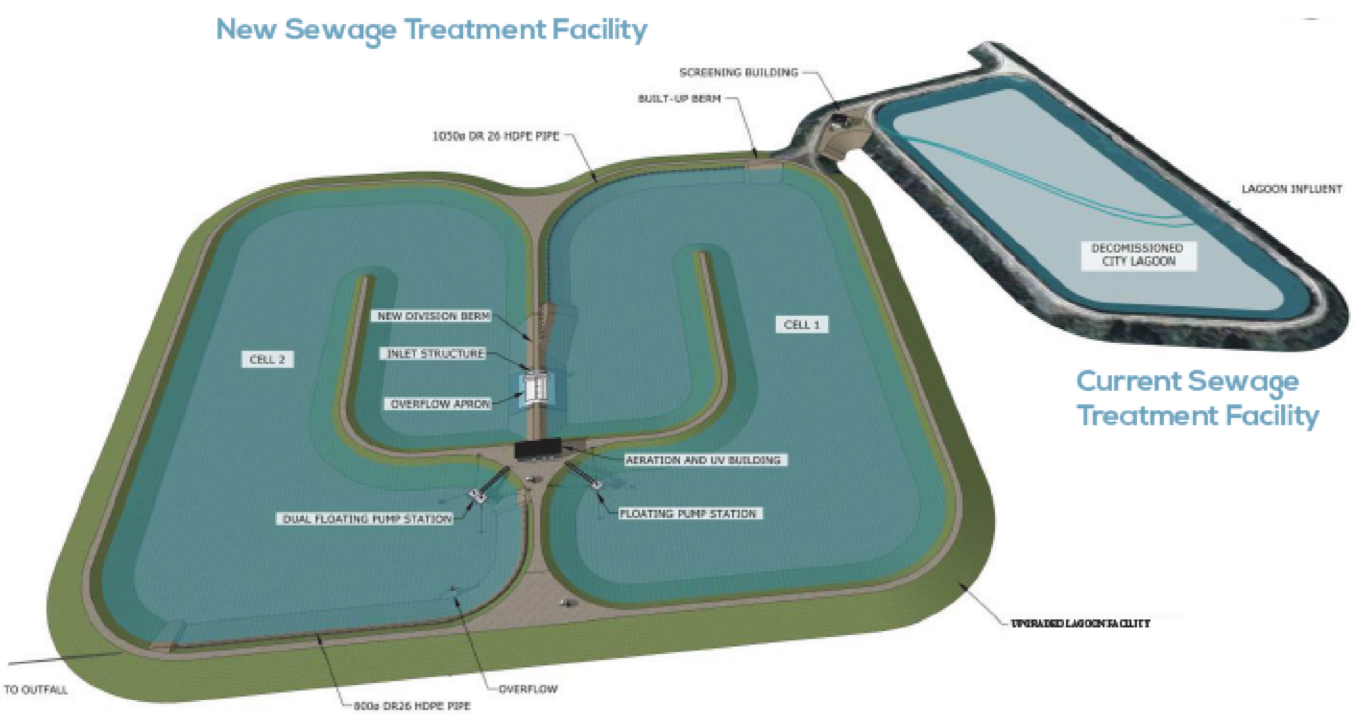
The new sewage treatment plant will significantly improve the quality of the effluent, dramatically reduce any potential public health impacts and improve the aquatic habitat in the Alberni Inlet for all species. Detailed studies and an innovative design process have been undertaken in the plans for the discharge system to minimize impacts on salmon.

HAS COMMUNITY INPUT BEEN CONSIDERED?

Community input and feedback is an important part of the development of a liquid waste management plan. The City has ensured that local interests are being considered through the formation of Technical and Public Advisory Committees and also through detailed consultation with the Hupacasath and Tseshaht First Nations. This dialogue has brought significant value to the project by incorporating local knowledge and perspectives regarding the unique environmental, recreational and cultural aspects of the estuary, river and harbour.

HOW CAN I LEARN MORE?

You can learn more about this project by visiting: www.portalberni.ca/liquid-waste-management-plan and review the documents and information there. You can also call the City's Engineering Department at 250-720-2830 or email cityservice@portalberni.ca



NEWS RELEASE

Tuesday, March 21, 2017

CITY RECEIVES ADDITIONAL FUNDING FOR WASTEWATER TREATMENT UPGRADE

One of the largest infrastructure projects in Port Alberni's recent history has received a further federal-provincial investment with the announcement of a $6.7 million grant from the Clean Water and Waste Water Fund.

The funding will help ensure the protection of public health and waterways by supporting the development of an upgraded wastewater treatment system, currently in the planning stages as part of the City's Liquid Waste Management Plan (LWMP).

Thanks to this investment, residents of Port Alberni and the surrounding area will benefit from improved handling and treatment of wastewater from residences, businesses and schools in Port Alberni and some surrounding areas. The Somass Estuary Environmental Stewardship Protection Project will utilize a disused lagoon facility purchased by the City from Catalyst Paper, resulting in an expanded waste water treatment capacity. Improvements to waste water treatment and outflow, exceeding federal and provincial standards, will mean that people, the environment and fish will all benefit from this investment.

The Honourable Amarjeet Sohi, Minister of Infrastructure and Communities, and the Honourable Peter Fassbender, Minister of Community, Sport and Cultural Development made the announcement, one of 144 projects funded through the Clean Water and Wastewater Fund. The federal government is providing up to 50 per cent of the funding—just over $4,000,000—and the provincial government is providing $2,741,469. The municipality will provide the balance of funding.

When combined with the $11.2 million received in 2011 from Government of Canada's Gas Tax Fund, the City's wastewater treatment upgrade has now received approximately $18 million in grant funding. Costs associated with the overall project have been estimated at approximately $22 million, excluding the acquisition costs of the former Catalyst Paper lagoon facility.

Quotes

"Safe and reliable drinking water and wastewater systems are essential infrastructure for all communities in our province. The Clean Water and Wastewater Fund enables local governments to make the critical investments in essential services their citizens rely upon. This program is another successful example of our government working together with our federal and municipal partners to best serve British Columbians."

The Honourable Peter Fassbender,

Minister of Community, Sport and Cultural Development

"City Council is extremely pleased with the funding support provided by both the federal and provincial governments. This project's innovative use of redundant industrial infrastructure reflects the City of Port Alberni's commitment to environmental stewardship, infrastructure renewal, and innovative leadership that enables the City to live within it's means while at the same time enhancing livability in our community."

Mike Ruttan
Mayor, City of Port Alberni

Quick facts

- The Government of Canada allocated $225,067,721 to British Columbia under the Clean Water and Wastewater Fund, and will fund up to 50 per cent of the eligible project costs.
- The Government of Canada will provide more than $180 billion in infrastructure funding over 12 years for public transit, green infrastructure, social infrastructure, transportation that supports trade, and Canada's rural and northern communities.

Associated links

Government of Canada's $180-billion+ infrastructure plan:
http://www.budget.gc.ca/fes-eea/2016/docs/themes/infrastructure-en.html

Federal infrastructure investments in British Columbia:
http://www.infrastructure.gc.ca/map-carte/bc-eng.html

CWWF and PTIF projects in British Columbia: http://www.infrastructure.gc.ca/pt-sp/projects-list-liste-projets-bc-eng.html

The Clean Water and Wastewater Fund:
http://www.infrastructure.gc.ca/plan/cwwf/cwwf-program-programme-eng.html.

City of Port Alberni Liquid Waste Management Plan:
https://www.portalberni.ca/liquid-waste-management-plan

Appendix G2 – Advertisements for Public Event (Stage 2 Engagement 2013-2017)

NEWS

Residents invited to wastewater treatment open house

0 Like 7

by Staff Writer - Alberni Valley News
Port Alberni *posted* Mar 9, 2017 *at* 3:00 PM

Port Alberni residents are invited to a wastewater treatment open house hosted by the city on Wednesday, March 15 from 11:30 a.m. to 8 p.m.

The open house will inform residents about improvements to wastewater treatment tha are being undertaken to meet federal and provincial regulations through a planning process called a Liquid Waste Management Plan.

The drop-in style event provides an opportunity for the community to learn about the project and share their comments.

"We're working to develop a long-term strategy for our wastewater infrastructure to bring the City into compliance with government regulations and address our community's unique needs," said Scott Smith, director of development services with the City of Port Alberni. "Our wastewater treatment system requires significant investment and it's important that we hear from residents to ensure the best decisions are made."

Key elements of the project include: piping and upgrades to the new wastewater lagoon facility purchased from Catalyst Paper, a screening facility to remove debris, an aeration system to breakdown organic material, ultraviolet (UV) disinfection and outfall piping and diffuser system in the Alberni Harbour.

Proposed upgrades have been developed to reflect local interests and conditions. A Wastewater Advisory Committee with representation from First Nations, community groups and technical experts has played an integral role in developing a 'made-in-Port Alberni' approach with fish health and habitat as a top priority.

Detailed project information, including cost estimates and timelines, will be provided at the open house. While a formal presentation will not be provided, city staff and project consultants will be on hand to discuss the proposed plan, respond to questions and receive comments.

For more information, please visit the City of Port Alberni online at www.portalberni.ca or call 250-723-2146.

islandRADIO

Island Radio
4550 Wellington Road
Nanaimo, BC V9T 2H3
Ph: 250 758 1131
Fx: 250 758 4644

CLIENT:	**City of Port Alberni**	**CART:**	**CL04598**
DATES:	**Mar 9 – Mar 14**	**TITLE:**	**Wastewater Open House**
WRITER:	**Maria**	**LENGTH:**	30
NOTES:		**STATIONS:**	**Peak**

The City of Port Alberni's waste-water lagoon, located across the Somass River, receives and treats waste-water from homes, schools and businesses. With the facility no longer meeting federal and provincial regulations, upgrades are required in order to support our community's high quality of life and protect our local environment. The City invites residents to an open house on Wednesday, March 15th from 11:30am to 8pm at the Echo Centre to learn more about this important project. For more information visit port-alberni-dot-c-a.

VOICED BY:		**PRODUCER:**	
MUSIC BED:		**DATE PRODUCED:**	

Appendix G3 – Content Developed for Public Event (Poster Boards) (Stage 2 Engagement 2013-2017)

Port Alberni - LWMP Overall Process

Liquid Waste Management Process

The City's 1958 wastewater treatment lagoon no longer meets applicable provincial and federal regulations. Upgrades are required to bring the City into compliance.

The Liquid Waste Management Planning process brings First Nations, City, and Stakeholders together to develop an affordable and sustainable wastewater solution for the community.

STAGE 1

Identification of key wastewater management issues

STAGE 2

Evaluation and selection of the preferred liquid waste management strategy

STAGE 3

Implementation of the preferred wastewater management strategy

www.portalberni.ca/liquid-waste-management-plan

LWMP - Project Timeline

TIMELINE

2003
Approval of Stage 1 LWMP

2004
Stage 2 LWMP suspended due to affordability challenges

2012
The City acquired the surplus wastewater treatment lagoon from Catalyst Paper for repurposing as the City's new, upgraded wastewater treatment facility

The City secured $11.2 Million in Gas Tax Funding

2013
Stage 2 LWMP was re-started

The Wastewater Advisory Committee (WAC) was formed

Environmental investigations (including site reconnaissance, water quality, and modelling) completed as part of the Environmental Impact Study (EIS)

2016
Archaeological investigations completed

Dredging of wastewater treatment lagoon completed

LWMP - Aquatic Habitat & Species

Fish are the most important

- The 2004 Somass Estuary Management Plan's vision:

  To maintain and enhance the productivity and diversity of the natural resources in the estuary with consideration for social and economic returns and benefits to the community
- First Nations and Stakeholders unanimously made fish health and habitat the top priority for the discharge of treated effluent.
- Main concern is adult salmon returning to spawn that hold in the deeper waters at the head of Alberni Inlet.
- Desire to minimize possibility of adverse effect to fish, and avoid any discharge into these deeper waters.
- Field data collection and extensive dilution modelling for the shallow discharge indicated a low probability of the treated effluent affecting the returning adult salmon and juvenile salmon.
- City requested that the province relax the depth requirement to enable discharge to be into shallower waters.
- Given the importance of the fish as part of ecosystem, the City has committed to implementing pre-discharge and operational monitoring programs.

Port Alberni - LWMP Project Elements

Project Elements

Key project elements consist of:

• Inlet Piping – to convey wastewater into the new, repurposed lagoon from the old City lagoon.
• Screening facility – to remove debris prior to the lagoon system.
• Diffused aeration system – to provide oxygen to microorganisms (bacteria) in the lagoon to breakdown organic material.
• Ultraviolet (UV) disinfection – for protection of human health - to inactivate pathogens that may be present in the treated effluent.
• Outfall piping and diffuser system – to discharge the treated effluent into the receiving environment (Somass Estuary) in a manner that protects the ecosystem.

Project Costs:

• Total project costs are estimated to be \$22.4 million, excluding the acquisition of the Catalyst lagoon (\$5.3 million).

• Cost estimates were developed for the preferred wastewater management strategy.

• The City has secured \$11.2 million in grant funding for this project and has submitted a further application to cover a portion of the outstanding costs.

LWMP - Evolution of Project Costs

COSTS

2011

Catalyst initiated their willingness to negotiate sale of surplus industrial lagoon to the City

Application for Gas Tax Grant Funding based on high-level plan to repurpose Catalyst lagoon. $14.2 million requested

2012

City was granted $11.2 Million from the Gas Tax Fund

New Provincial and Federal regulations requiring City to be in compliance by January 2020

2014

New Provincial regulations for discharge into estuaries requires significant additional infrastructure (pumping, UV Disinfection, long outfall); these changes are estimated to cost an additional $6.0 Million

Screening facility added to remove plastics; estimated to cost an additional $1.0 Million

2016

Extensive Environmental Impact Study to investigate impacts of discharge on fish and archaeological investigation of outfall pipeline alignment; $200,000 additional to 2011 funding application

Dredging of biosolids from legacy of paper mill treatment operations; $2.0 Million

Costs of materials and construction adjusted to accommodate for inflation (from 2011 to 2016)

Appendix G4 – Public Participation Summary Memorandum (Stage 2 Engagement 2013-2017)

CITY OF PORT ALBERNI

CLERK'S DEPARTMENT
MEMORANDUM

TO:	Tim Pley, CAO
FROM:	Jake Martens, Deputy City Clerk/Communications Coordinator
COPIES TO:	Scott Smith, Director of Development Services
DATE:	April 13, 2017

SUBJECT: **Liquid Waste Management Plan – Public Participation Summary**

Purpose

To summarize the level of public participation to date in the City's Liquid Waste Management Planning (LWMP) process.

