

**METRO VANCOUVER REGIONAL DISTRICT  
LIQUID WASTE COMMITTEE**

**MEETING**

**May 17, 2023**

**1:00 pm**

**Meeting conducted electronically/in-person pursuant to the Procedure Bylaw  
28<sup>th</sup> Floor Boardroom, 4515 Central Boulevard, Burnaby, British Columbia**

**A G E N D A<sup>1</sup>**

**1. ADOPTION OF THE AGENDA**

**1.1 May 17, 2023 Meeting Agenda**

That the Liquid Waste Committee adopt the agenda for its meeting scheduled for May 17, 2023 as circulated.

**2. ADOPTION OF THE MINUTES**

**2.1 April 12, 2023 Meeting Minutes**

That the Liquid Waste Committee adopt the minutes of its meeting held April 12, 2023 as circulated.

*pg 3*

**3. DELEGATIONS**

**4. INVITED PRESENTATIONS**

**5. REPORTS FROM COMMITTEE OR STAFF**

**5.1 Stage Gate 2: Northwest Langley Wastewater Treatment Plant Expansion Project**

*pg 7*

That the GVS&DD Board approve the Northwest Langley Wastewater Treatment Plant Expansion Project advancing to detailed design (Stage Gate 2), as described in the report dated May 5, 2023, titled, "Stage Gate 2: Northwest Langley Wastewater Treatment Plant Expansion Project".

**5.2 Annacis Island Wastewater Treatment Plant – Stage 5 Expansion and Outfall Updates**

*pg 24*

That the GVS&DD Board receive for information the report dated May 5, 2023, titled, "Annacis Island Wastewater Treatment Plant – Stage 5 Expansion and Outfall Updates".

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<sup>1</sup> Note: Recommendation is shown under each item, where applicable.

**5.3 2023 Liquid Waste Capital Projects** *pg 34*  
That the GVS&DD Board receive for information the report dated May 4, 2023 titled “2023 Liquid Waste Capital Projects”.

**5.4 Manager’s Report** *pg 38*  
That the Liquid Waste Committee receive for information the report dated May 8, 2023 titled “Manager’s Report”.

**6. INFORMATION ITEMS**

**6.1 2023 Update on Liquid Waste Sustainability Fund Projects** *pg 42*

**7. OTHER BUSINESS**

**8. BUSINESS ARISING FROM DELEGATIONS**

**9. RESOLUTION TO CLOSE MEETING**

*Note: The Committee must state by resolution the basis under section 90 of the Community Charter on which the meeting is being closed. If a member wishes to add an item, the basis must be included below.*

That the Liquid Waste Committee close its meeting scheduled for May 17, 2023 pursuant to section 226 (1) (a) of the *Local Government Act* and the *Community Charter* provisions as follows:

- 90 (1) A part of a council meeting may be closed to the public if the subject matter being considered relates to or is one or more of the following:
- (e) the acquisition, disposition or expropriation of land or improvements, if the council considers that disclosure could reasonably be expected to harm the interests of the municipality;

**10. ADJOURNMENT/CONCLUSION**

That the Liquid Waste Committee adjourn/conclude its meeting of May 17, 2023.

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Membership:

Hurley, Mike (C) – Burnaby  
Knight, Megan (VC) – White Rock  
Albrecht, Paul – Langley City  
Cassidy, Christine – West Vancouver  
Ferguson, Steve – Langley Township

Johnstone, Patrick – New Westminster  
Kim, Steve – Coquitlam  
Kirby-Yung, Sarah – Vancouver  
Kooner, Pardeep – Surrey

Little, Mike – North Vancouver District  
Loo, Alexa – Richmond  
West, Brad – Port Coquitlam  
Yousef, Ahmed – Maple Ridge

**METRO VANCOUVER REGIONAL DISTRICT  
LIQUID WASTE COMMITTEE**

Minutes of the Regular Meeting of the Metro Vancouver Regional District (MVRD) Liquid Waste Committee held at 1:06 pm on Wednesday, April 12, 2023 in the 28<sup>th</sup> Floor Committee Room, 4515 Central Boulevard, Burnaby British Columbia.

**MEMBERS PRESENT:**

Chair, Mayor Mike Hurley, Burnaby  
 Vice Chair, Mayor Megan Knight\*, White Rock  
 Councillor Paul Albrecht\*, Langley City  
 Councillor Christine Cassidy, West Vancouver  
 Councillor Steve Ferguson, Langley Township  
 Mayor Patrick Johnstone, New Westminster  
 Councillor Steve Kim\*, Coquitlam  
 Councillor Sarah Kirby-Yung\*, Vancouver  
 Councillor Pardeep Kooner\*, Surrey  
 Mayor Mike Little, North Vancouver District  
 Councillor Alexa Loo, Richmond  
 Mayor Brad West\*, Port Coquitlam  
 Councillor Ahmed Yousef\*, Maple Ridge

**MEMBERS ABSENT:**

None.

**STAFF PRESENT:**

Jerry W. Dobrovolny‡, Chief Administrative Officer  
 Peter Navratil, General Manager, Liquid Waste Services  
 Morgan Mackenzie, Legislative Services Coordinator, Board and Information Services

**1. ADOPTION OF THE AGENDA**

**1.1 April 12, 2023 Meeting Agenda**

**It was MOVED and SECONDED**

That the Liquid Waste Committee adopt the agenda for its meeting scheduled for April 12, 2023 as circulated.

**CARRIED**

\*denotes electronic meeting participation as authorized by section 3.6.2 of the *Procedure Bylaw*

‡denotes electronic meeting participation

**2. ADOPTION OF THE MINUTES**

**2.1 March 15, 2023 Meeting Minutes**

**It was MOVED and SECONDED**

That the Liquid Waste Committee adopt the minutes of its meeting held March 15, 2023 as circulated.

**CARRIED**

**3. DELEGATIONS**

No items presented.

**4. INVITED PRESENTATIONS**

No items presented.

**5. REPORTS FROM COMMITTEE OR STAFF**

**5.1 Annacis Wastewater Treatment Plant Outfall Diffuser Arm Installation**

Members were presented a Metro Vancouver video regarding the Annacis Wastewater Treatment Plan Outfall Diffuser Arm Installation.

The video presentation is not retained with the agenda.

**It was MOVED and SECONDED**

That the Liquid Waste Committee receive for information the Metro Vancouver video on the Annacis Wastewater Treatment Plan Outfall Diffuser Arm Installation.

**CARRIED**

**5.2 Liquid Waste Services Capital Program Expenditure Update as at December 31, 2022**

Report dated March 29, 2023, from Colin Meldrum, Director, Engineering, Design & Construction, Liquid Waste Services, reporting on the status of the Liquid Waste Services' capital program and financial performance for the 2022 fiscal year to December 31, 2022.

Members were provided with a presentation regarding the Liquid Waste Services Capital Program Expenditures Project Update as at December 31, 2022 highlighting the 2022 capital expenditures, the 2022 projects year in review and selected capital projects, including the Annacis Island Wastewater Treatment Plant Trickle Filter Rehabilitation, the Burnaby Lake North Interceptor, and the Iona Island Wastewater Treatment Plant Biosolids Dewatering Facility.

Presentation material titled "Liquid Waste Services Capital Program Expenditures Project Update as at December 31, 2022" is retained with the agenda.



**It was MOVED and SECONDED**

That the GVS&DD Board receive for information the report dated March 29, 2023, titled "Liquid Waste Services Capital Program Expenditure Update as at December 31, 2022".

**CARRIED**

**5.3 Award of Contract Resulting from Request for Proposal No. 22-318 Supply and Delivery of Dry Polymer to Wastewater Treatment Plants**

Report dated March 30, 2023, from Gary Soo, Director, Wastewater Treatment & Residuals Management, Liquid Waste Services, and George Kavouras, Director, Procurement, Procurement and Real Estate Services, advising the GVS&DD Board of the results of RFP 22-318: Supply and Delivery of Dry Polymer to Wastewater Treatment Plants and recommending the Board award a 3-year contract, in an amount of up to \$7,956,000 (exclusive of taxes), to Solenis LLC.

**It was MOVED and SECONDED**

That the GVS&DD Board:

- a) approve the award of a contract in the amount of up to \$7,956,000 (exclusive of taxes) to Solenis LLC for supply and delivery of Dry Polymer to Wastewater Treatment Plants, resulting from Request for Proposal No. 22-318; and
- b) authorize the Commissioner and the Corporate Officer to execute the required documentation once the Commissioner is satisfied that the award should proceed.

**CARRIED**

**5.4 Manager's Report**

Report dated April 4, 2023, from Peter Navratil, General Manager, Liquid Waste Services, updating the Liquid Waste Committee on the North Shore Wastewater Treatment Plan Project, the Liquid Waste Committee Wastewater Plant tours, and the Committee's 2023 Work Plan.