Background

The City of Port Alberni has been conducting a consultation process specific to the ongoing development of the LWMP. The consultation process provides a forum for community members, government and First Nations representatives, technical experts and various stakeholders to contribute throughout the LWMP process.

These efforts, outlined in the attached Consultation Plan Update, have supported the City's work by ensuring the inclusion of local interests and community-driven solutions for the development of the LWMP.

Discussion

Planning for improvements to the City's wastewater system has reached an important phase with the Stage 2 report detailing the evaluation of options and selection of preferred projects nearing completion. With public participation being an important component of the overall process, a brief summary of the extent of this participation is provided. A summary of the specific information received through the consultation process will be included in the Stage 2 report.

Public Input Overview

Stakeholder groups and members of the community were invited to provide input through three key methods:

- Wastewater Advisory Committee
- Public Open House & Outreach
- Public Survey

The Wastewater Advisory Committee includes representatives from a spectrum of the community organizations and stakeholders including; City, Regional District, Tseshaht First Nation, Hupacasath First Nation, Environment Canada, DFO, West Coast Aquatic, Somass Estuary Management Plan Committee, Alberni Valley Enhancement Association, Catalyst Paper, Western Forest Products, Port Alberni Port Authority, Ministry of Environment, Ministry of Health, Ducks Unlimited, AV Chamber of Commerce, Worley Parsons, McGill & Associates Engineering and Associated Engineering. This Committee has worked productively on the details of the LWMP and has met approximately 9 times since re-engaging in 2013.

On February 25, 2017 representatives of the City attended the Alberni Valley Bulldogs hockey game with display boards and other information in the upper lounge area. It was reported that 1100 people were in attendance with approximately 300 of those viewing the display and 30 directly engaging with staff.

On March, 2017 a public open house was held at Echo Centre from 11:30am to 8:00pm. Approximately 60 members of the community attended throughout the day-long event.

Concurrent with the open house event, a public survey was distributed at the meeting and made available online from March 31 – April 13, 2017. Approximately 75 responses were received in total.

Extent of Public Participation

The level of public participation in the LWMP plan to date is reflective of similar planning processes undertaken by the City. This is evidenced below in the comparative analysis provided in Table 1.

Table 1: Comparative analysis of public participation levels

	Liquid Waste Management Plan	**Waterfront North Plan (2014)**	**Uptown and Waterfront Redevelopment Plan (2007)**	**2017-2021 Five-Year Financial Plan (2017)**
Participation time frame	Ongoing	2 months	6 months	5 months
Goal/Objective	Provide balanced and objective information, obtain feedback, and collaboratively identify preferred solutions	Gather sense of current uses, key issues/concerns and opportunities	Gather interest and ideas on issues to address and obtain feedback on alternatives	Provide budget and service information and gather input on desired service levels and projects.
Levels/Stages of participation	Inform / Consult / Involve / Collaborate	Inform / Consult / Involve	Inform / Consult / Involve	Inform / Consult / Involve
Methods of participation	- Advisory Committee - Attendance at Public Event (1) - Public Open House (1) - Public Survey	- Public Workshop (2) - Public Survey	- Public Workshop (2)	- Budget Town Hall (1) - Public Survey
How many	60 attended open	75 attended	55 survey	30 attended the

participated	house; 75 survey responses	workshops; 129 survey responses	responses	town hall in-person and 15 participated online; 275 survey responses

Conclusion

Based on the analysis provided, the level of public participation in the LWMP process generally illustrates a similar level of engagement in comparison to other planning initiatives conducted within the community.

Respectfully submitted,

Jake Martens
Deputy City Clerk/ Communications Coordinator

Liquid Waste Management Plan
Consultation Plan Update
February 2017

Overview:
The City of Port Alberni is developing a Liquid Waste Management Plan (LWMP) to identify and develop cost-effective solutions to address sewage, stormwater and other wastewaters within the community. The LWMP is being developed in accordance with provincial and federal wastewater regulations that require upgrades to the City's infrastructure to ensure the protection of public health and the environment.

The LWMP is required to be developed in three stages, with Provincial approval as each stage is completed. The three stages are based on a problem-solving approach to create solutions specific to the local community. Given this approach, public participation is a key requirement of the LWMP to ensure multiple interests have been considered and that the Plan is supported by and reflects the needs of the community.

Objective:
To provide opportunities for all those affected by the development of the Liquid Waste Management Plan (LWMP) to review and provide input on the planning process.

Target Audience:
- Port Alberni residents and businesses
- Hupacasath and Tseshaht First Nations
- Community-based environmental groups
- Natural resource user groups
- Relevant regulatory agencies

Primary Methods of Consultation:
- Online Engagement
- Traditional Communications
- Community Level Events/Outreach

Consultation is ongoing through the following specific mechanisms:
- The development of a Wastewater Advisory Committee with representatives from First Nations, the public, stakeholders, and the provincial and federal governments.
- Meetings with representatives from the Tseshaht and Hupacasath First Nations.
- Mail-out(s), advertisement(s) and media coverage on the process and ways for the public to participate.
- A webpage with information on the planning process, committee meetings, Frequently Asked Questions (FAQ) paper, fact sheets, and technical reports.
- Open House and other public outreach events to provide information and receive input on the LWMP.

- Print, in person and online surveys.
- Meetings with City Council and other local and regional officials.

Schedule

The City began its LWMP process in 1999 with the Stage 1 document completed and approved by the Ministry of Environment in 2001. Following a comprehensive review of options and protracted negotiations for the preferred lagoon facilities, the City has reengaged in Stage 2 of the LWMP process.

The Stage 2 LWMP document will be submitted to City Council for consideration of submission to the Minister of Environment. The proceedings and results of consultation activities will be documented and outlined in the report, targeted for completion in April 2017.

Execution

The Deputy City Clerk/Communications Coordinator and Director of Development Services will coordinate and facilitate the consultation process.

Budget

Resources required to deliver on the consultation activities are provided for within the City's Engineering Department's approved budget.

Appendix G5 - Results of the Community Survey during Open House (March 15, 2017)

March 15, 2017

City of Port Alberni
Community Survey Results

* Note, results are displayed in red.

1. In which neighbourhood do you live?
   - ☐ Alberni/Oldtown 4
   - ☐ Arrowsmith Heights
   - ☐ Cameron Heights 1
   - ☐ Echo
   - ☐ Grieve Park
   - ☐ Industrial Park
   - ☐ Northport 3
   - ☐ Redford Heights
   - ☐ Sahara Heights
   - ☐ Southport 8
   - ☐ Westporte Place
   - ☐ **Other (please provide location):**
   - Uplands
   - Owner Commercial/Residential building at bottom of Argyle
   - Lantzville
   - Cherry Creek
   - Maitland & 3rd Avenue area
   - Cherry Creek
   - Central Port (upper)
   - Sproat Lake
   - Central Port Alberni – 16th Avenue
   - Klekhoot Indian Reserve #2

2. How is your household wastewater treated?
   - ☐ Sewer and treatment facility 20
   - ☐ Private on-site system (i.e. septic system) 4
   - ☐ Pump and haul (i.e. holding tank)
   - ☐ Other
     - City
     - NA

3. Older areas of the City's sewer system are "combined" – which means that both storm water and wastewater are collected/conveyed in one "combined" piping system. During high precipitation events the flows can overwhelm the capacity of the pipes. Were you aware that there are Combined Sewer Overflows (CSOs) that occasionally send untreated wastewater/storm water directly into the Somass River?
   - ☐ Yes 18
   - ☐ No 4

- Just found out at this information session
- The sooner the separation occurs the better. Also, the separation of grey water from the sewer system would be good as well.
- Good to see (long term) plans to resolve this
- Winter 2016/2017 – Identified diesel contaminant in sewer/storm drain on Argyle Street. Also sewer smell
- I did not know "for sure" until this presentation (although I highly suspected)
- Would be extremely happy to have this corrected and willing to pay for it; we all use the estuary whether we live in the City or not.
- They didn't know any better
- Obviously something we want to correct
- This wastewater treatment facility is contingent on the continuing process of separating the storm water. So a serious financial commitment to continuing that process must be made.
- I believe the City and Weaver Park is splitting the line.
- Should not be done!!
- I would prefer that all wastewater be "treated"

4. "Sewer separation" is the replacement of combined sewers with separate storm water and wastewater collection/conveyance systems. This greatly reduces the volume of wastewater that is sent to the treatment system, and eliminates CSOs. Were you aware the City is currently working on a sewer separation program?
   - ☐ Yes 22
   - ☐ No 4

- I was glad to hear it was underway
- End of Argyle Street overflow near property
- This presentation is helpful in explaining the proposed "sewer/rainwater" separation. Great!!!
- I am glad to hear that this is being discussed and planned for. I wish the provincial government would initiate grey water treatment on residential lots.
- The biggest thing with treatment plant is being penny wise and dollar foolish. Look at the projected maintenance cost down the road not just the initial capital costs.
- Good

5. The City's existing wastewater treatment system consists of a lagoon across from Victoria Quay. In it, bacteria break down organic material with the help of oxygen provided by mechanical aeration. Were you aware that treatment performance is compromised during periods of high flow and the effluent is sometimes out of compliance with the Provincial and Federal regulations?
   - ☐ Yes 25
   - ☐ No 6

- I didn't think that they would be putting raw sewage into the river/inlet system
- I would hope that the annual "stinks" would disappear as well.
- I assumed it happens
- Effluent discharge into fish sensitive area. Concerns around discharge content? Health considerations pharmaceuticals etc.
- Particularly bad with input from fish plant
- This presentation confirmed my fears of affluent being discharged into the river.
- I suspected this was so but didn't know for sure
- I am convinced that our current system is not adequate
- Infiltration is expensive and waste of money to treat.
- Needs to be corrected as being planned
- I can smell it in my backyard at times.

6. Provincial regulations include requirements that treated effluent be discharged in a manner that prevents exposure to humans. Were you aware the City's lagoon presently discharges treated effluent through an open ditch into the Somass River in an area open to the public?
   - ☐ Yes 19
   - ☐ No 7

- I haven't been in that area for probably 40 years
- Yikes, shades of Victoria
- Yikes!
- I sit on Barclay Salmon Working Group West Coast Aquatic
- This presentation confirmed my fears
- Have been very worried about the outlet for years.
- I thought it went into the Harbour
- No!!

7. The Somass River/Estuary is the most important fishery on Vancouver Island. Were you aware that the Somass Estuary is a sensitive and critical ecosystem for adult and juvenile salmon?
   - ☐ Yes 25
   - ☐ No 1

- Also for other things – especially plants
- Anything we can do as a community to increase habitat's survival should be done.
- We fish in the river
- Now I know it

8. The Liquid Waste Management Planning process (LWMP) is an alternate regulatory process for municipalities to involve the larger community in establishing a plan for sustainable wastewater management. Were you aware the City initiated the development of a LWMP in 1999, and that this was put on hold in 2004 in the absence of affordable alternatives?
   - ☐ Yes 10
   - ☐ No 16

- Since 1999
- I consider it a priority as said – I'm willing to pay increased taxation – Valley wide – we all use it.
- Stalling a project means higher cost but in this case a better system due to better understanding of the whole process
- I was only aware that in 1999 the province required higher level of treatment and that the City had been looking for a way to comply for a long time.
- Good to see them proceeding with changes.
- I feel that not enough information is provided to the taxpayers
- I was Mayor then.

9. Were you aware the City was successful in securing $11.2 Million in Gas Tax Funding in 2012 for the wastewater treatment upgrades?
   - ☐ Yes 18
   - ☐ No 7

- Just found out
- I knew about the grant. Not the actual amount.
- I'm glad to hear this
- Yahoo
- Good start!
- Just heard on radio
- Heard it on the radio

10. Were you aware that in 2012 the City purchased Catalyst Paper's surplus lagoon to provide the basis for additional treatment capacity – and assist with affordability?
    - ☐ Yes 22
    - ☐ No 3

- Just found out from AV Times today or yesterday - I considered it a fabulous deal and forward thinking of the City to move on it - Good planning - Good

11. Were you aware that in 2012 the City re-started the LWMP process after securing funding and acquiring the Catalyst lagoon, and has been working with First Nations and Stakeholders to evaluate a variety of discharge alternatives to bring the City into compliance with regulations?
    - ☐ Yes 16
    - ☐ No 9

- Just found out today - Very happy to hear it. - I am pleased that First Nations have been included in the process - Generally aware of this. - Good Work!!

12. Provincial regulations for discharge into estuaries require additional infrastructure (pumping, UV disinfection, 1.2 km outfall) that have increased project costs. Participants in the LWMP process (local First Nations and various Stakeholder Groups) have prioritized the protection of fish and fish habitat in determining the final discharge location. Do you agree with this priority?
    - ☐ Yes 24
    - ☐ No 1

- Providing protected fish habitat should result in providing human habitat protection. - Also other biological values - Absolutely - There is no doubt that we should be doing what we can to protect fish and fish habitat. - The reality is that the activities of the Port will not be compromised. And that the discharge will be located accordingly. - Continue with the good work. - Yes!

13. Participants in the LWMP process agreed that protection of fish and fish habitat was a very important priority for the community. The preferred discharge system is the one that offers the best protection for fish. It includes a 1.2 km long outfall/diffuser system with a discharge into the Somass Estuary. Do you have any comments or concerns relating to this option?

- Sounds ok to me
- Is there data that shows salmon are being negatively affected? I think other factors are more important.
- Yes an important consideration
- This will likely be ok once we reduce storm water in the system
- I think we need to do what is needed!
- Support WCA engagement in finding best practice
- Fish habitat is very important
- Public recreation – walking also important
- The further south that the discharge pipe runs, the better the clean-up
- Does the new system address micro plastics/fibres?
- The system was explained to me and seems the best option – it has to go somewhere and you've done your homework with the fisheries/biologists.
- I'm surprised it doesn't go further into the harbour. If the current plan is found to be insufficient, it will be easy to extend it.
- It sounds to me like this issue has been thoroughly researched
- No
- The B.O.D. reduction is critical to fish habitat thus secondary treatment is important.
- No as long as it's deep
- Better than the existing.
- Fish habitat is very important we fish and eat from this area
- Discharge should be discussed with the PAPA. I will put it in our agenda for our joint meeting.
- No, well explained
- Up to a point, I', in favour of spending more to protect fish and fish habitat
- No. The design looks good

14. The City applied to the federal Clean Water and Wastewater Fund (CWWF) in November 2016. An additional $6.9 million was requested to increase the total funding from senior government from 50% to 81% of total project costs. Were you aware that the City applied for this funding?
    - ☐ Yes 16
    - ☐ No 10

- I found out about this tonight
- To clean up our water/river system, I, as a tax payer am willing to pay more taxes.
- We need all the help we can get! Make it happen!
- I believe other jurisdictions may be getting more than 50% but doubt if we'll be lucky enough to hit 81%
- Good luck
- Bravo – hope we are successful
- I was aware that the City will always apply for funding for projects like this.
- Just learned this today. I am very happy with the proposed sewage treatment plan
- City Works employee
- Jake Martens just told me!
- I hope the City is successful

Notes on their own:

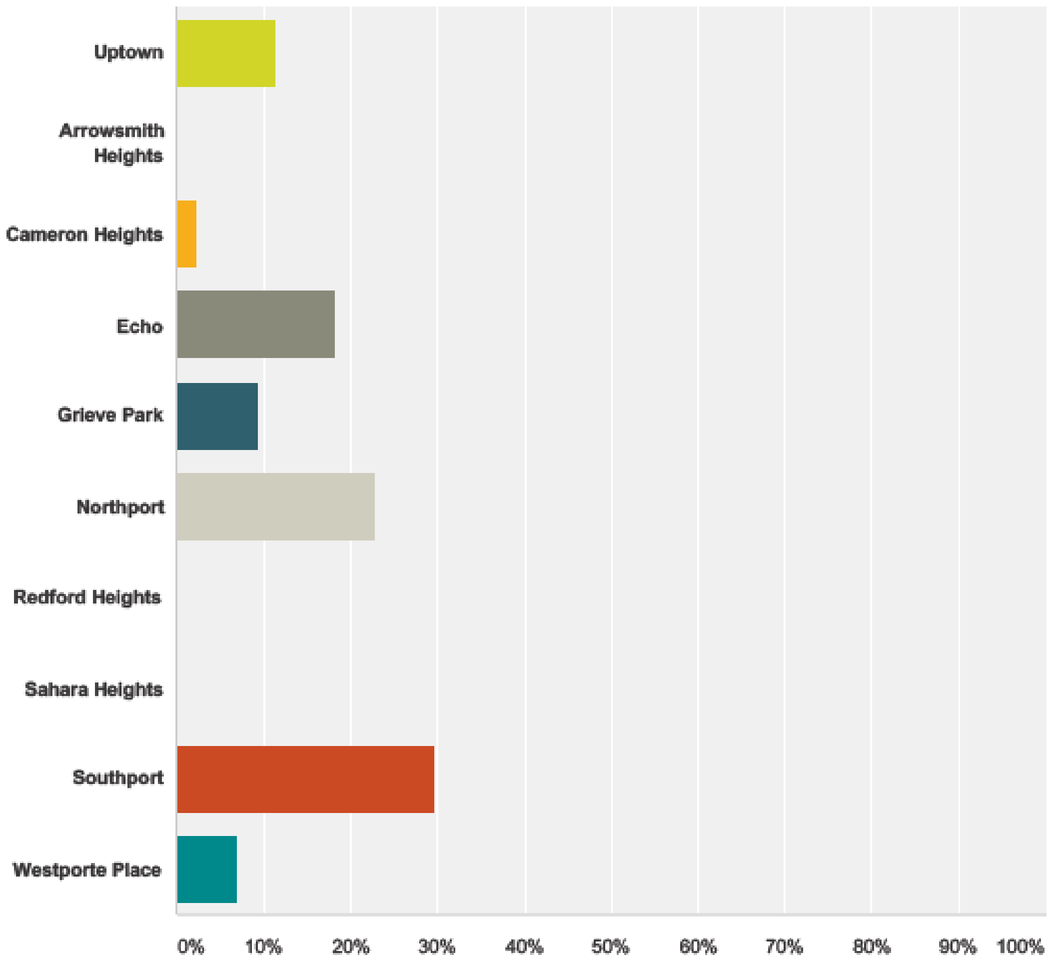
- The City needs to have a publicity campaign to inform citizens of what kind of junk is being flushed and explain to them how it costs them in hard dollars to clean that up. People need to dump less junk in the water.
- 30 years ago, a friend of mine suggested we make a bumper sticker, "VICTORIA, GET YOUR SHIT TOGETHER". This still applies to Victoria. I'm happy to hear & see that Port Alberni is showing responsibility in correcting our affluent problems. As a community, I feel we need to educate more residents to use less water and flush less often every month, not just summer shortage months.
- Some figures would be useful: What is the daily/yearly discharge? (sewers and storm water) What are the projected increases likely to be in taxes/utility bills at different levels of government funding? De-coupling sewer and storm draws block by block results in an ideal set up, but is it cost effective? Can the new lagoon handle the current flow?

Please note: One survey had no answers on number 9 thru 12.

Appendix G6 - Results of the Online Community Survey (Stage 2 Engagement 2017)

Q1 In which neighbourhood do you live?

Answered: 44 Skipped: 4

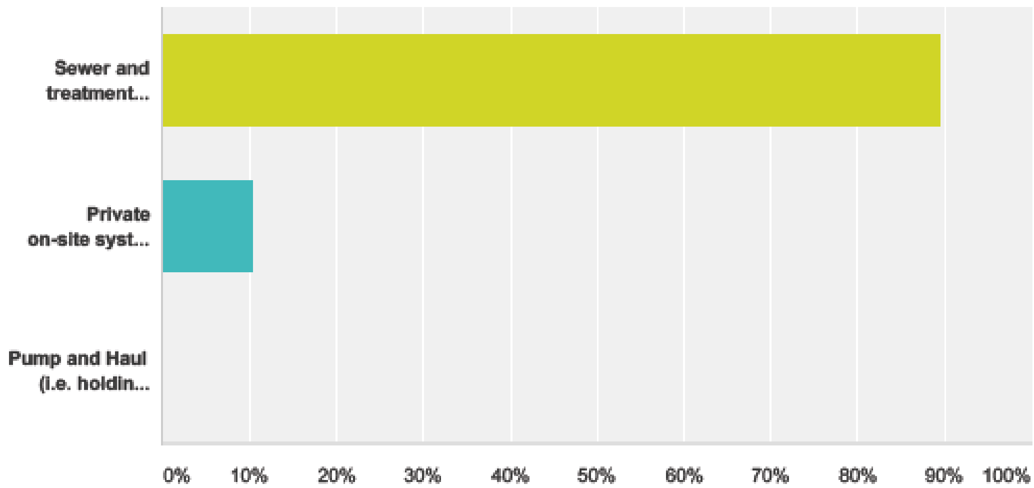


Answer Choices	Responses	
Uptown	11.36%	5
Arrowsmith Heights	0.00%	0
Cameron Heights	2.27%	1
Echo	18.18%	8
Grieve Park	9.09%	4
Northport	22.73%	10
Redford Heights	0.00%	0
Sahara Heights	0.00%	0
Southport	29.55%	13
Westporte Place	6.82%	3
Total		44

#	Other (please provide location)	Date
1	Johnston Road	4/5/2017 2:38 PM
2	Sproat lake	4/5/2017 7:54 AM
3	Beaver Creek	4/2/2017 5:18 PM

Q2 How is your household wastewater treated?

Answered: 48 Skipped: 0

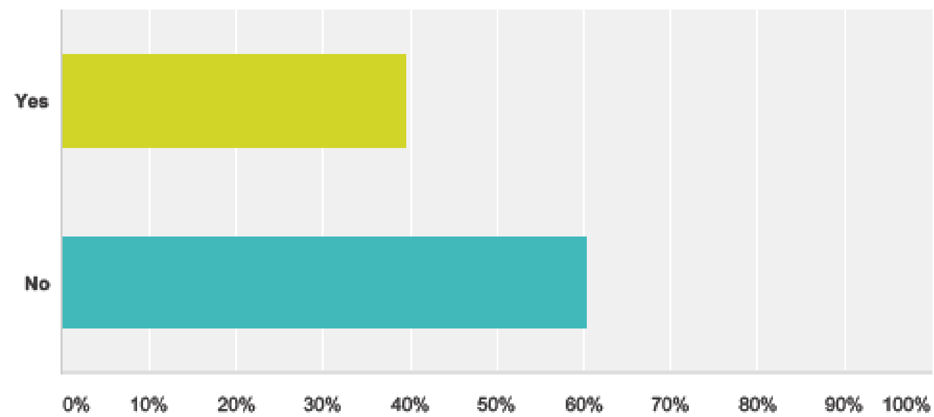


Answer Choices	Responses	
Sewer and treatment facility	89.58%	43
Private on-site system (i.e. septic system)	10.42%	5
Pump and Haul (i.e. holding tank)	0.00%	0
Total		48

#	Other (please specify)	Date
	There are no responses.	

Q3 Older areas of the City's sewer system are "combined" – which means that both storm water and wastewater are collected/conveyed in one "combined" piping system. During high precipitation events the flows can overwhelm the capacity of the pipes. Were you aware that there are Combined Sewer Overflows (CSOs) that occasionally send untreated wastewater/storm water directly into the Somass River?

Answered: 48 Skipped: 0

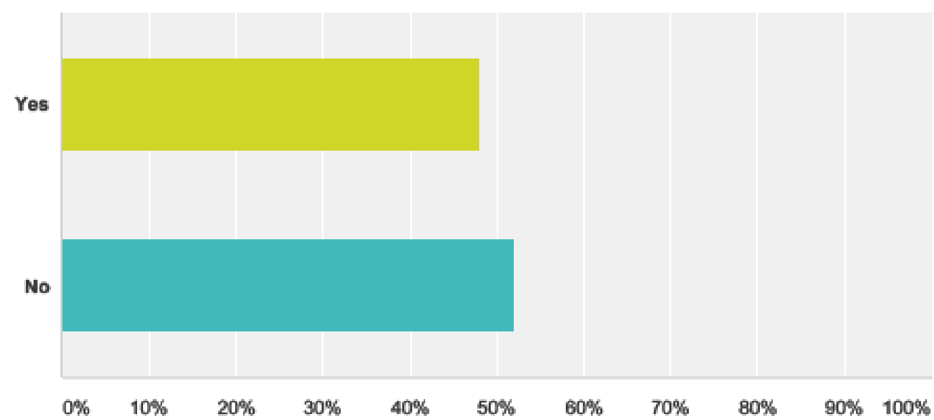


Answer Choices	Responses	
Yes	39.58%	19
No	60.42%	29
Total		48

#	Additional Comments	Date
1	Talked to guys working on separating the flows in Weaver Park last fall.	4/6/2017 5:40 PM
2	Sewage should be harnessed and treated as sewage with very little infiltration. There for the sewage can be used to power the treatment facility.	4/1/2017 6:49 AM

Q4 "Sewer separation" is the replacement of combined sewers with separate storm water and wastewater collection/conveyance systems. This greatly reduces the volume of wastewater that is sent to the treatment system, and eliminates CSOs. Were you aware the City is currently working on a sewer separation program?

Answered: 48   Skipped: 0

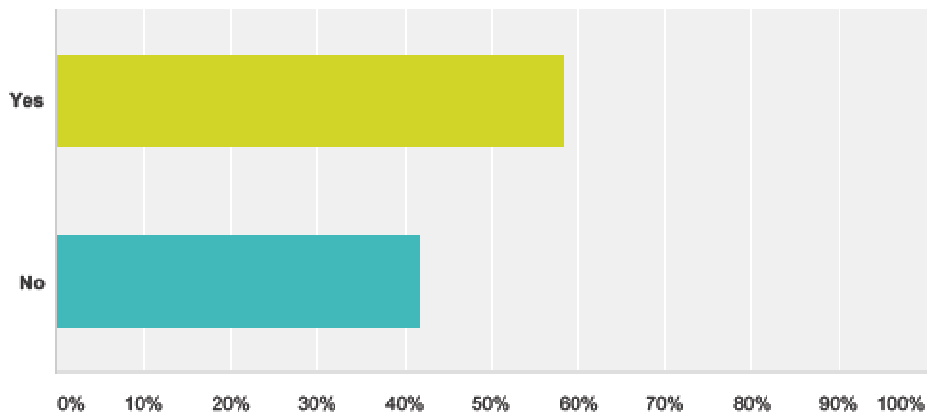


Answer Choices	Responses	
Yes	47.92%	23
No	52.08%	25
Total		**48**

#	Additional Comments	Date
1	I was happy to learn this. Not sure if you are aware that there is a sewage smell in South Port....might be the same complaints heard already; might be different.	4/6/2017 5:40 PM

Q5 The City's existing wastewater treatment system consists of a lagoon across from Victoria Quay. In it, bacteria break down organic material with the help of oxygen provided by mechanical aeration. Were you aware that treatment performance is compromised during periods of high flow and the effluent is sometimes out of compliance with the Provincial and Federal regulations?

Answered: 48   Skipped: 0

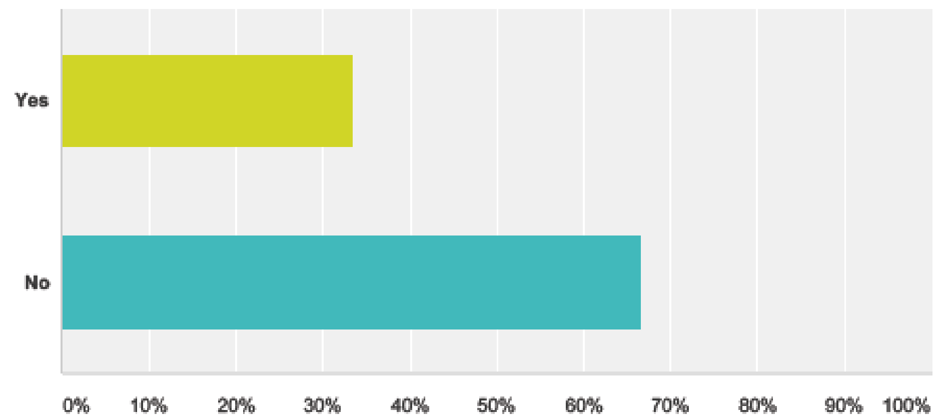


Answer Choices	Responses	
Yes	58.33%	28
No	41.67%	20
Total		48

#	Additional Comments	Date
1	But I am also aware that lower Alberni (north Port) - around Adelaide shopping area and Roger Creek - nearly always stink from this poorly functioning system. I advise newcomers in town to never buy real estate there because of this!	4/6/2017 5:40 PM

Q6 Provincial regulations include requirements that treated effluent be discharged in a manner that prevents exposure to humans. Were you aware the City's lagoon presently discharges treated effluent through an open ditch into the Somass River in an area open to the public?