**It was MOVED and SECONDED**

That the Liquid Waste Committee receive for information the report dated April 4, 2023 titled "Manager's Report".

**CARRIED**

**6. INFORMATION ITEMS**

No items presented.

**7. OTHER BUSINESS**

No items presented.

**8. BUSINESS ARISING FROM DELEGATIONS**

No items presented.

9. **RESOLUTION TO CLOSE MEETING**

No items presented.

10. **ADJOURNMENT/CONCLUSION**

**It was MOVED and SECONDED**

That the Liquid Waste Committee conclude its meeting of April 12, 2023.

**CARRIED**

(Time: 1:38 pm)

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Morgan Mackenzie,  
Legislative Services Coordinator

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Mike Hurley,  
Chair

59291566 FINAL

To: Liquid Waste Committee

From: Marie-Liesse Marc, Director, Major Projects, Project Delivery

Date: May 5, 2023 Meeting Date: May 17, 2023

Subject: **Stage Gate 2: Northwest Langley Wastewater Treatment Plant Expansion Project**

**RECOMMENDATION**

That the GVS&DD Board approve the Northwest Langley Wastewater Treatment Plant Expansion Project advancing to detailed design (Stage Gate 2), as described in the report dated May 5, 2023, titled, “Stage Gate 2: Northwest Langley Wastewater Treatment Plant Expansion Project”.

**EXECUTIVE SUMMARY**

At its October 26, 2018 meeting, the GVS&DD Board endorsed the Project Definition of the Northwest Langley Wastewater Treatment Plant Program – a transformative program to meet the needs of our growing population and to continue to protect public health and the environment. This program will accommodate growth in the Fraser Sewerage Area by redirecting wastewater flows from Maple Ridge, Pitt Meadows, and areas of North Surrey to an expanded and upgraded tertiary treatment facility located in the Township of Langley.

Since 2018, work has included construction of a new river crossing, pump station, sanitary sewer overflow tank, ground improvements and design development. Due to unexpected archeological findings, the program is expected to be completed in 2030, three years after the initial target completion date.

In 2022, a cost and design review of the wastewater treatment plant expansion led to value engineering of the design and an increase in design service population. Following the unanimous support of the expert panel, staff recommend advancing to detailed design.

**PURPOSE**

To seek Board approval for the Northwest Langley Wastewater Treatment Plant Expansion Project to advance to detailed design (Stage Gate 2), provide information to support this decision, and provide a progress update on the entire program of work, including the projects that support the treatment plant expansion.

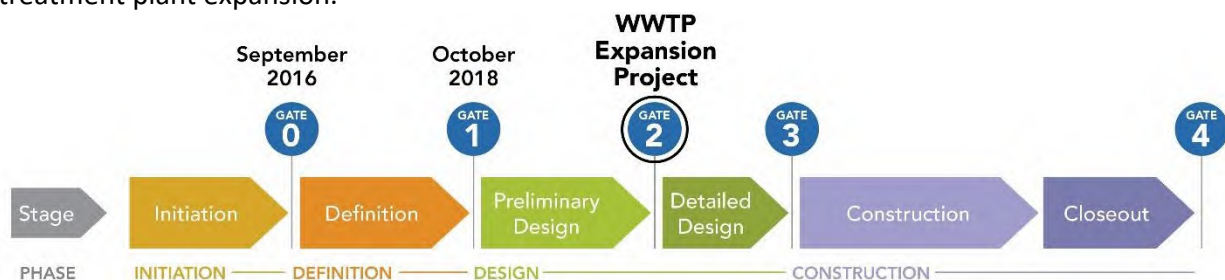


Figure 1: Stage Gate Approval Process

## **BACKGROUND**

The existing Northwest Langley Wastewater Treatment Plant was constructed as a secondary treatment facility in 1978 to serve 30,000 people in the Township of Langley. In 2016, the GVS&DD Board endorsed the Fraser Sewerage Area servicing and facility plan (Stage Gate 0), which identified the opportunity to better meet the needs of a growing region by redirecting Maple Ridge and Pitt Meadows wastewater flows from the Annacis Island Wastewater Treatment Plant to an expanded Northwest Langley Wastewater Treatment Plant.

In 2018, the Project Definition Report for the treatment plant expansion and supporting infrastructure (collectively the Northwest Langley Wastewater Treatment Plant Program) was endorsed by the GVS&DD Board (Stage Gate 1). It describes the project components, design criteria, treatment technologies, cost estimate, and community enhancement opportunities associated with the program. While the primary purpose of the program is to accommodate growth in the region, the Project Definition Report also defines key objectives related to the protection of the Fraser River with a tertiary level of treatment, increased resilience to earthquakes and sea-level rise, advanced odor control and energy efficiency and integrated resource recovery opportunities.

## **PROGRAM OVERVIEW AND STATUS**

The Northwest Langley Wastewater Treatment Plant Program comprises five projects, each at different stages of development, which will collectively increase the capacity of the existing plant and achieve program objectives.

### **Golden Ears Pump Station and Sanitary Sewer Overflow (SSO) Tank**

A new pump station and storage tank in Maple Ridge will divert flows from Maple Ridge and Pitt Meadows (which currently go to the Annacis Island Wastewater Treatment Plant via the North Surrey Interceptor) to the expanded treatment plant in the Township of Langley. The SSO tank will temporarily store wastewater to prevent the release of untreated wastewater to the Fraser River and Katzie Slough during heavy rain. The Golden Ears Pump Station and SSO tank are anticipated to be complete in mid-2023.

### **Fraser River Crossing and Forcemain**

Two new pipes under the Fraser River, running parallel to the Golden Ears Bridge, will carry wastewater from the new pump station to the expanded treatment plant. The crossing is being built using horizontal directional drilling, which involves drilling a tunnel under the riverbed to avoid impacts to the river. Construction is anticipated to be complete in mid-2023.

### **Outfall**

A new outfall pipe will carry treated wastewater from the expanded treatment plant to the Fraser River. The new outfall is currently in the initial stage of design. The outfall discharge location identified in the Project Definition Report is no longer considered viable. An options analysis has identified a new preferred discharge location, based on land use and property impacts, First Nations fisheries and cultural values, water quality, regulatory and permitting impacts, river morphology, water depth, river navigation, constructability, and seismic stability. Design will be advanced once the discharge location has been confirmed, and completion of the outfall is scheduled for 2029.

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## Ground Improvements

Expansion of the wastewater treatment plant requires significant ground improvements work in advance of treatment plant construction, to ensure operation following an earthquake and to raise the plant site above the 1-in-200-year flood level. Work to densify soil to meet BC Building Code seismic criteria is being undertaken in four phases to manage contract size and implementation.

During development of the Project Definition Report, an archaeological overview assessment of the plant site and surrounding area was undertaken, which concluded that the potential for encountering archaeological sites was low. Since then, over 5,000 artifacts have been recovered and a new archeological site registered. The *Heritage Conservation Act* requires study and recovery of archaeological artifacts and features on the site. As a result, completion of the ground improvements work has been delayed, which in turn has delayed the site readiness dates to commence construction of the wastewater treatment facilities by 2.5 years.

## Wastewater Treatment Plant Expansion

Detailed design work for the treatment plant expansion facilities began in fall 2019 and had progressed to 60% design in 2021 when the new archeological site was identified. At that time, the plant construction costs estimates showed significant iterative increases since the 2018 Project Definition Report. The detailed design work was paused for a year to conduct a comprehensive cost and design peer review. The design peer review focused on simplifying the design to right size the amount of excavation and concrete required, while ensuring that none of the program's objectives endorsed by the Board in 2018 were impacted. During that time, it was also determined that population growth in the northeast Surrey area had accelerated, and that certain areas originally scheduled for connection to the Northwest Langley Wastewater Treatment Plant during a second phase of expansion should be included in the current build. This resulted in an increase in the treatment plant's initial design service population from 230,000 to 280,000 people. The additional service population was incorporated into the plant design along with other recommended design changes, culminating in the Basis of Design Report, which will guide the completion of the detailed design for the project.

## Schedule

The Northwest Langley Wastewater Treatment Plant Program is now scheduled for completion in 2030, a three-year delay from the 2027 date anticipated in the 2018 Project Definition Report. This variance is primarily due to the archaeological finds on the plant site delaying site readiness. Completion of the pump station, storage tank, river crossing, and outfall is also delayed when compared to the Project Definition Report schedule, but not sufficiently to delay completion of the treatment plant. The construction completion dates envisioned for each of the program components in the Project Definition Report are shown in Attachment 1, together with the current projected completion dates and causes of variance.