Answered: 48 Skipped: 0

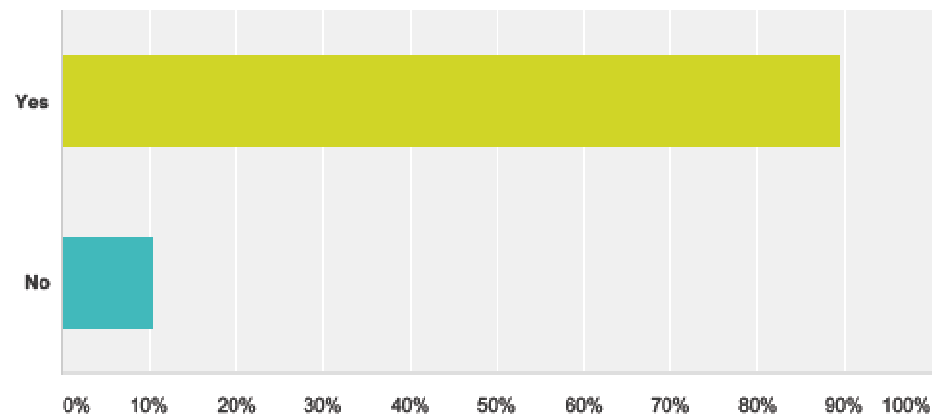


Answer Choices	Responses	
Yes	33.33%	16
No	66.67%	32
Total		48

#	Additional Information	Date
1	Sounds sketchy - especially since the system isn't working properly.	4/6/2017 5:40 PM

Q7 The Somass River/Estuary is the most important fishery on Vancouver Island. Were you aware that the Somass Estuary is a sensitive and critical ecosystem for adult and juvenile salmon?

Answered: 48 Skipped: 0

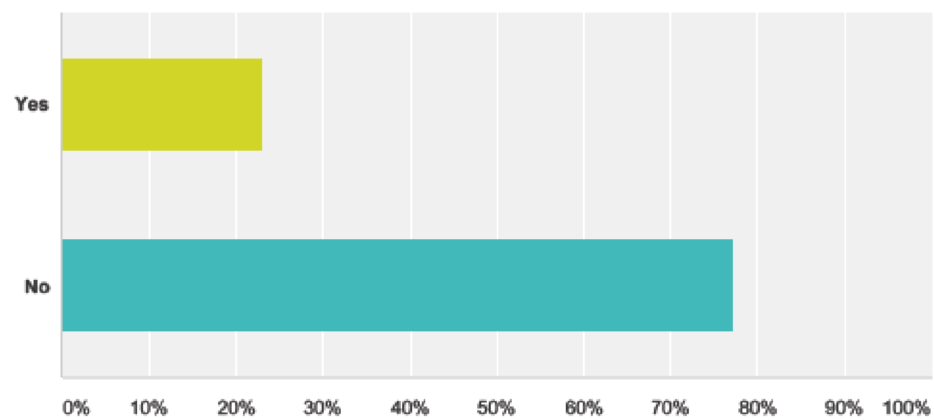


Answer Choices	Responses	
Yes	89.58%	43
No	10.42%	5
Total		48

#	Additional Information	Date
1	Any water system deserves respect.	4/6/2017 5:40 PM
2	Kinda late to start to care now with what the mills have been doing since they came and with oceans ph getting too acidic and climate changes, it won't be long before they're gone.	4/4/2017 6:11 PM

Q8 The Liquid Waste Management Planning process (LWMP) is an alternate regulatory process for municipalities to involve the larger community in establishing a plan for sustainable wastewater management. Were you aware the City initiated the development of a LWMP in 1999, and that this was put on hold in 2004 in the absence of affordable alternatives?

Answered: 48 Skipped: 0

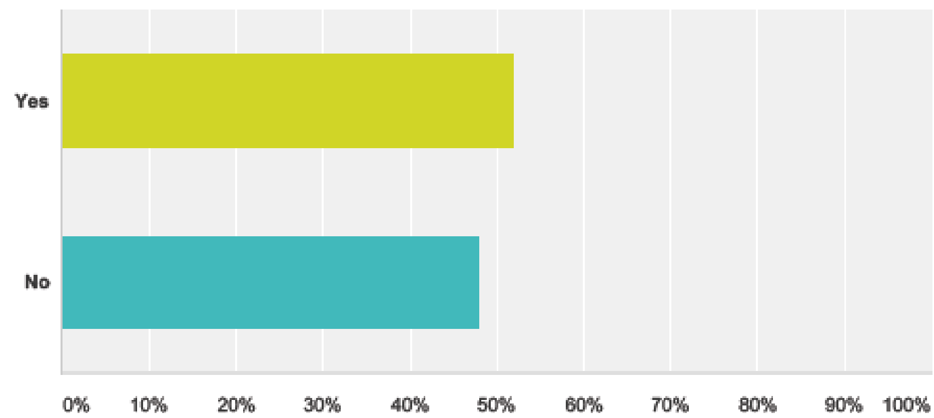


Answer Choices	Responses	
Yes	22.92%	11
No	77.08%	37
Total		**48**

#	Additional Information	Date
1	What progress was made in that 5 year period?	4/6/2017 5:40 PM

Q9 Were you aware the City was successful in securing $11.2 Million in Gas Tax Funding in 2012 for the wastewater treatment upgrades?

Answered: 48 Skipped: 0

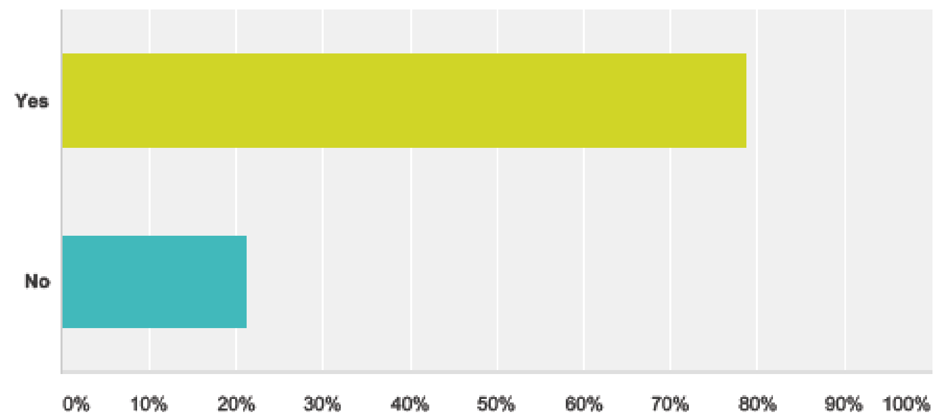


Answer Choices	Responses	
Yes	52.08%	25
No	47.92%	23
Total		48

#	Additional Information	Date
1	And so what happened to that money?	4/6/2017 5:40 PM
2	Not enough as the price will be probably closer to $ 40,000,000 as this is the norm with CityPa projects.	4/4/2017 6:11 PM

Q10 Were you aware that in 2012 the City purchased Catalyst Paper's surplus lagoon to provide the basis for additional treatment capacity – and assist with affordability?

Answered: 47 Skipped: 1

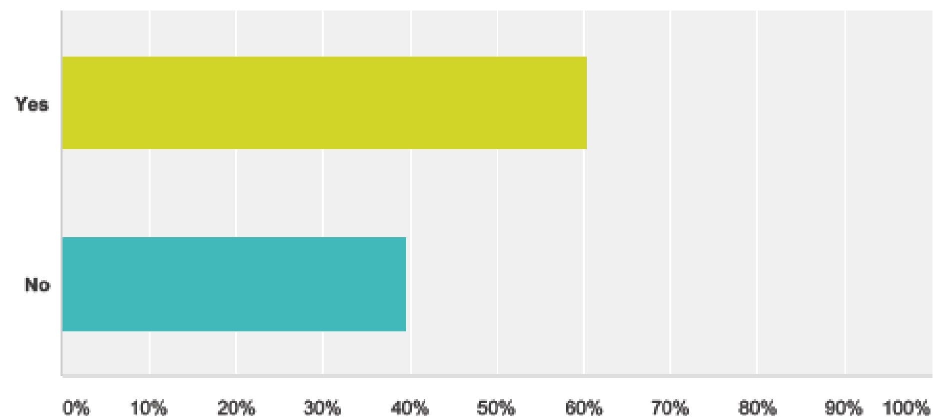


Answer Choices	Responses	
Yes	78.72%	37
No	21.28%	10
Total		47

#	Additional Information	Date
1	Probably could have built a new system cheaper than fixing this old outdated system.	4/4/2017 6:11 PM

Q11 Were you aware that in 2012 the City re-started the LWMP process after securing funding and acquiring the Catalyst lagoon, and has been working with First Nations and Stakeholders to evaluate a variety of discharge alternatives to bring the City into compliance with regulations?

Answered: 48 Skipped: 0

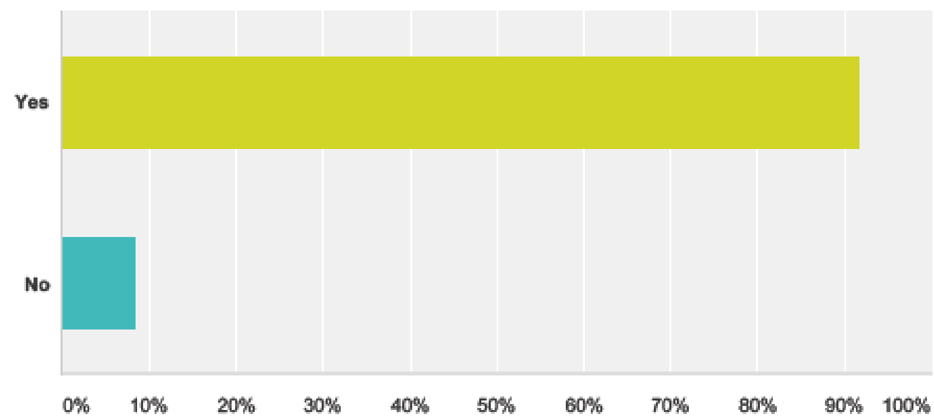


Answer Choices	Responses	
Yes	60.42%	29
No	39.58%	19
Total		48

#	Additional Information	Date
1	That is now 5 years ago. Glacial speed...	4/6/2017 5:40 PM
2	While this may not be the place for this, I remember that VIU had a project in which they used biosolids on growing trees. The trees "treated" with biosolids grew at a much faster rate than the untreated trees.	4/5/2017 6:33 PM
3	Who are these stakeholders?	4/5/2017 7:30 AM
4	And I was against it.	4/4/2017 6:11 PM

Q12 Provincial regulations for discharge into estuaries require additional infrastructure (pumping, UV disinfection, 1.2 km outfall) that have increased project costs. Participants in the LWMP process (local First Nations and various Stakeholder Groups) have prioritized the protection of fish and fish habitat in determining the final discharge location. Do you agree with this priority?

Answered: 48 Skipped: 0

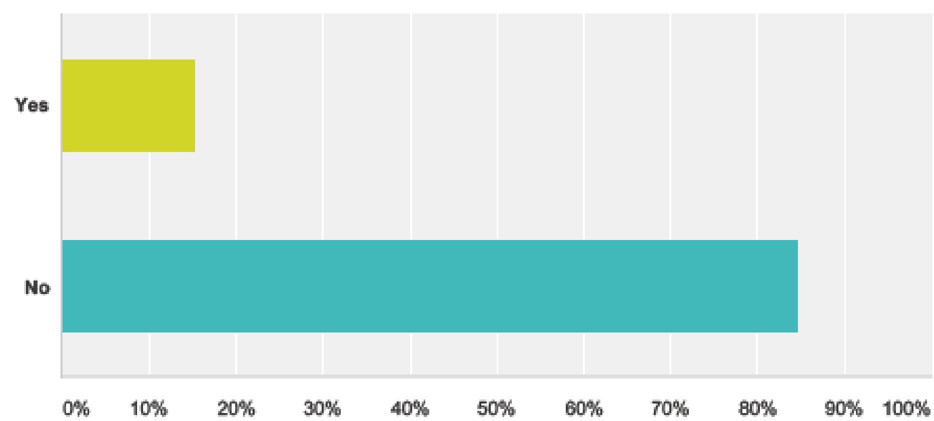


Answer Choices	Responses	
Yes	91.67%	44
No	8.33%	4
Total		48

#	Additional Information	Date
1	If we are protecting a baseline species, we should be in compliance in all respects - yes?	4/6/2017 5:40 PM
2	Can't we have it go into the ocean further down the canal outside of the estuary?	4/5/2017 11:09 PM
3	I also agree with no fishing for all parties	4/5/2017 7:30 AM
4	Save money and dump it, Victoria has way more they dump every day.	4/4/2017 6:11 PM
5	With the growth of the population and the approval by the First Nations of the possible LNG Port out the inlet which will more than likely bring the population up also . Wouldn't sewage Digesters be a better option ?Take for instance the Nanaimo Pollution Control Center	4/1/2017 6:49 AM

Q13 Participants in the LWMP process agreed that protection of fish and fish habitat was a very important priority for the community. The preferred discharge system is the one that offers the best protection for fish. It includes a 1.2 km long outfall/diffuser system with a discharge into the Somass Estuary. Do you have any comments or concerns relating to this option?