## CAPITAL COST UPDATE

Current cost estimates for the Northwest Langley Wastewater Treatment Plant Program are \$2.28 billion. The revised cost estimate reflects Metro Vancouver's Best Practice Project Cost Estimating Framework, implemented in 2021. The framework includes a rigorous approach to addressing challenges inherent in estimating future costs on large, complex, and lengthy projects, including

using forecast cash flows to estimate escalation, as well as a separate risk reserve for risks retained by Metro Vancouver, which are identified, managed and quantified according to a standardized risk review process.

**Updated Program Costs Estimate**

Total Design & Construction Costs (2022 Dollars)	\$1,565 million
Estimated Escalation	\$287 million
Risk reserve	\$428 million
<b>Total Cost Estimate</b>	<b>\$2,280 million</b>

**PROJECT RISKS**

A project-specific risk identification and quantification process for the program of work began in 2021 to identify the risk reserve requirement for each project in the program. Risk identification workshops were held with project staff and consultants, where risks were identified and characterized by severity, likelihood, and cost and schedule impact, among other items. A Quantitative Risk Analysis was then performed to calculate the risk reserve. Monthly risk management meetings are held to refine and update risk characteristics and mitigations, to allow for active response to risks that may be realized in the future so that the projects can be successfully completed. Notable risks identified in the upcoming phases of work include contractors’ and consultants’ productivity, availability, and performance; price volatility; further schedule delay for archeological works; unexpected environmental or community issues; regulatory changes; and unexpected site conditions.

**PROCUREMENT UPDATE**

All projects in the program of work have been delivered using a design-bid-build delivery model. The same model is expected to be used for the construction of the expanded treatment plant facilities and the outfall. The construction of the liquid treatment facilities is expected to be procured first in 2024, with the solid treatment facilities procured second in 2025 and the outfall construction procured last in 2026. Given the current level of construction activities in the region, a further breakdown of the construction packages is under evaluation.

**ENGAGEMENT**

Since the outset of the Northwest Langley Wastewater Treatment Plant Program, Metro Vancouver has engaged with member jurisdictions, First Nations, residents and businesses, and environmental organizations and Fraser River users. Themes that emerged during this engagement included those pertaining to water quality and treatment level; fish, fish habitat, and fishing activities; odour; geotechnical investigations; navigation on the Fraser River; and traffic management.

Metro Vancouver has engaged, and continues to engage, with First Nations who may be impacted by the program. In the program’s current phases, Metro Vancouver has engaged, in particular, with ą́ıćăý (Katzie First Nation) due to the program’s proximity to Katzie First Nation’s reserve lands and Katzie First Nation’s expressed interest in the program. To date, discussions with Katzie First Nation have centered on construction and environmental considerations for the Fraser River Crossing Project and the archaeological work for the treatment plant ground improvements. Through this

engagement, Metro Vancouver has heard, and noted, Katzie First Nation's interests around environmental, cultural, and archaeological resources. Metro Vancouver is taking steps to advance engagement opportunities with Katzie First Nation on the program.

### **ADVISORY COMMITTEES AND EXPERT PANEL REVIEWS**

In advance of this report to the Liquid Waste Committee, staff provided an update on the status of the Northwest Langley Wastewater Treatment Plant Program to the Regional Engineers Advisory Committee (REAC) and the Regional Administrators Advisory Committee (RAAC). REAC feedback included a request for review of the business case for movement of wastewater flows from the Annacis Island Wastewater Treatment Plant to the expanded Northwest Langley Wastewater Treatment Plant. Metro Vancouver's Liquid Waste Services Policy, Planning and Analysis division will share outcomes of this review when available.

An independent expert panel review of the program was conducted through information sharing and a workshop. Members of the expert panel include John Herbert, Shannon Katt, Guy Lembach, Frank Margitan, and Alan Russell. During the workshop, the expert panel reached a unanimous recommendation that the Northwest Langley Wastewater Treatment Plant Expansion Project has achieved a state of readiness such that it can proceed past Stage Gate 2 to detailed design.

### **FUTURE BOARD DECISIONS**

Future Stage Gate approvals for subsequent design and construction on individual projects, together with contract awards and change orders, will be brought to the GVS&DD Board following GVS&DD policies and practices. The following Stage Gate 3 is planned for 2024 at which point an update on the project, its costs, and schedule will be provided in the request to move forward to the construction phase.

### **ALTERNATIVES**

- 1) That the GVS&DD Board approve the Northwest Langley Wastewater Treatment Plant Expansion Project advancing to detailed design (Stage Gate 2), as described in the report dated May 5, 2023, titled, "Stage Gate 2: Northwest Langley Wastewater Treatment Plant Expansion Project".
- 2) That the GVS&DD Board receive for information the report dated May 5, 2023, titled, "Stage Gate 2: Northwest Langley Wastewater Treatment Plant Expansion Project", and provide staff with alternate direction.

### **FINANCIAL IMPLICATIONS**

#### **Budget Implications and Household Impact**

As noted above, the total estimated cost of the program is \$2.28 billion, with cash flows over the next five years estimated at \$1.049 billion. As a growth-driven project, the Northwest Langley Wastewater Treatment Plant Program is eligible to be primarily funded through Metro Vancouver's development cost charges (DCC) program. Rather than increasing liquid waste levies to fund growth infrastructure, DCCs fund the costs of growth infrastructure through new developments that drive these costs. The updated Liquid Waste DCC rates adopted in 2022 include an assist factor of 17.5%, meaning that new development will pay for 82.5% of project costs over the 30-year period of the

DCC program. Metro Vancouver is examining approaches to increase the amount paid by DCCs from 82.5% to 99%, the maximum legislatively allowed amount. As part of the updates to the DCC program, Metro Vancouver considers the combined impact of its DCCs on development within current market conditions.

### **Funding Opportunities**

Metro Vancouver is pursuing grant opportunities to fund components of the Northwest Langley Wastewater Treatment Plant Program. In 2021, \$10 million towards the treatment plant ground improvements was awarded through the COVID-19 Resilience Infrastructure Stream of the Investing in Canada Infrastructure Program. An additional grant of \$13.4 million has been requested for construction of a renewable natural gas facility at the treatment plant site, via the Investing in Canada Infrastructure Program's CleanBC Communities Stream.

### **CONCLUSION**

The Northwest Langley Wastewater Treatment Plant Program is being undertaken to accommodate growth in the Fraser Sewerage Area while protecting public health and the environment. Due to unexpected archeological findings on the wastewater treatment site, the Program is expected to be completed in 2030, three years after the initial target completion date. A cost and design peer review of the wastewater treatment plant project led to a simplification of the design and an increase in design service population from 230,000 to 280,000 people. Based on the previous GVS&DD Board direction which approved the Fraser Sewer Area servicing and facility plan and Project Definition Report, staff recommend the detailed design work for the Northwest Langley Wastewater Treatment Plant Expansion Project to proceed (Alternative 1).

### **Attachments**

1. Program Components and Completion Schedule
2. Previous Key Board Reports and Updates
3. Stage Gate 2 – Northwest Langley Wastewater Treatment Plant Expansion Project – Presentation by Cheryl Nelms

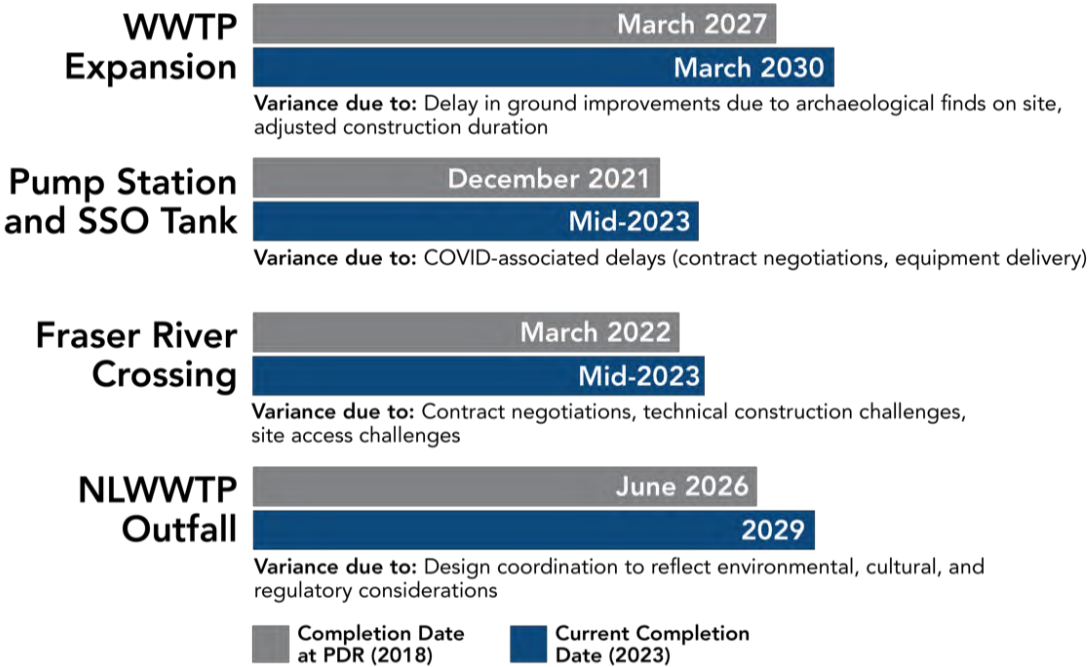
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Program Components and Completion Schedule



Northwest Langley Wastewater Treatment Plant Program Components



Program Completion Schedule

**Previous Key Board Reports and Updates**

<b>Date</b>	<b>Topic</b>
September 2016	Endorsement of new Fraser Sewerage Area servicing and facility plan (Stage Gate 0)
<a href="#">May 2018</a>	Endorsement of tertiary treatment level for new wastewater treatment plant
<a href="#">May 2018</a>	Award of first ground improvement construction contract
<a href="#">October 2018</a>	Endorsement of Indicative (Conceptual) Design (Stage Gate 1)
<a href="#">October 2019</a>	Award of second ground improvement construction contract
<a href="#">November 2019</a>	Award of pump station and SSO tank construction contract
<a href="#">March 2021</a>	Endorsement of grant funding application for ground improvements
<a href="#">July 2021</a>	Award of river crossing construction contract
<a href="#">February 2022</a>	Ground improvements update
<a href="#">May 2022</a>	Endorsement of grant funding application for renewable natural gas project
<a href="#">October 2022</a>	Amendments to contracts for archaeological services and related excavation services





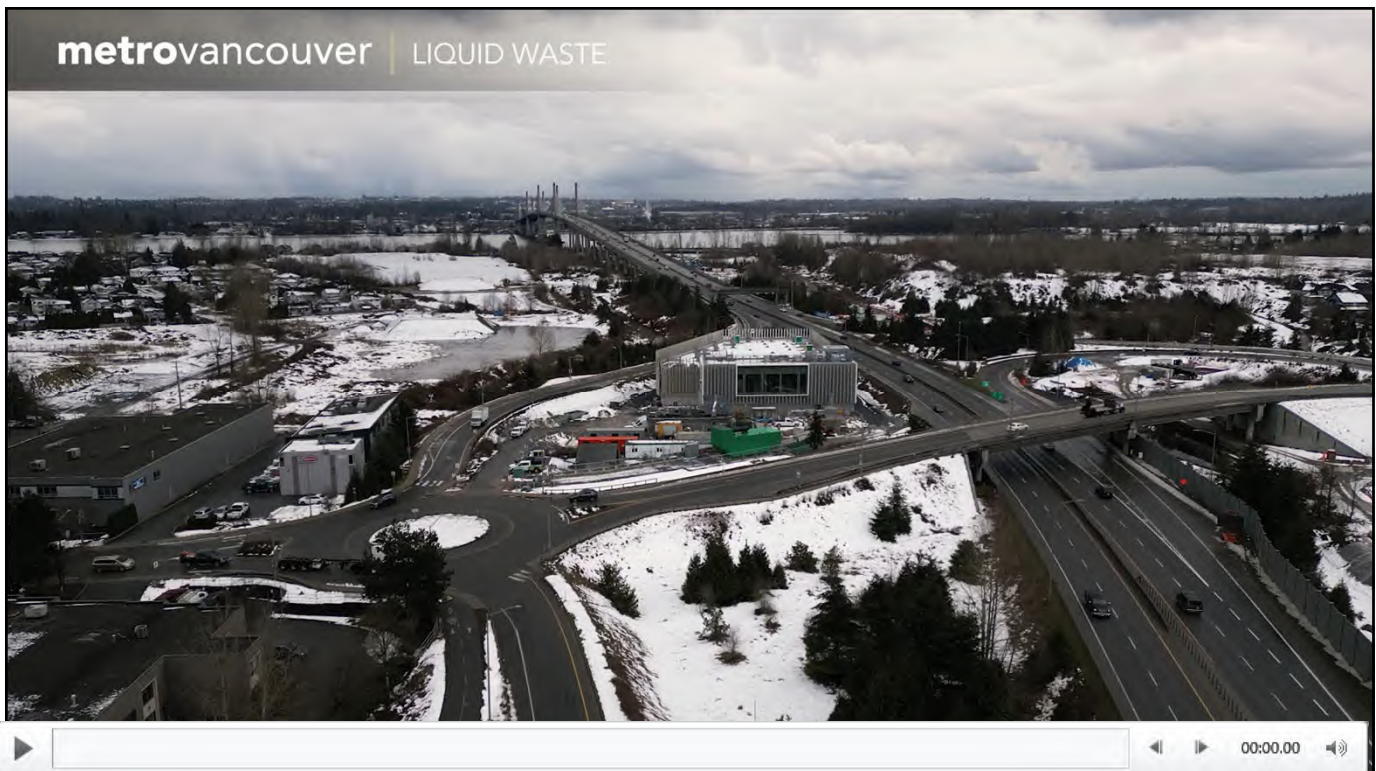
# Stage Gate 2: Northwest Langley WWTP Expansion Project

Cheryl Nelms, Ph.D.  
General Manager, Project Delivery

Liquid Waste Committee Meeting – May 17, 2023

59489418

**metrovancouver**



## PURPOSE

- Seek Board approval for the Northwest Langley Wastewater Treatment Plant Expansion Project to advance to detailed design (Stage Gate 2)
- Provide a progress update on the entire program of work, including the projects that support the treatment plant expansion

## WHERE WE ARE

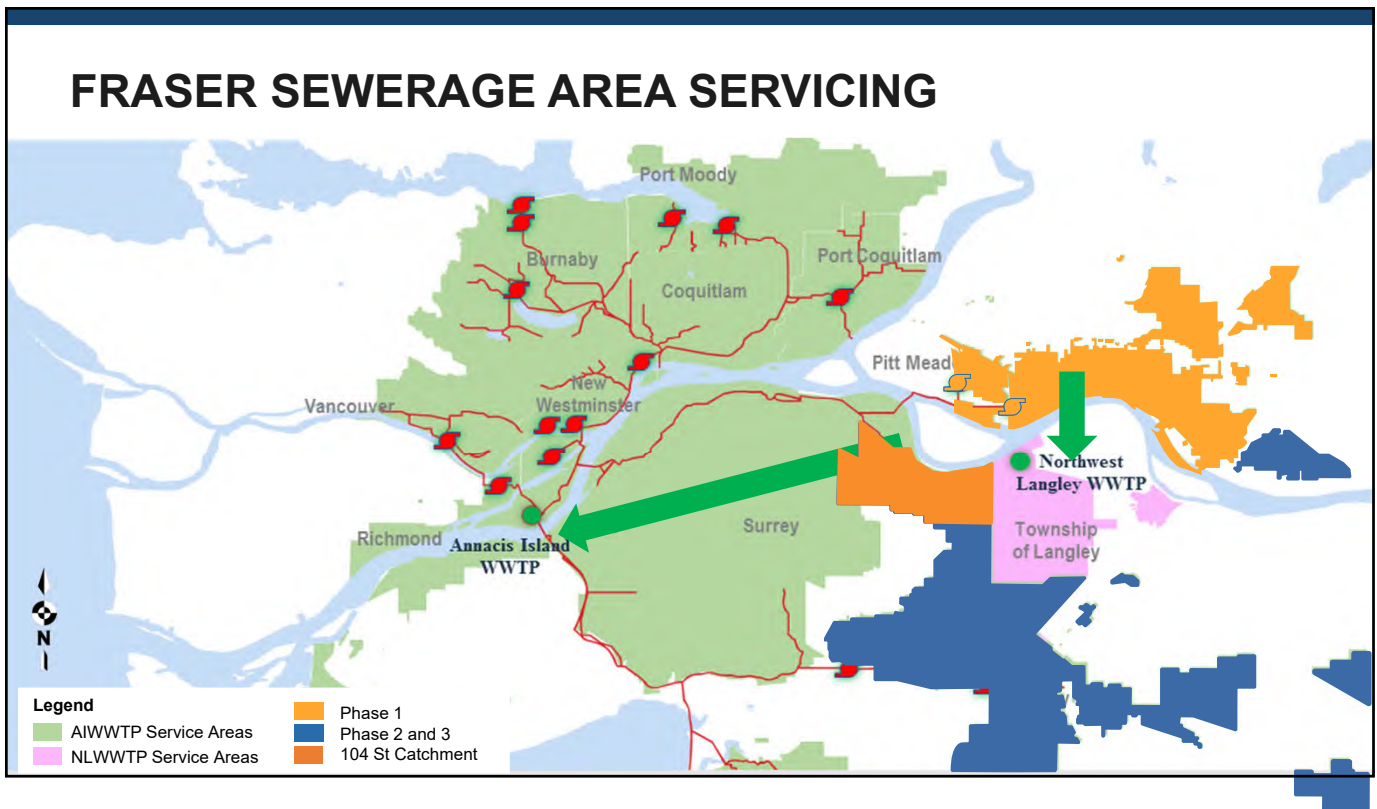
### Stage Gate Process

The NLWWTP Program is made up of five projects, each in different stages of development:

- Pump Station and Sanitary Sewer Overflow (SSO) Tank
- Fraser River Crossing
- Outfall Pipe
- Ground Improvements (WWTP)
- **WWTP Expansion Project**







## PROGRAM BENEFITS

The NLWWTP Program is being undertaken to continue to protect public health and the environment, specifically to:

- Meet the growing needs of Maple Ridge, Pitt Meadows, Langley, Langley Township, and northeast Surrey
- Meet regulatory requirements and treat to tertiary
- Increase resiliency to earthquakes and sea-level rise
- Realize energy savings and resource recovery opportunities
- Reduce need to release untreated wastewater to the Fraser River during heavy rain



Rendering of the Northwest Langley WWT Expansion Project

## PROGRAM STATUS UPDATE

### Supporting Projects

#### 1. Pump Station & SSO Tank

- Construction – 97% complete, on budget



Pump Station & SSO Tank – Katzie artist Rain Pierre

#### 2. Fraser River Crossing

- Construction – 85% complete, on budget



Fraser River Crossing – Installation of first pipe



# PROGRAM STATUS UPDATE

## Supporting Projects

### 3. NLWWTP Outfall Pipe

- Preliminary design
- Project completion: 2029



Early works ground improvements

### 4. NLWWTP Ground Improvements

- Densifying soil to meet seismic criteria
- Being completed in 4 phases
- Archaeological impacts



Archaeological investigation

# VALUE ENGINEERING EXERCISE

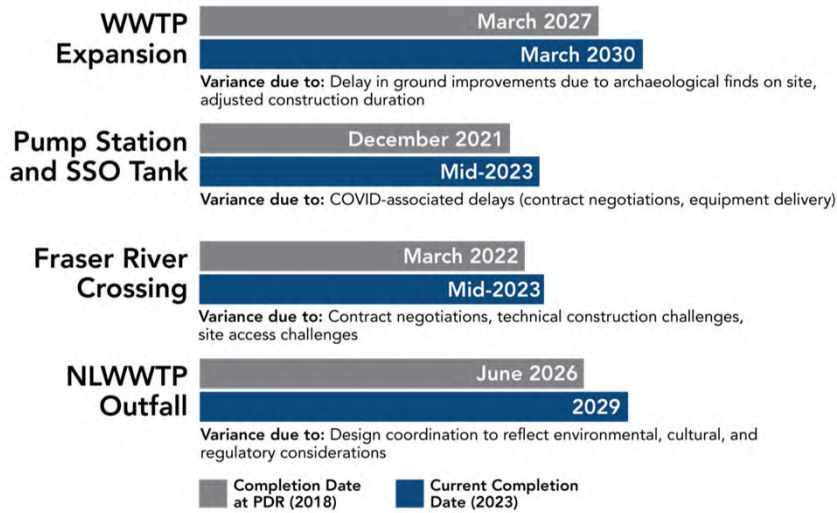
## WWTP Expansion Project

- Capital cost savings
- Improved schedule certainty
- Design simplification
- Evaluated processes with a smaller footprint
- More modular design for future expansion
- Design population adjustment (230,000 to 280,000)



Value Engineering Summary

# PROGRAM SCHEDULE STATUS UPDATE



# PROGRAM COST ESTIMATES

Program costs included in current budget

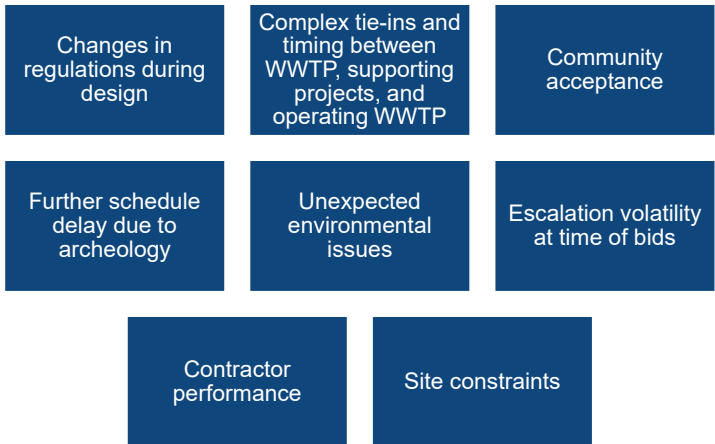
Current Program cost estimates (2022)

	Total Program Estimated Costs
Design & Construction Costs (\$2022)	\$1,565 million
Escalation & Risk Reserve	\$715 million
<b>Total Cost Estimate</b>	<b>\$2,280 million</b>



# RISK MANAGEMENT

- Project-specific risk identification and quantification process was implemented for 2022 budget
- Risk reserve allows for active responses to risks that may be realized in the future, so that the project can be successfully completed



# WORKING WITH MEMBER STAFF

- Provided overview to REAC, RAAC
- Request for review of business case for movement of wastewater flows from Annacis Island WWTP to the expanded NLWWTP



Rendering of the Northwest Langley WWTP Expansion Project

## EXPERT ADVISORY PANEL

Five independent subject matter experts

### Experience:

- Major infrastructure program delivery (Guy Lembach)
- Project management and risk (Alan Russell)
- Wastewater engineering and design (John Herbert)
- Constructability (Frank Margitan)
- Scheduling (Shannon Katt)

## EXPERT PANEL REVIEW

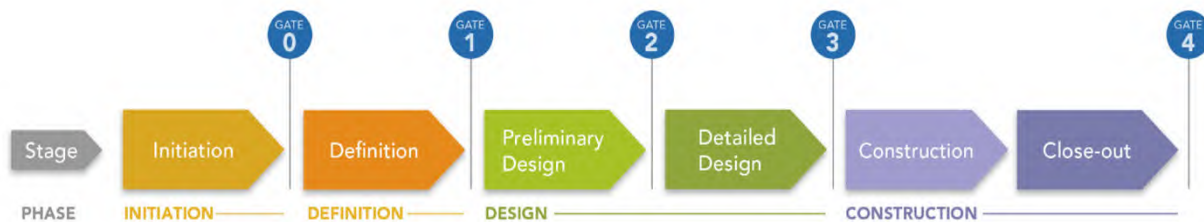
- **Mandate:** Review of process and steps to advance project progress, and to assess readiness of advancing to detailed design
- Unanimous expert panel agreement that project is ready to move past Stage Gate 2



Pump stations and SSO tank

# RECOMMENDATION

Recommend advancing to detailed design (Stage Gate 2) and bringing forward update on project, costs, and schedule in 2024, prior to construction phase (Stage Gate 3)



Rendering of the expanded Northwest Langley Wastewater Treatment Plant

Thank You

To: Liquid Waste Committee

From: Bob Cheng, Director, Major Projects, Project Delivery  
Murray Gant, Director, Major Projects, Project Delivery

Date: May 5, 2023 Meeting Date: May 17, 2023

Subject: **Annacis Island Wastewater Treatment Plant – Stage 5 Expansion and Outfall Updates**

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### **RECOMMENDATION**

That the GVS&DD Board receive for information the report dated May 5, 2023, titled, “Annacis Island Wastewater Treatment Plant – Stage 5 Expansion and Outfall Updates”.

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### **EXECUTIVE SUMMARY**

The Annacis Island Wastewater Treatment Plant, located in Delta, provides secondary treatment for approximately 1.2 million people in Metro Vancouver. To accommodate growth, the plant is undergoing a major expansion, including the Stage 5 Expansion and Outfall, which will increase its capacity to serve 1.5 million people while reducing odour and remaining operational in the event of a major earthquake.

The Stage 5 Expansion consists of three phases to increase the size of the plant and its ability to treat more wastewater. Phase 1 is substantially complete, Phase 2 Early Works is mostly complete with one final contract at approximately 32 per cent complete, and design of Phase 2 works commenced in 2022. A new Digester No. 5 and Regional Biosolids Dryer have been added to the program to meet the needs of regional population growth and are anticipated to go through the Stage Gate Process in late 2023. The Outfall project, including tunnel excavation, is approximately 85 per cent complete and anticipated to be substantially completed in the second quarter of 2025.