Answered: 46 Skipped: 2

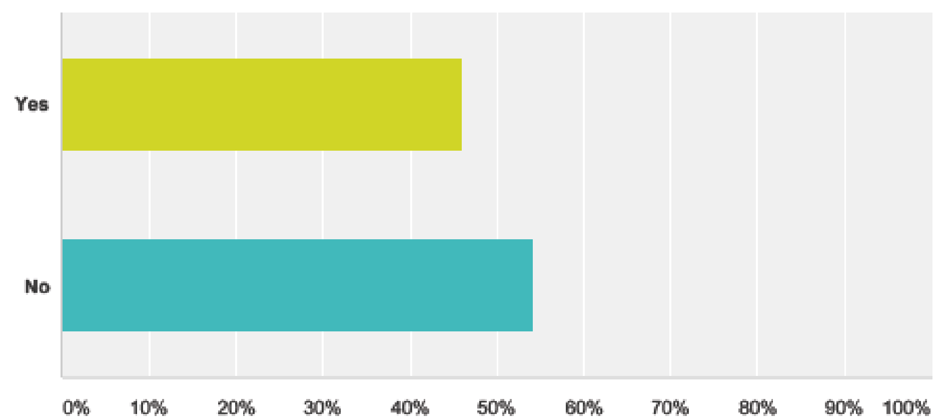


Answer Choices	Responses	
Yes	15.22%	7
No	84.78%	39
Total		46

#	If yes, please specify	Date
1	I would like to know more about where and how.	4/12/2017 9:12 PM
2	What exactly will fall from the out fall, and will this address community concerns for odors? This too is important.	4/6/2017 5:40 PM
3	Unnecessary as it's an inlet and a pipe will not make any difference as the tide and winds will bring the waste right up the Somass River to Paper Mill Dam regardless. More wasted money from lacking common sense.	4/4/2017 6:11 PM
4	The city should proceed with this important issue. It makes way more sense that changing street names.	4/1/2017 9:02 AM
5	I have faith that it's been properly designed and constructed.	4/1/2017 12:38 AM
6	Rather than discharging into the Somass River, why can we not do methane capture and utilizing this to create biofuel?	3/31/2017 7:18 PM

Q14 The City applied to the federal Clean Water and Wastewater Fund (CWWF) in November 2016. An additional $6.9 million was requested to increase the total funding from senior government from 50% to 81% of total project costs. On March 17, 2017 it was announced that the City's application was successful. Were you aware that the City applied for this funding?

Answered: 48 Skipped: 0



Answer Choices	Responses	
Yes	45.83%	22
No	54.17%	26
Total		48

#	Additional Information	Date
1	This survey doesn't seem like it really wants public input it just seems like a crappy way to get people to read information on what the city is doing and to lessen concerns about spending.	4/5/2017 7:30 AM

Appendix G7 – Web-Based Material (Combined Stage 2/3 Engagement 2020)

Port Alberni Wastewater Treatment Plant Upgrades

Background

The City of Port Alberni treats wastewater from approximately 18,000 people in the Alberni Valley. To provide this service, the City uses a centralized wastewater treatment plant and lagoon that has been in place since the 1950's. With the infrastructure aging and the Canadian wastewater treatment standards changing, the City is upgrading the plant and lagoon.

The City's Wastewater Treatment Plant Upgrades are part of a larger process set out by the province for communities across BC to establish comprehensive, long-term strategies for dealing with all aspects of municipal wastewater, storm water, and runoff. The planning process, known as a Liquid Waste Management Plan (LWMP), provides each community with a roadmap that provides comprehensive solutions for managing their municipal wastewater responsibly and as required by Provincial and Federal regulations.

LWMP Planning

The City has completed Stage 1 of the LWMP process. From 2013-2017, the City worked extensively to develop a Stage 2 LWMP, which involved Public Consultation activities, and selection of the preferred wastewater management solution.

Based on the information gathered, the City commenced upgrades on the newly acquired Catalyst lagoon in 2018. With construction now nearing completion, the City is looking to complete a Combined Stage 2/3 LWMP submission for approval by City Council and the BC Ministry of Environment. The "Plan" will provide details on how the City intends to implement the LWMP, and continue to monitor the plan to ensure compliance.

Engaging on the Plan

Public and First Nations engagement is a key component to receiving plan approval, and we want to hear from you. The current consultation program is to update the public on progress of the LWMP components, to bring further awareness of the LWMP process, and allow an opportunity to provide feedback. Besides managing the treatment of wastewater, the LWMP components include: Source Control and Volume Reduction, Combined Sewer Overflows, Inflow and Infiltration, Sustainability and Resource Recovery and Urban Stormwater Management.

Please take ten minutes to complete our survey and help guide the City in developing a holistic approach to monitoring and managing the community's wastewater.

SURVEYS & FORMS | Q & A

City of Port Alberni Liquid Waste Management Plan: Community Survey

There are 17 questions in this survey. Please skip any questions that you wish not to answer. We thank you for taking the time as your valuable input will help shape the City's Combined Stage 2/3 LWMP submission.

Take Survey

STAY INFORMED

Subscribe for project updates

Your email address...

Subscribe

19 members of your community are following this project

Document Library

- Glossary - The City of Port Alberni Liquid Waste Management Plan (464 KB) (pdf)
- Fast Facts on the City's LWMP.pdf (402 KB) (pdf)
- Liquid Waste Management Plan - Timeline (183 KB) (pdf)
- NEW! Project Fact Sheet - 2nd Edition - Jan 2020 (699 KB) (pdf)

- Port Alberni Wastewater Treatment Facility Site Plan (6.81 MB) (pdf)
- A Guide to What You Can & Can't Flush or Put Down the Drain
- Utility Usage Rates
- City of Port Alberni - Public Works and Infrastructure

more..

FAQ

- WHY IS AN UPGRADE TO THE WASTEWATER TREATMENT PLANT NEEDED?
- HOW MUCH WILL THIS PROJECT COST?
- WHY DOES THIS UPGRADE COST SO MUCH?
- IS THERE GRANT FUNDING AVAILABLE FOR THIS PROJECT?

more..

Key Dates

Contract Award
September 2018

Phase 1 - Plant construction and lagoon upgrades
September 2018 → November 2020

Phase 2 - Outfall and diffuser construction
September 2019 → February 2020

Phase 3 - Commissioning
October 2020

more..

Who's listening

Ken Watson

Acting Director of Engineering & Public Works

City of Port Alberni

Phone 250-720-2838

Email ken-watson@shaw.ca

Alicia Puusepp

Communications Manager
City of Port Alberni

Phone 250-720-2822

Email alicia_puusepp@portalberni.ca

Photos

Aerial View Of City Lagoon Prior To Upgrades

Aerial View Of City Lagoon Prior To Upgrades 2

more..

Appendix G8 - Results of the Online Community Survey (Combined Stage 2/3 Engagement 2020)

City of Port Alberni Liquid Waste Management Plan: Community Survey

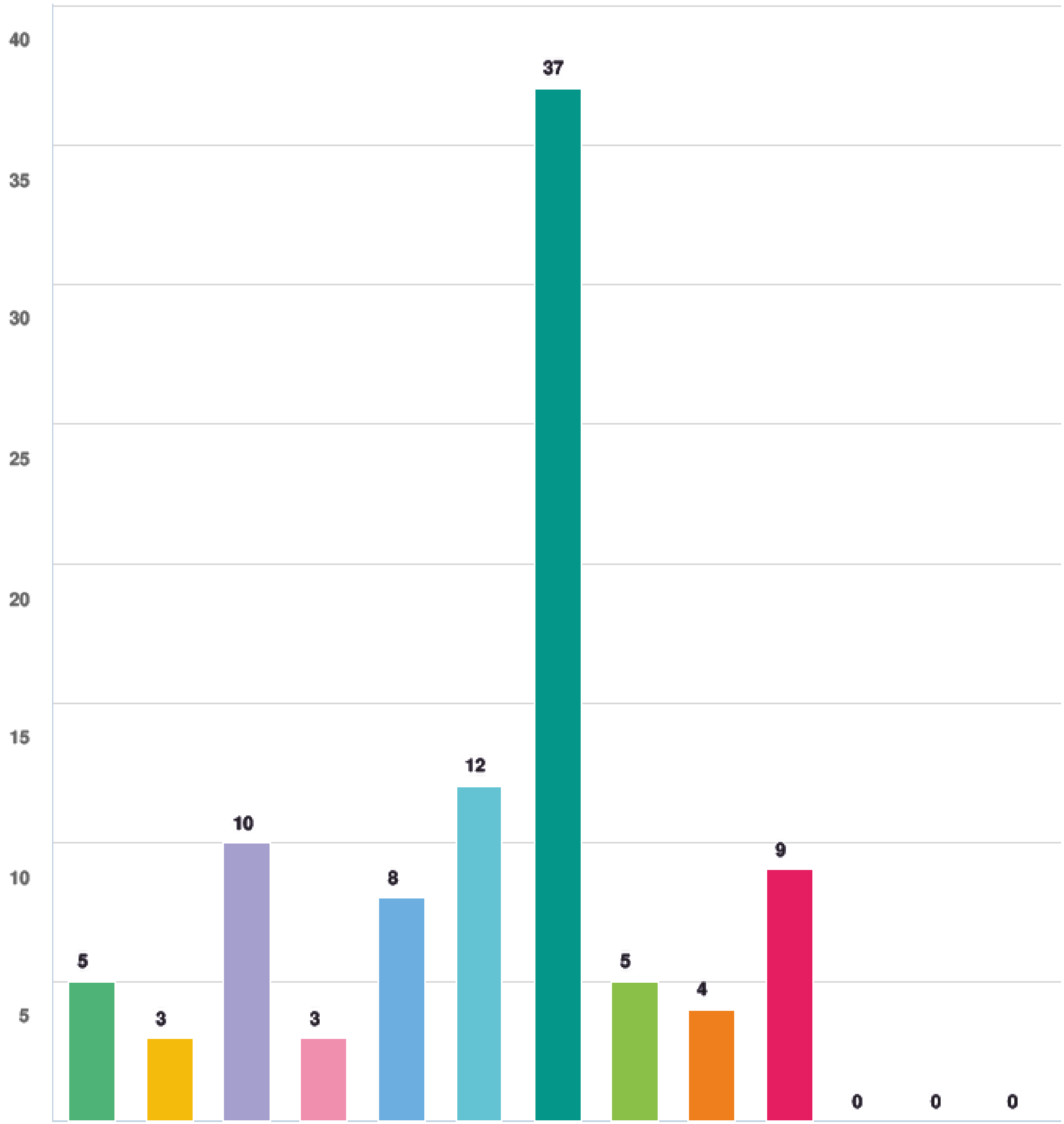
SURVEY RESPONSE REPORT
07 June 2020 - 06 July 2020

PROJECT NAME:
Port Alberni Wastewater Treatment Plant Upgrades

BANG THE TABLE engagementHQ

SURVEY QUESTIONS

Q1 In which neighbourhood do you live?

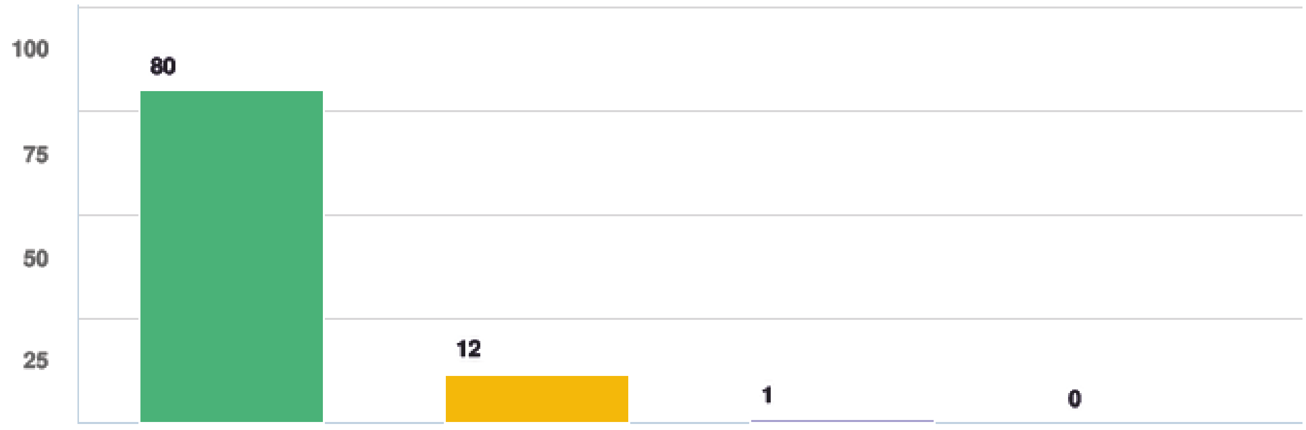


Question options

- Beaver Creek
- Cameron Heights
- Central Port Alberni
- Cherry Creek
- Echo
- Northport
- Southport
- Sproat Lake
- Westporte Place
- Other (please provide location):
- Hupacasath Reserve (Ahahswinis 1)
- Polly Point Reserve (Alberni 2)
- Tseshaht Reserve (Tsahaheh 1)

Optional question (94 response(s), 1 skipped)
Question type: Checkbox Question

Q2 How is your household wastewater treated?

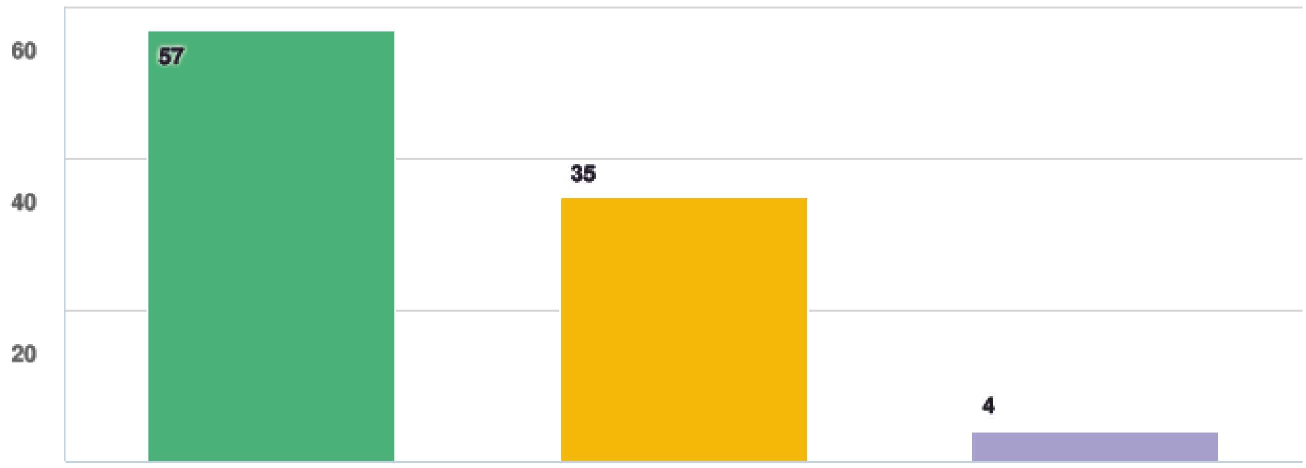


Question options

- Sewer and treatment facility
- Private on-site system (i.e. septic system)
- Other (please specify):
- Pump and haul (i.e. holding tank)

Optional question (93 response(s), 2 skipped)
Question type: Checkbox Question

The City's existing wastewater treatment system consists of an aerated lagoon across the Somass River from Victoria Quay; In it, bacteria breaks down organic material with the help of oxygen provided by mechanical aeration. Were you aware that treatment performance can be compromised during high precipitation events and that effluent (treated wastewater) is sometimes out of compliance with the Provincial and Federal regulations?



Question options

- Yes
- No
- Please select box to add comment:

Optional question (93 response(s), 2 skipped)
Question type: Checkbox Question

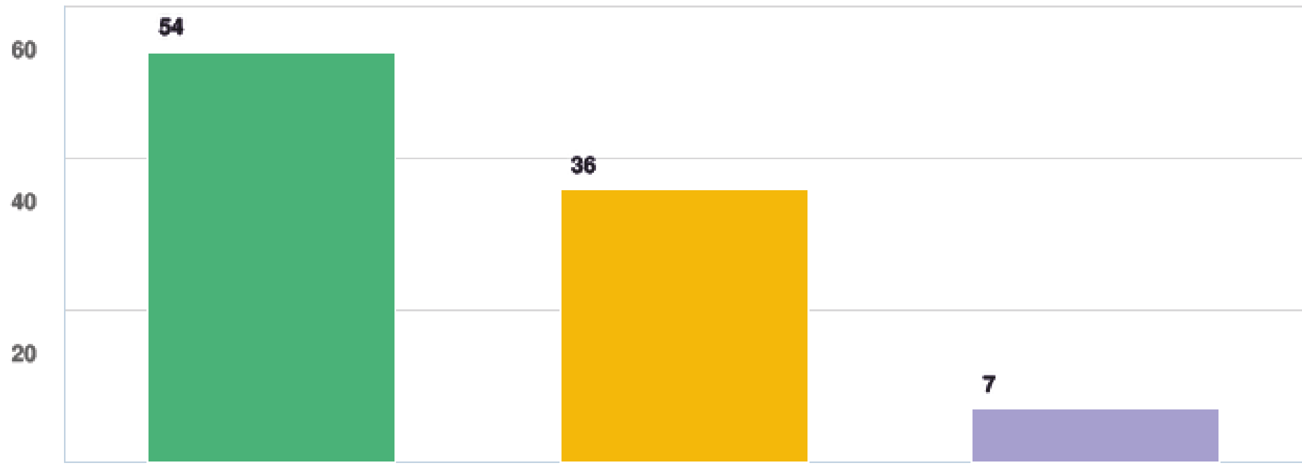
Other Comments:

Only became aware of this in recent years.

This should be addressed

Sunlight, oxygen, should aid breakdown. How do you avoid rain/snow from natural sources in the holding /settling pond.

Provincial regulations include requirements that treated effluent be discharged in a manner that prevents contact/exposure to humans. Were you aware the City's lagoon presently discharges treated effluent into the Somass River through an open channel in an area accessible to the public?



Question options

Yes No Please select box to add comment

Other Comments:

To avoid infection on human being

Only became aware of this in recent years.

If the lagoon discharge has been treated, to acceptable levels, the discharge should not be a concern. WHERE the discharge is located, in relation to to areas accessible to public at the river would be more important in my opinion

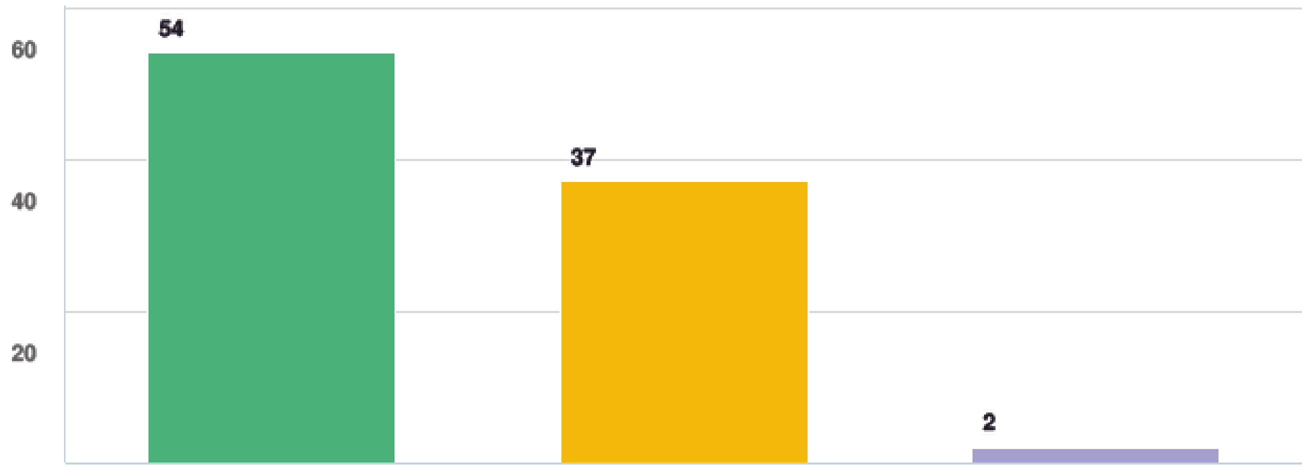
absolutely I did not know this its wrong and you should be ashamed of yourselves for letting this happen. There is no excuse that can justify this.

Yes,This is not ok

That's disturbing

Optional question (93 response(s), 2 skipped)
Question type: Checkbox Question

In 2012, the City was successful in securing $11.2 Million in Gas Tax Funding and in 2016, $6.9 Million in Funding from the Clean Water and Wastewater Fund for the wastewater treatment upgrades. The upgrades will far exceed the current treatment system by increasing the capacity of the system while improving the quality of the effluent. Were you aware that the City received funding from these sources for this purpose?



Question options

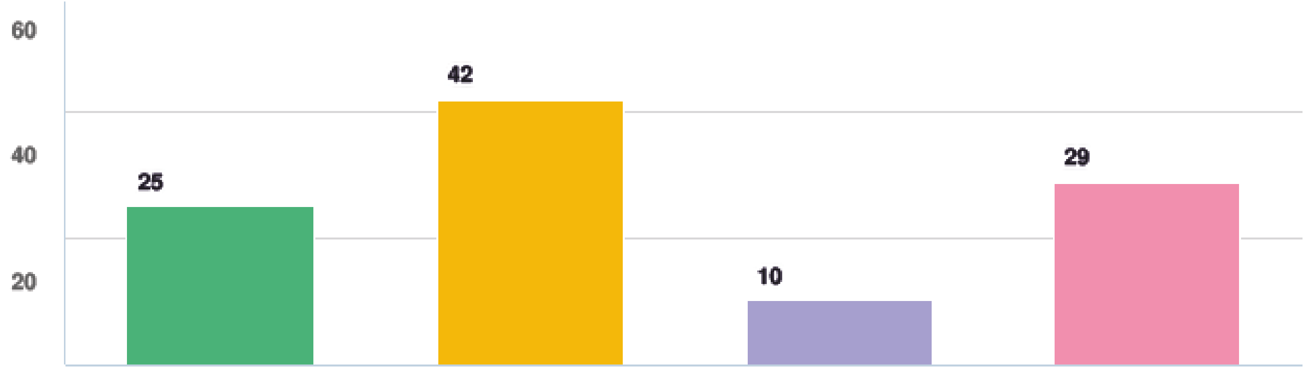
Yes No Please select box to add comment:

Other Comments:

No but I didn't live here then.

Optional question (93 response(s), 2 skipped)
Question type: Checkbox Question

The City has been developing a Liquid Waste Management Plan (LWMP) strategy for some time; In 2001, the City completed a Stage 1 LWMP.In 2012 the City re-started the Stage 2 LWMP process after securing funding and acquiring the Catalyst lagoon. From 2013-2017, the City consulted and engaged with First Nations and Stakeholders to evaluate a variety of wastewater management solutions.In 2018, the City began construction to upgrades to the acquired Catalyst Lagoon, as per recommendations from the Stage 2 work.In 2020, the City will complete a combined Stage 2/3 LWMP for approval by City Council and the BC Ministry of Environment.How aware of you to the City's LWMP process to date? Select all that apply.

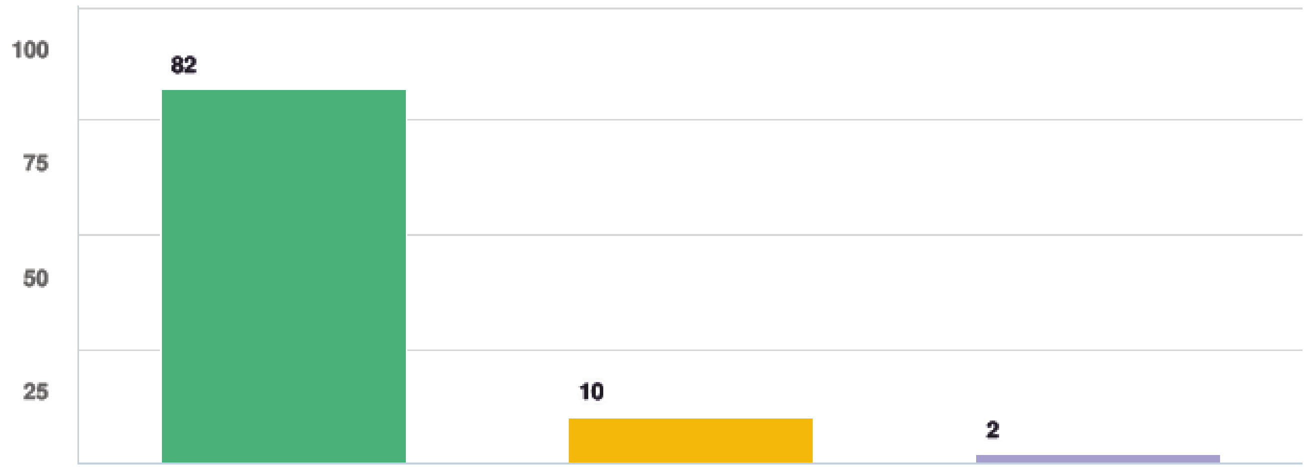


Question options

- Not aware of any of the previous LWMP work.
- Somewhat aware of the previous Stage 1 and/or Stage 2 work.
- Quite aware of the past Stage 2 work and participated in previous public consultation campaigns.
- Aware of the recent construction upgrades that have been occurring at the Wastewater Treatment Plant (WWTP)

Optional question (93 response(s), 2 skipped)
Question type: Checkbox Question

The Somass River/Estuary is the most important fishery on Vancouver Island. Critical conditions can occur naturally during the late summer in the Somass Estuary that can affect the health and survival of adult salmon that are preparing to enter the river for spawning. The upgraded facility will be capable of mitigating the impact of the effluent on the environment during these critical times. Were you aware that the Somass Estuary is a sensitive and critical ecosystem for adult and juvenile salmon?



Question options

- Yes
- No
- Please select box to add comment:

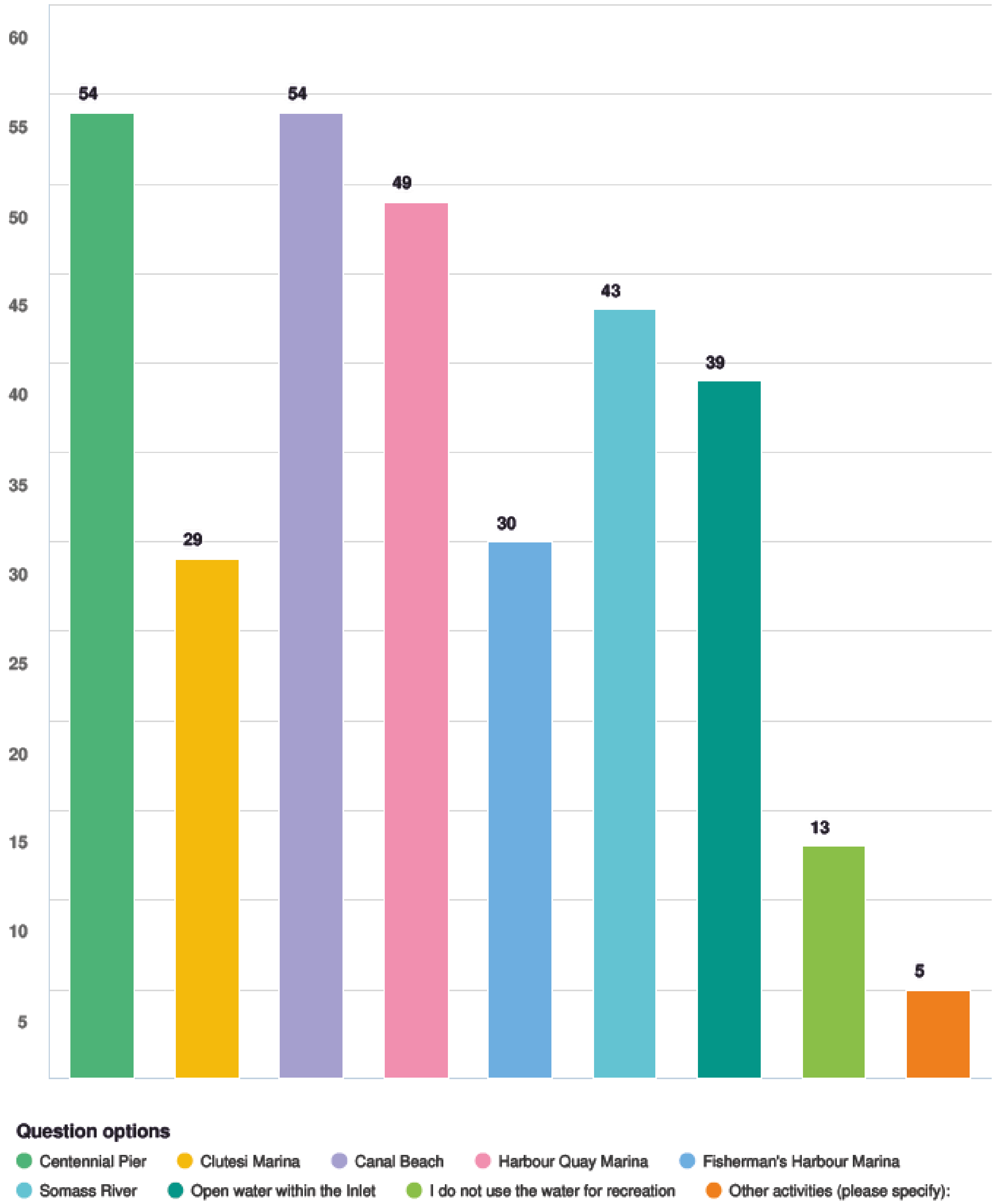
Optional question (93 response(s), 2 skipped)
Question type: Checkbox Question

Other Comments:

mitigating the effluent implies that it will happen. Plan a system that does NOT put ANY effluent into the river.