### **PURPOSE**

The purpose of this report is to provide an update on the progress of the Annacis Island Wastewater Treatment Plant – Stage 5 Expansion and Outfall projects.

### **BACKGROUND**

In accordance with the Liquid Waste Committee 2023 Work Plan, an update on the Annacis Island Wastewater Treatment Plant – Stage 5 Expansion and Outfall projects is being brought forward to the Liquid Waste Committee.

The Stage 5 Expansion program was transferred from the Liquid Waste Services department to the Project Delivery department in the fourth quarter of 2022.

### **PROJECT UPDATE**

Projects under the Annacis Island Wastewater Treatment Plant Stage 5 Expansion and Outfall programs are in various stages of design and construction.

## **Stage 5 Expansion – Treatment Plant Works**

The Annacis Island Wastewater Treatment Plant Stage 5 Expansion comprises three phases: Phase 1, Phase 2 Early Works, and Phase 2. The phased expansion includes adding new equipment necessary to increase the plant's capacity to treat additional wastewater, as well as designing the new treatment plant components to meet new seismic standards. Furthermore, a new Digester No. 5 and Regional Biosolids Dryer have been added to the program (Attachment 1) to respond to regional population growth.

### *Phase 1*

All work under this phase is complete and includes design and construction of new turbo blowers, ground improvements, a three-storey industrial control systems and laboratory building, odour control facilities, pre-aeration tanks, primary sedimentation tanks, solid contact tanks, and secondary clarifiers. The Phase 1 treatment components have been in operation since 2021 and the Annacis Island Wastewater Treatment Plant has seen benefits in the treatment process with improved treated wastewater (effluent) quality and operational redundancy to allow scheduling of regular maintenance activities.

### *Phase 2 Early Works*

The Phase 2 Early Works includes the design and construction of a new influent pump and screen, digester heat exchangers, and gravity thickeners. The influent pump station expansion and digester heat exchangers are substantially complete. The gravity thickeners construction is approximately 32 per cent complete. The original substantial completion date was April 2024; however, the schedule has been delayed due to various site issues, and is now anticipated to be substantially completed by the end of 2024.

### *Phase 2*

Phase 2 works includes ground improvements, trickling filters, trickling filter pump station, centrifuges, and a maintenance workshop. The detailed design is underway. Construction of the first contract, ground improvements, is expected to begin in 2024 and all works under this phase are anticipated to be complete by the end of 2029.

## **Digester No. 5**

Digesters convert organic sludge into biosolids in the overall wastewater treatment process. Due to continued population growth in the region and expansion at the North Shore Wastewater Treatment Plant and Iona Island Wastewater Treatment Plant, the amount of dewatered biosolids produced from Metro Vancouver's regional wastewater treatment plants is expected to more than double over the next decade. A centralized digester at the Annacis Island Wastewater Treatment Plant is the preferred option for providing additional regional digestion capacity. The new facility is anticipated to be in service by 2033. Design is anticipated to commence in late 2023, at which time Digester No. 5 is expected to begin the Stage Gate Process.

## **Regional Biosolids Dryer**

In conjunction with Digester No. 5, additional regional biosolids processing capacity will also be required over the next decade. The GVS&DD Board endorsed drying as a biosolids management



strategy in 2019, which would produce dried biosolids pellets as a renewable alternative fuel for the region's industries, and a compact, easy to spread fertilizer product. Reduced greenhouse gas emissions from avoided truck trips also helps lower Metro Vancouver's carbon footprint.

The Annacis Island Wastewater Treatment Plant has been determined to be the most appropriate location for siting the Regional Biosolids Dryer. The capacity of the biosolids dryer is anticipated to be 90,000 bulk tonnes and early works are underway to determine the footprint size of the proposed facility. The Regional Biosolids Dryer is expected to go through the Stage Gate Process in late 2023. The new facility is anticipated to be in service by 2033.

### **Outfall**

The Outfall project includes a 1-km-long tunnel from the Annacis Island Wastewater Treatment Plant to the Fraser River, where two new diffuser arms will release treated water over a broad area underwater. The outfall is designed to meet Stage 5 peak wet weather flows, and is sized to match the capacity of the ultimate plant build out (Attachment 2). The new outfall is approximately 85% complete. In summer 2022, during the final portion of excavating the outfall tunnel, the tunnel boring machine encountered an obstruction. Work to remove the obstruction and complete the tunnel is ongoing and is expected to be complete soon. The diffuser arms have been placed in the river bed, and minor final works will occur on the diffusers in fall 2023 after the freshet. Substantial completion is anticipated in the second quarter of 2025.

### **ALTERNATIVES**

This is an information report. No alternatives are presented.

### **FINANCIAL IMPLICATIONS**

The estimated budget of the Annacis Stage 5 Expansion and Outfall projects is \$1.97 billion. The total expenditures to date is approximately \$740 million and the remaining anticipated expenditures of \$1.23 billion are anticipated to be spread out over the next decade. The project team will be returning to the Liquid Waste Committee with an updated budget in 2024 with the addition of Digester Number 5 and the Regional Biosolids Dryer which have been recently added to this Program of work from the Liquid Waste Department.

### **CONCLUSION**

The Annacis Island Wastewater Treatment Plant provides secondary treatment for approximately 1.2 million people in Metro Vancouver. To accommodate growth, the plant is undergoing a major expansion, including the Stage 5 Expansion and Outfall, which will increase its capacity to serve 1.5 million people while reducing odour and remaining operational in the event of a major earthquake. The Stage 5 Expansion consists of three phases, namely Phase 1, Phase 2 Early Works, and Phase 2. Phase 1 is substantially complete. Furthermore, a new Digester No. 5 and Regional Biosolids Dryer has been added to the program. Phase 2 early works is mostly complete with one final contract approximately 32 per cent complete. Design of Phase 2 works is underway. The Outfall is approximately 85 per cent complete and anticipated to be substantially complete in the second quarter of 2025.

**Attachments**

1. Annacis Stage 5 Expansion
2. Annacis Outfall
3. Annacis Island Wastewater Treatment Plant – Stage 5 Expansion and Outfall Updates –  
Presentation by Bob Cheng and Murray Gant

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Annacis Stage 5 Expansion



Annacis Island Wastewater Treatment Plant



Annacis Outfall





Annacis Island Wastewater Treatment Plant

# Annacis Island Wastewater Treatment Plant

## STAGE 5 EXPANSION AND OUTFALL UPDATES

**Bob Cheng**

Director, Major Projects, Project Delivery

**Murray Gant**

Director, Major Projects, Project Delivery

Liquid Waste Committee – May 17, 2023  
59829391

**metro**vancouver

## AIWWTP – STAGE 5 EXPANSION AND OUTFALL

### Background

- Allows plant to manage a higher volume of wastewater (increase from 1.2 to 1.5 million residents)
- Reduce odour
- Remain operational in the event of a major earthquake
- Stage 5 Expansion covers treatment plant works
- Outfall increases capacity to release treated water into Fraser River



Trickling filters and solid contact tanks

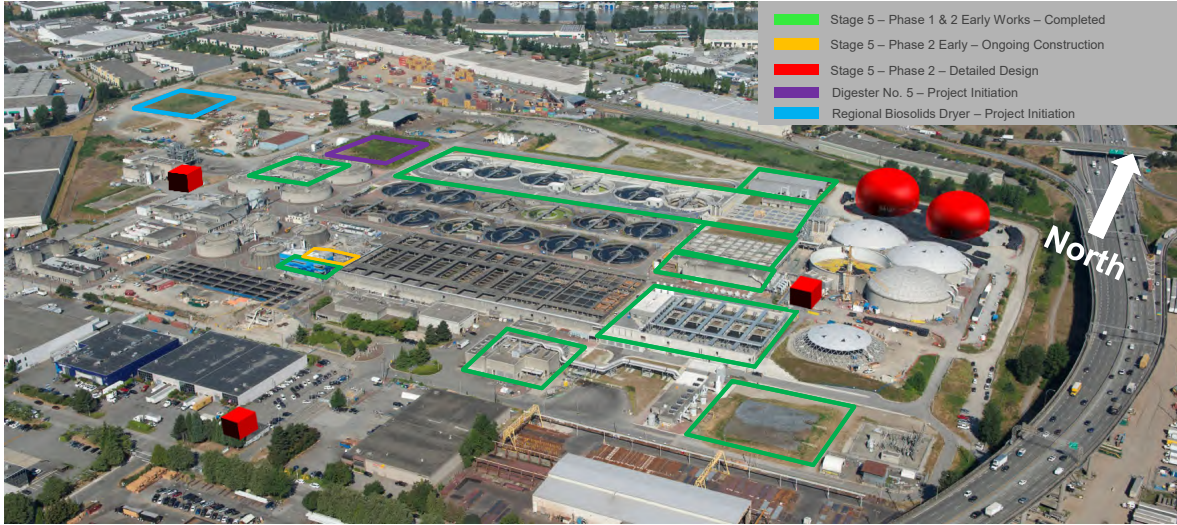
**metro**vancouver

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# ANNACIS ISLAND WWTP STAGE 5 EXPANSION

## Status of Work

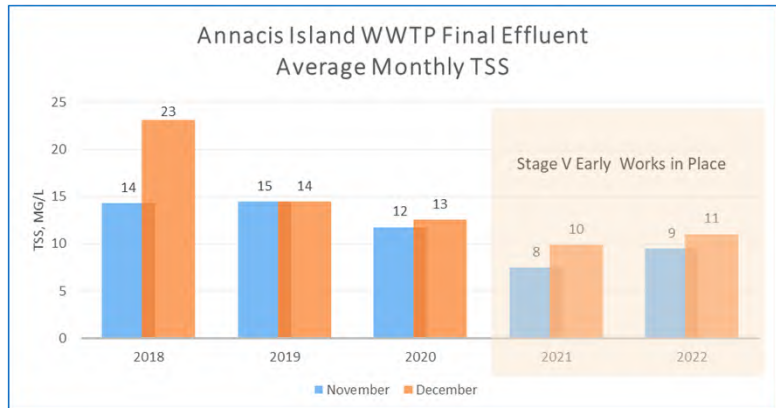


Annacis Island Wastewater Treatment Plant

# AIWWTP – STAGE 5 EXPANSION

## Impact of Completed Early Works

- Early Works in Operation since 2021
- Treated wastewater (effluent) quality improvement
  - Reduction in Total Suspended Solids
- Provides operational redundancy, allowing flexibility to schedule regular maintenance work



# STAGE 5 EXPANSION

## Schedule

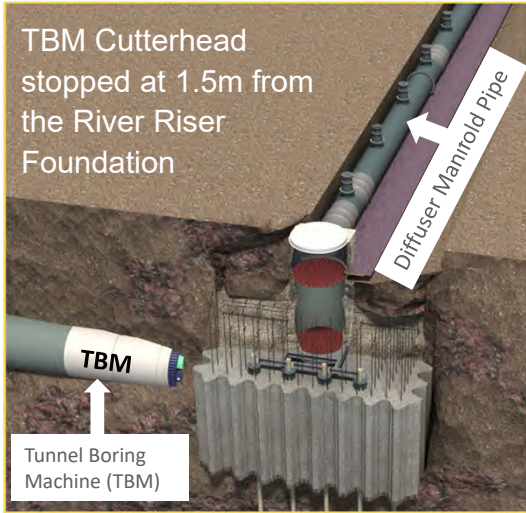
Stage 5 Expansion		2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Phase 1	Construction												
Phase 2 Early Works	Construction												
Phase 2	Design												
	Construction												
Digester No. 5	Design												
	Construction												
Regional Biosolids Dryer	Early Engineering Works												
	Design/Build/Operate												

# ANNACIS OUTFALL





# ANNACIS OUTFALL



Tunnel Boring Machine

metrovancover

7



Annacis Island Wastewater Treatment Plant Tricking Filters



Questions?

metrovancover

8

To: Liquid Waste Committee

From: Colin Meldrum, Director, Engineering, Design & Construction, Liquid Waste Services

Date: May 4, 2023 Meeting Date: May 17, 2023

Subject: **2023 Liquid Waste Capital Projects**

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### **RECOMMENDATION**

That the GVS&DD Board receive for information the report dated May 4, 2023 titled “2023 Liquid Waste Capital Projects”.

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### **EXECUTIVE SUMMARY**

The GVS&DD Board approves an annual capital budget for the liquid waste system. This report provides the Board with geographical information regarding the location of the different projects that were approved for 2023.

### **PURPOSE**

The purpose of this report is to inform the GVS&DD Board of the liquid waste capital projects under its purview for 2023, as approved by the Board on October 28, 2022.

### **BACKGROUND**

As part of the capital projects reporting process, an annual report identifying the locations of capital projects under the Liquid Waste Committee’s purview has historically been brought forward early in the year.

### **CAPITAL PLANNING PROCESS**

As part of the annual budget and five-year financial planning process, a determination is made of the capital projects that are required in order to continue to meet Metro Vancouver’s service obligations. This is done through senior level capital planning teams which prioritize each project on the basis of several criteria including environmental impact, health and safety, and ability to meet service delivery requirements and regulations. Typically, in May or June of each year, when the complete updated draft Long Range Capital Plan is prepared, each local government member is provided with copies for their review and comment. Comments received are considered in finalizing the draft plan commencing in late July, for incorporation into the annual budget and five-year financial plan.

Financial information for the projects within the liquid waste capital budget are to be provided to the Committee and Board in the fall of each year as part of the annual budget and five-year financial planning process.

Liquid waste capital projects that are expected to commence in 2023 and ongoing projects that were initiated in previous years are represented on regional maps and summarized for reference purposes on Attachments 2 and 3, respectively.

The maps provide a quick summary of the full Capital Plan and are used when meeting with other agencies, municipal members and First Nations.

In accordance with the Terms of Reference for the Liquid Waste and Finance Committees, updates of the capital expenditures will be presented to the Committees on a quarterly basis, with a final year-end report to the Committees and Board in April.

**ALTERNATIVES**

This is an information report. No alternatives are presented.

**FINANCIAL IMPLICATIONS**

For 2023, the GVS&DD Board approved a capital cash flow of approximately \$681.8 million for liquid waste capital projects.

**CONCLUSION**

The 2023 liquid waste capital budget was approved by the GVS&DD Board in October 2022. This report presents information regarding the location of the projects that were approved for 2023.

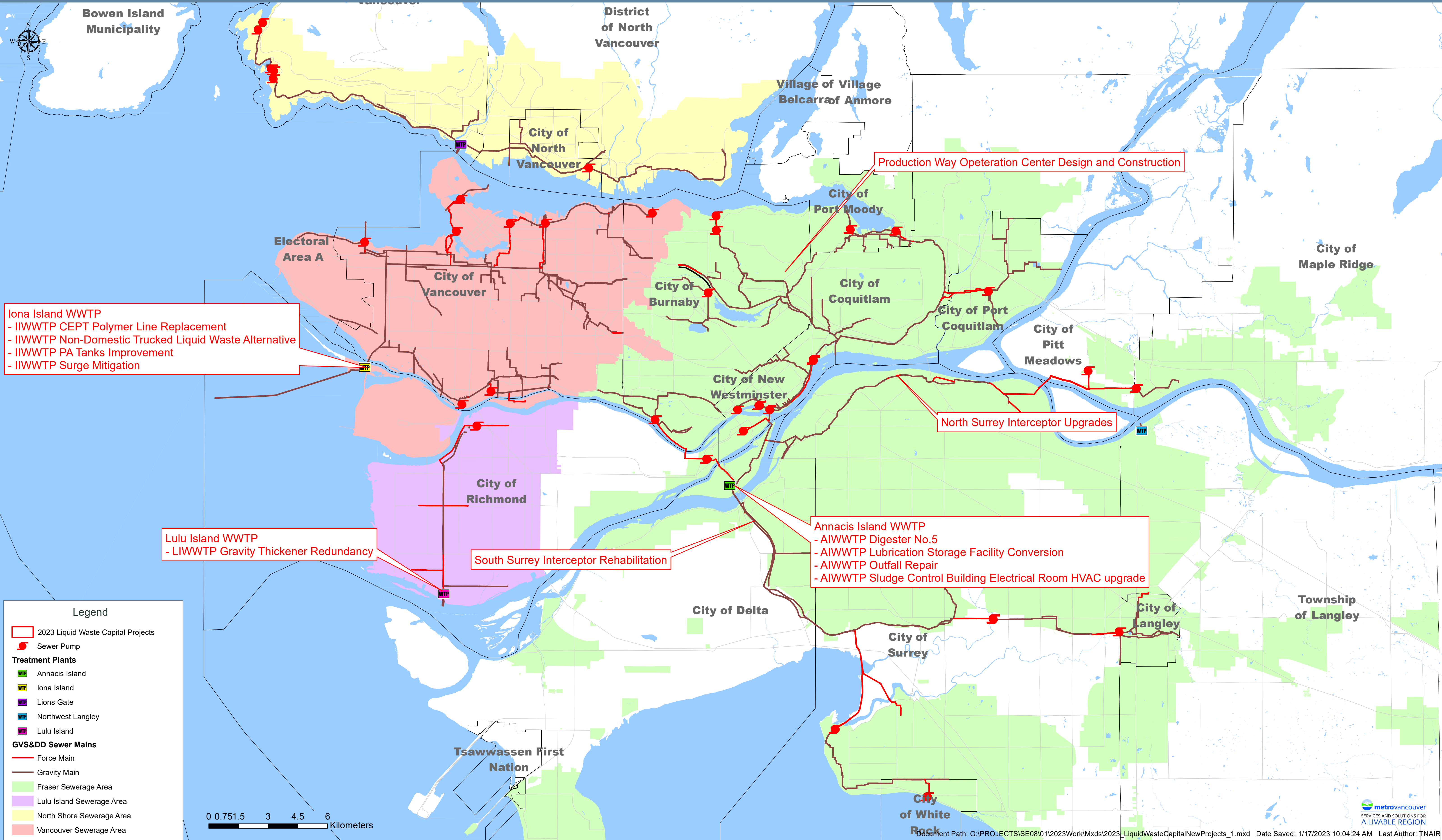
**Attachments**

1. 2023 Liquid Waste Capital New Projects Map
2. 2023 Liquid Waste Capital Approved in Progress Projects