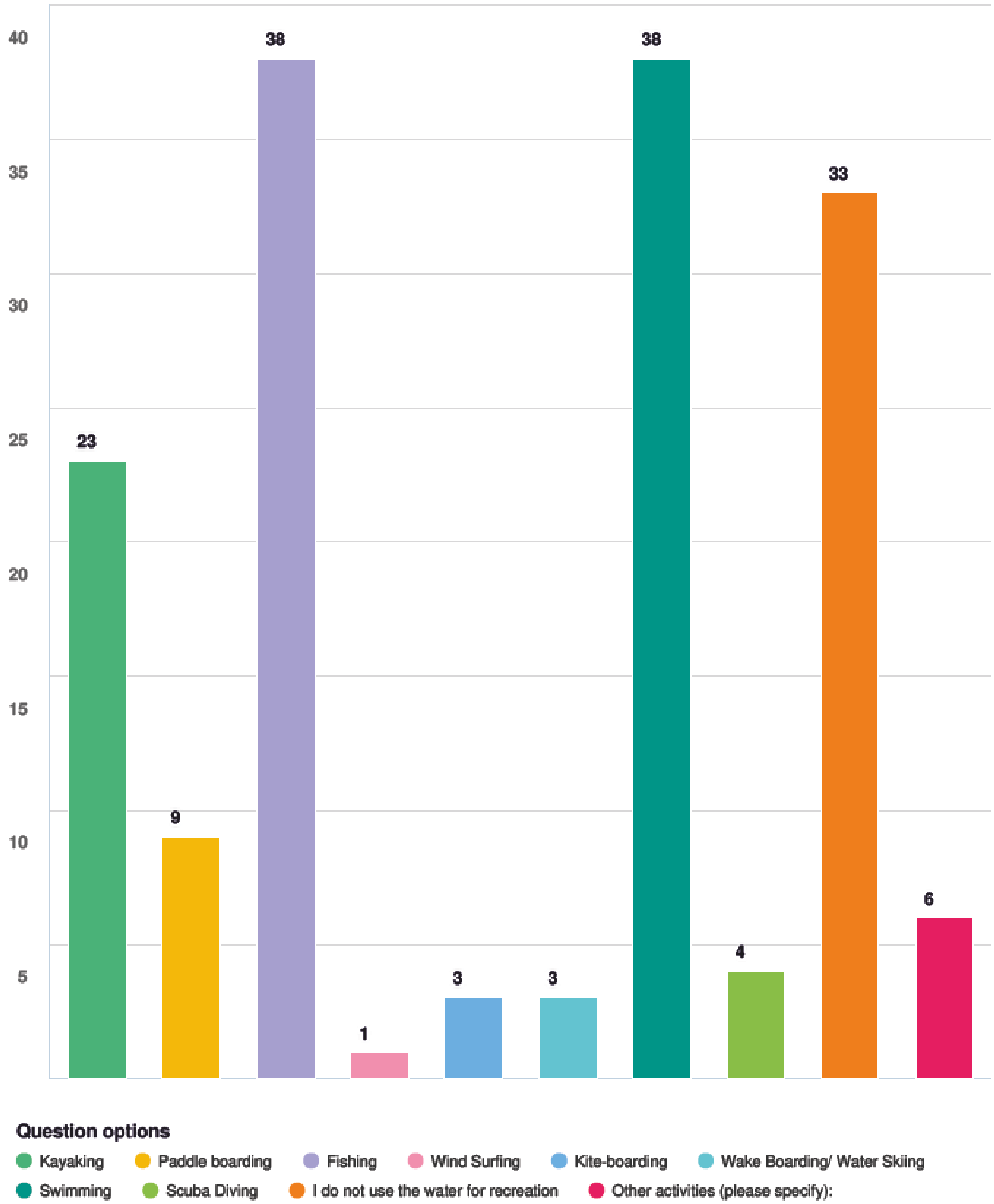
It is also a critical and sensitive ecosystem for a large number of resident and migrating bird species.

Q8 **Which areas of the Alberni Inlet and Somass Estuary do use for recreation activities? Select all that apply.**



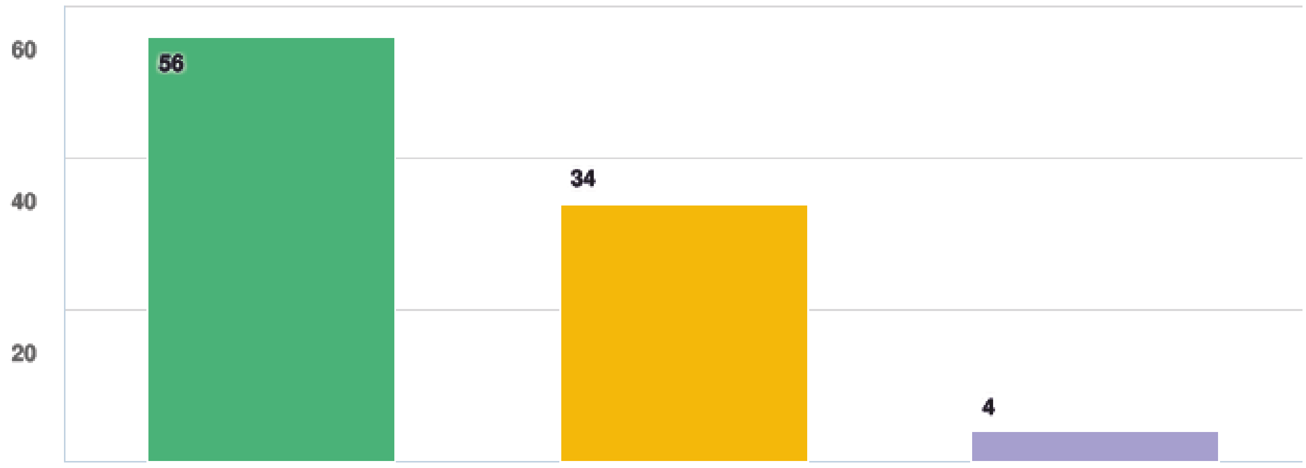
Optional question (91 response(s), 4 skipped)
Question type: Checkbox Question

The wastewater treatment upgrades include the addition of effluent disinfection, which will inactivate most bacteria and pathogens from the treated effluent prior to discharge. What kind of recreating do you do that puts you in direct contact with the water? Select all that apply.



Optional question (91 response(s), 4 skipped)
Question type: Checkbox Question

Much of the older areas of the City's sewer system are "combined sewers" – which means that both stormwater and wastewater are collected/conveyed in one "combined" piping system. During high precipitation events flows can exceed the capacity of the pumping/piping system and a portion of the flow is directed to combined sewer overflows. Were you aware that there are Combined Sewer Overflows (CSOs) that occasionally send untreated wastewater and stormwater directly into the Alberni Inlet?



Question options

Yes | No | Select box to add comment:

Optional question (92 response(s), 3 skipped)
Question type: Checkbox Question

Other Comments:

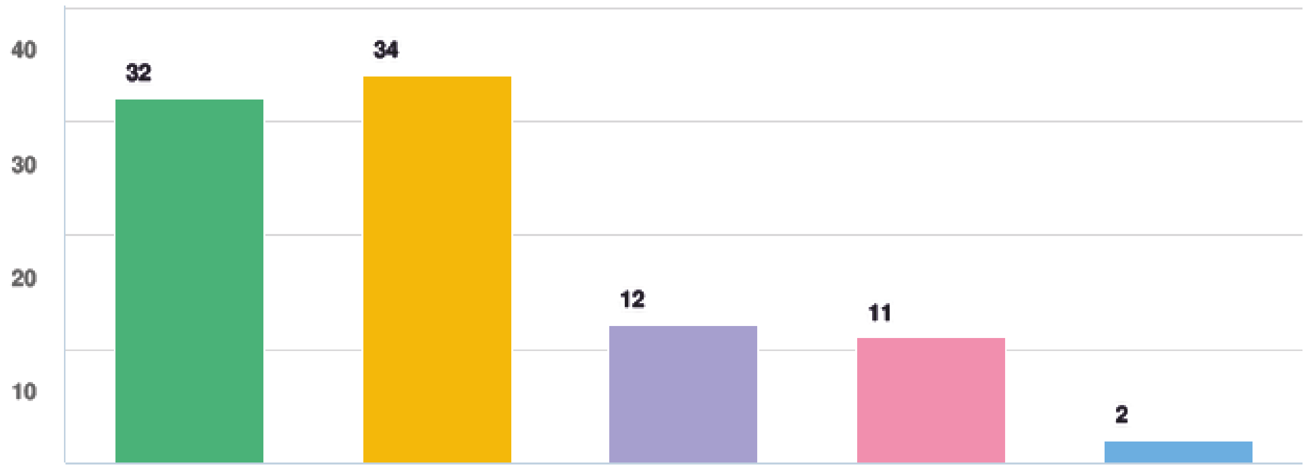
Wow again very disturbing

This is not ok

How long has this been happening? this has to stop our inlet is not a refuse container for our dirty water.

Was recently aware from a radio broadcast that was short lived, and never reached the paper for the public. I figured the story was buried with influences from CityPA.

The figure below shows a map of the areas within the Port Alberni sewer system that have "combined" storm and sanitary sewers, as opposed to areas that have "separated" storm and sanitary sewers. If connected to a "separated" system, your property should have a sanitary sewer connection, and a separate storm water connection (for perimeter drains and roof drainage). As far as you are aware, how is your home currently connected to the sewer system?



Question options

Combined | Separated | Unsure | Not on the City's system | Please select box to add comment:

Optional question (90 response(s), 5 skipped)
Question type: Checkbox Question

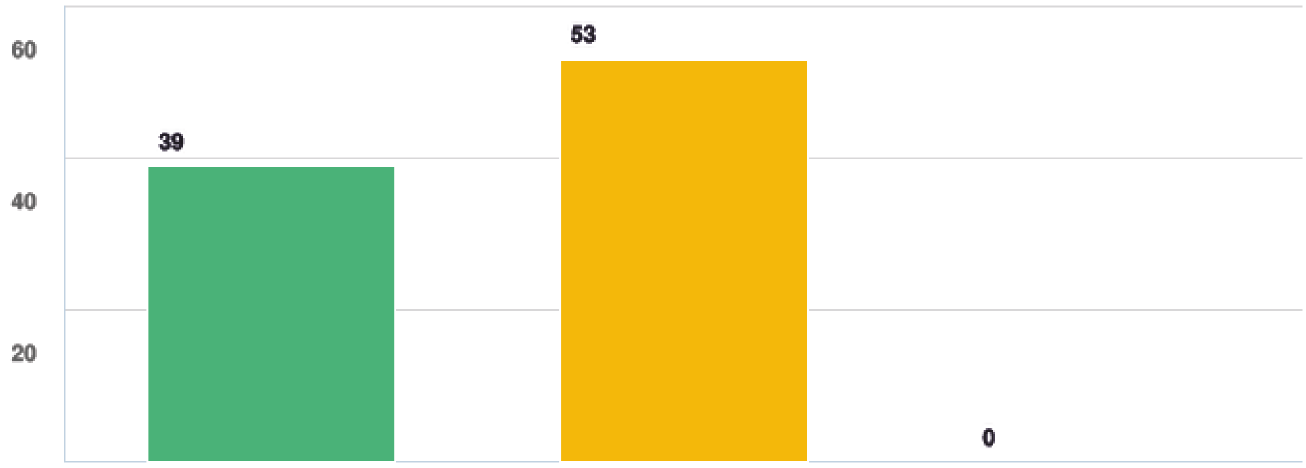
Other Comments:

Not on the City system as indicated in previous answer

Cannot see print to tell. At 6th and Bruce

hard to tell map is not very well done

"Sewer separation" is the replacement of combined sewers with separate stormwater and wastewater collection/conveyance systems. This greatly reduces the volume of wastewater that is sent to the treatment system and eventually eliminates CSOs. Were you aware the City is currently working on a sewer separation program?

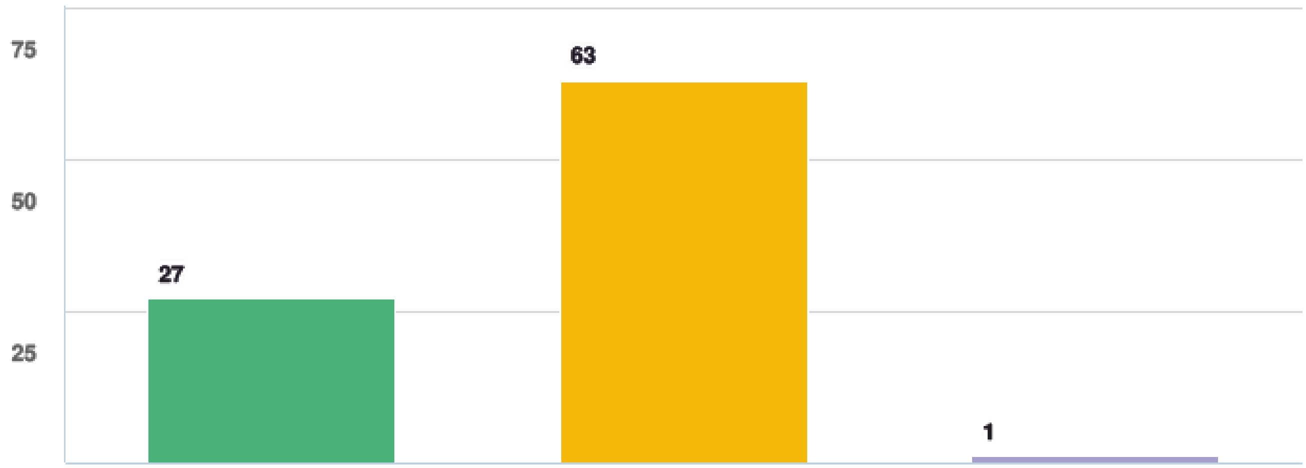


Question options

Yes · No · Please select box to add comment:

Optional question (92 response(s), 3 skipped)
Question type: Checkbox Question

"Inflow and infiltration" refers to the occurrence where relatively clean water enters the sanitary sewer system, mainly as a result of a rainfall event or snow melt.Inflow enters the system from the top, for example roof leaders that drain into the sewer system. Infiltration enters the system from below the ground, for example through leaky pipes. Were you aware that the City's mitigating against "inflow and infiltration" through its sewer separation program?



Question options

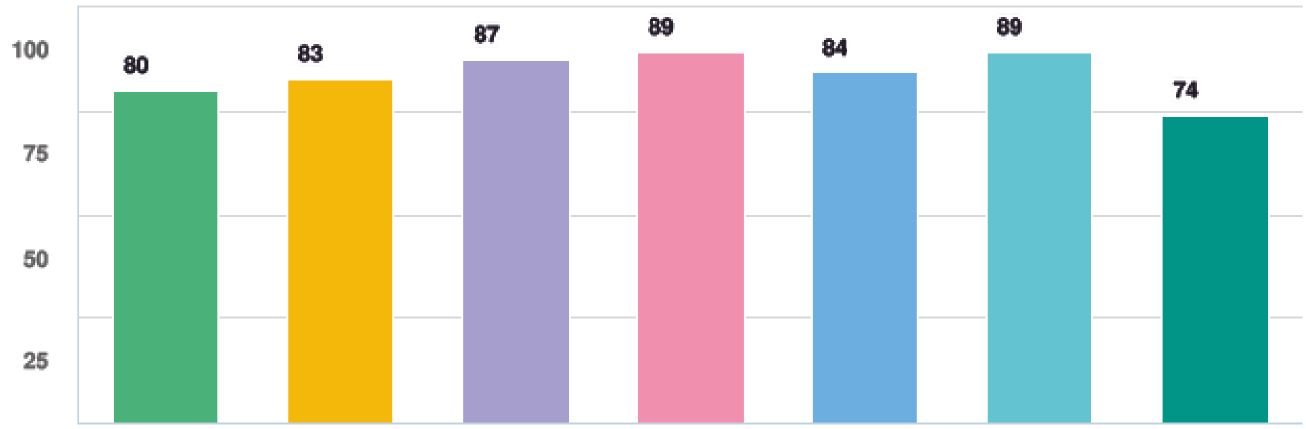
Yes · No · Please select box to add comment:

Other Comments:

The question does not make sense

Optional question (91 response(s), 4 skipped)
Question type: Checkbox Question

"Source Control" includes practices that protect sewer and wastewater treatment infrastructure, the public, and the environment from discharges that may pose risks to safety and proper operation. In your household you can have a big impact by implementing source control practices such as limiting what is disposed down sinks, toilets and other drains. The following list are items that should not be disposed of to the sewer system. Which of the following were you aware should not be "flushed"? Select all that apply.

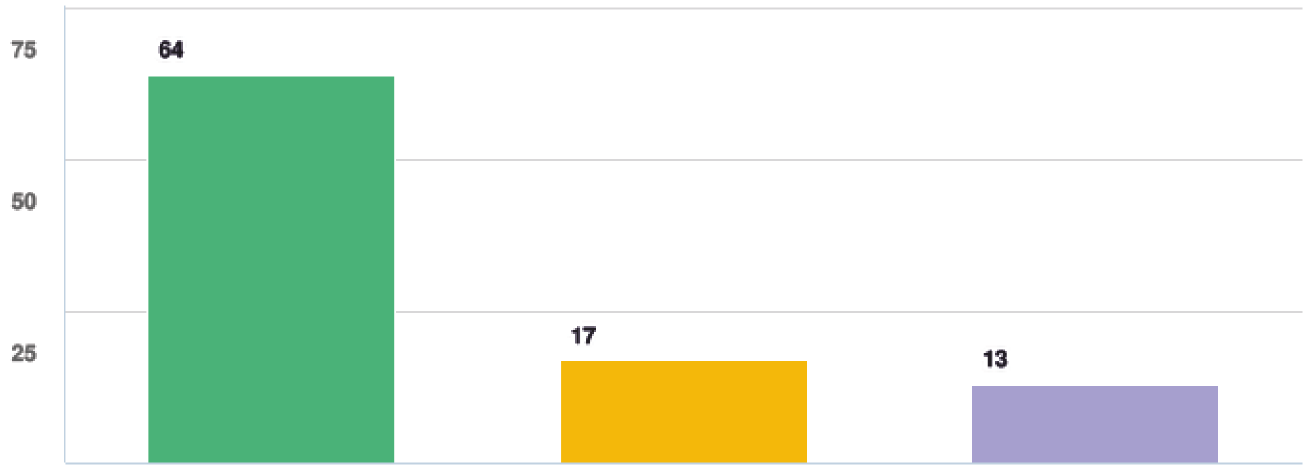


Question options

"Flushable" Wipes · Oil and Grease · Pharmaceuticals · Plastics · Feminine Hygiene Products · Diapers · Hair, Floss and other stringy materials

Optional question (90 response(s), 5 skipped)
Question type: Checkbox Question

The City has a Sewer Use Bylaw (Bylaw No. 3224) that dictates what users are allowed to discharge into the City's sewer system. This bylaw also prescribes universal water metering rates, as a means of water conservation and to reduce the volume of wastewater produced; Are you in support of the City updating this bylaw to reflect the best practices prescribed by another municipalities in BC?



Question options

Yes · No · Please select box to add comment:

Optional question (89 response(s), 6 skipped)
Question type: Checkbox Question

Other Comments:

There should be a monthly cap or annual temporary application for a temporary reduction on water use. There should also be reinforced education on water conservation and wastewater. Households with marginal income need to be supported.

Just another money grab as they charge sewer rates according to water usage which is wrong. Not all water used goes down the drains! Put meters on the sewer pipes would be fair!

Yes we should dictate what users can discharge. I can't answer if the rates should be changed without more information.

Should be doing our own and not relying on someone else

I guess my question would we be charged for water and waste?

The first point doesn't make sense.

So long as there is no cost to the taxpayer

Water that is consumed by pools, hot tubes , gardens, lawns IE. Does not represent the wastewater discharged to the effluent system. Tying the water consumption to wastewater amounts to nothing more than doubling the cost of water consumed. And is very unfair

The question seems misstated. That said, I would support the City reviewing best practices prescribed by Provincial and Federal bodies, debating those best practices, and then clearly proposing those changes to the City's residents before updating the bylaw. Thank you.

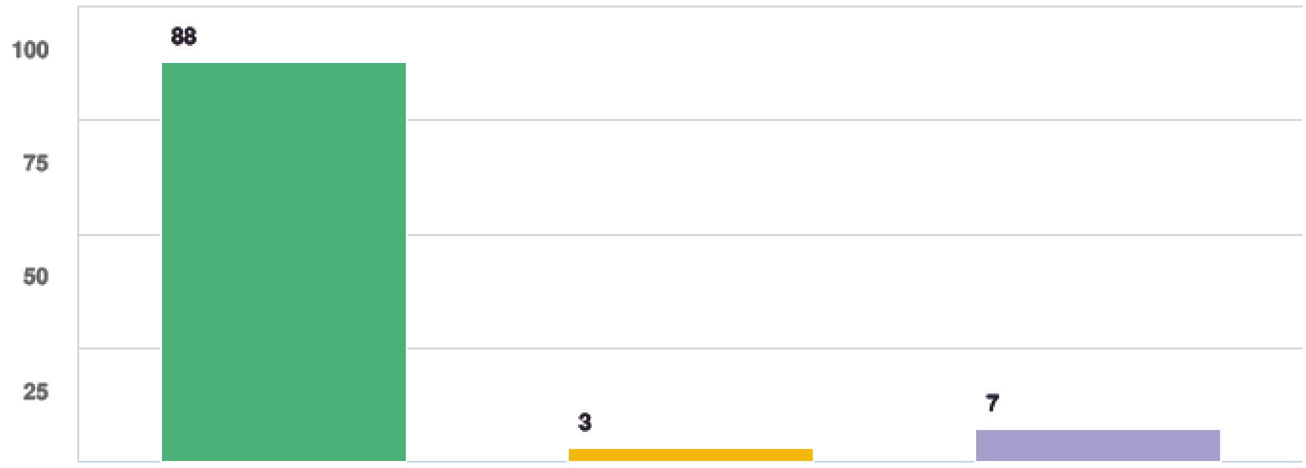
More details needed

Are the water use rates not high enough currently to cover the costs of providing water to households?

I would want to see what the bylaw changes were before I say yes or no.

Generally, but would need to see the contents of the bylaw.

Once the upgrades have been completed at the wastewater treatment plant (estimated 2021), the City will de-commission the old City lagoon. This may involve removing solids that have accumulated at the bottom of the la-goon, removing excess water from these solids, and removing these solids from site. Another alternative being considered is to have these solids stabilized on site.(The City has historically transported these solids to the Alberni Valley Landfill where they have been composted with wood chips for beneficial reuse as cover material at the Landfill.). The City has plans to restore the existing City lagoon into natural "estuary" habitat. Are you in sup-port of the City implementing these plans, assuming that they are able to secure funding?



Question options

Yes · No · Please select box to add comment:

Optional question (92 response(s), 3 skipped)
Question type: Checkbox Questi

Other Comments:

The estuary is a very important bird habitat. Loss of the lagoon would be devastating to nature and nature lovers.

If it is more environmentally friendly to remove the solids from the bottom of the lagoon to the landfill, please do so.

They are limiting cost

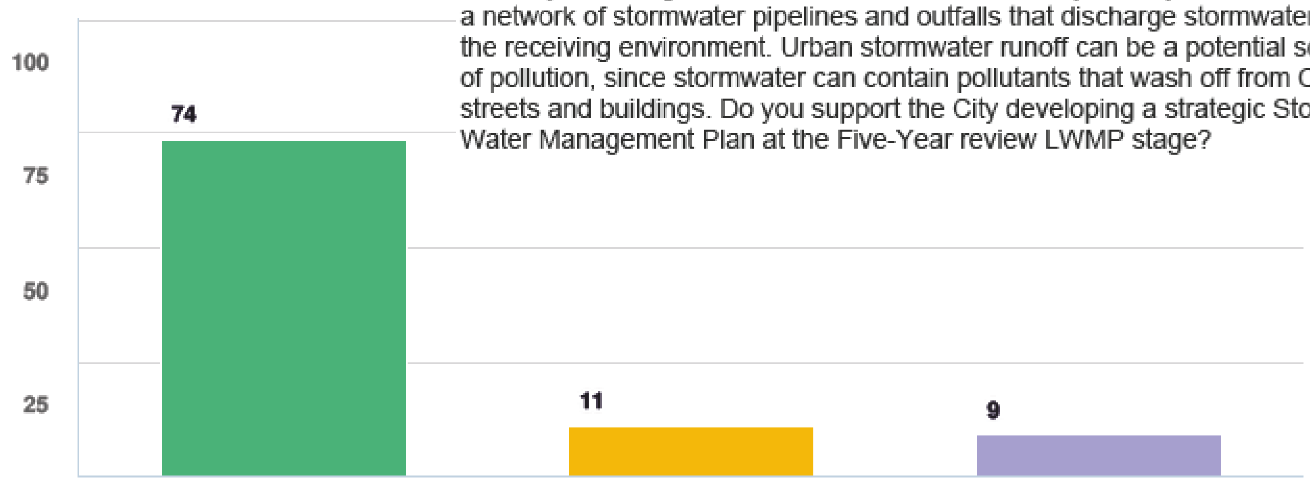
More wasted money!

I don't have the expertise in these areas to give an informed opinion.

The estuary is essential to our ecosystem and our economy; any attempts to enhance and promote the estuary would seem ethical and economically sound in the long run.

I hope you will be consulting with Alberni Valley Nature Club and other groups regarding the restoration of the old lagoon. Salmon values are important, but there are other wildlife values that are also important.

The City's existing storm water collection and conveyance system consists of a network of stormwater pipelines and outfalls that discharge stormwater to the receiving environment. Urban stormwater runoff can be a potential source of pollution, since stormwater can contain pollutants that wash off from City's streets and buildings. Do you support the City developing a strategic Storm Water Management Plan at the Five-Year review LWMP stage?



Question options

Yes · No · Please select

Optional question (91 response(s), 4 s
Question type: Checkbox Question

Other Comments:

As long as it includes mitigation of that stormwater by things like converting the asphalt and other hard surfaces in the city to natural absorbent ground.

It sure doesn't apply to my street (6th between Melrose and Bruce. It was to be fixed last year, along with the road and sidewalks. Encountered major flooding in the yard from the road. Need another drain in front of my house. Water even got into the basement.

Depending on what our city financial situation is at that time and what other priorities may be, I would consider supporting this.

I'm would support a long term strategic plan that include a proper treatment centre that in-cludes primary treatment, bioreactors, and solids removal. This would be very costly facil-ity but is the why of the future. so plan for it now and start a 10 year plan to get this done.

I think too much many is spent on plans and not enough implementation.

There is no explanation to what this "strategic plan" is!

Only if funding is secured

TOO much money for this dead town

for quality water and cost limit