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# 2023 Liquid Waste Capital New Projects



**Iona Island WWTP**  
 - IiWWTP CEPT Polymer Line Replacement  
 - IiWWTP Non-Domestic Trucked Liquid Waste Alternative  
 - IiWWTP PA Tanks Improvement  
 - IiWWTP Surge Mitigation

**Lulu Island WWTP**  
 - LIWWTP Gravity Thickener Redundancy

**South Surrey Interceptor Rehabilitation**

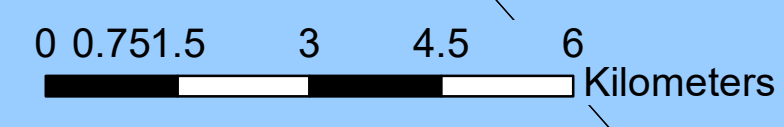
**Annacis Island WWTP**  
 - AIWWTP Digester No.5  
 - AIWWTP Lubrication Storage Facility Conversion  
 - AIWWTP Outfall Repair  
 - AIWWTP Sludge Control Building Electrical Room HVAC upgrade

**Production Way Operation Center Design and Construction**

**North Surrey Interceptor Upgrades**

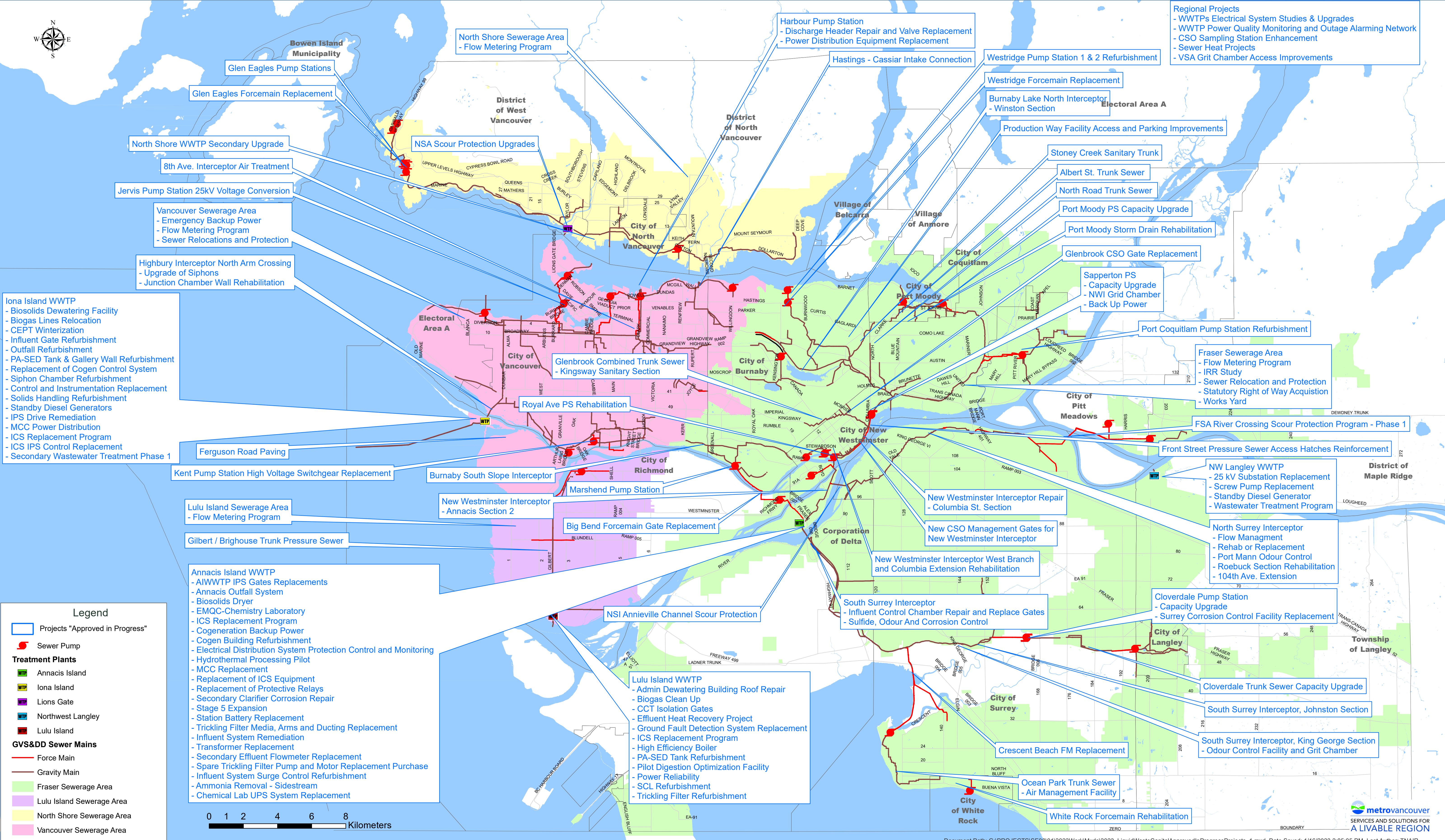
**Legend**

- 2023 Liquid Waste Capital Projects
- Sewer Pump
- Treatment Plants**
- Annacis Island
- Iona Island
- Lions Gate
- Northwest Langley
- Lulu Island
- GVS&DD Sewer Mains**
- Force Main
- Gravity Main
- Fraser Sewerage Area
- Lulu Island Sewerage Area
- North Shore Sewerage Area
- Vancouver Sewerage Area





# 2023 Liquid Waste Capital Approved in Progress Projects



- Iona Island WWTP**
- Biosolids Dewatering Facility
  - Biogas Lines Relocation
  - CEPT Winterization
  - Influent Gate Refurbishment
  - Outfall Refurbishment
  - PA-SED Tank & Gallery Wall Refurbishment
  - Replacement of Cogen Control System
  - Siphon Chamber Refurbishment
  - Control and Instrumentation Replacement
  - Solids Handling Refurbishment
  - Standby Diesel Generators
  - IPS Drive Remediation
  - MCC Power Distribution
  - ICS Replacement Program
  - ICS IPS Control Replacement
  - Secondary Wastewater Treatment Phase 1

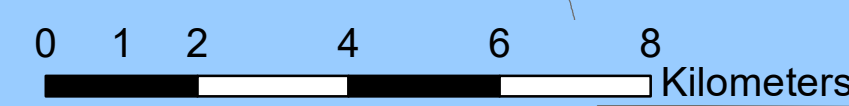
- Annacis Island WWTP**
- AIWWTP IPS Gates Replacements
  - Annacis Outfall System
  - Biosolids Dryer
  - EMQC-Chemistry Laboratory
  - ICS Replacement Program
  - Cogeneration Backup Power
  - Cogen Building Refurbishment
  - Electrical Distribution System Protection Control and Monitoring
  - Hydrothermal Processing Pilot
  - MCC Replacement
  - Replacement of ICS Equipment
  - Replacement of Protective Relays
  - Secondary Clarifier Corrosion Repair
  - Stage 5 Expansion
  - Station Battery Replacement
  - Trickling Filter Media, Arms and Ducting Replacement
  - Influent System Remediation
  - Transformer Replacement
  - Secondary Effluent Flowmeter Replacement
  - Spare Trickling Filter Pump and Motor Replacement Purchase
  - Influent System Surge Control Refurbishment
  - Ammonia Removal - Sidestream
  - Chemical Lab UPS System Replacement

- Lulu Island WWTP**
- Admin Dewatering Building Roof Repair
  - Biogas Clean Up
  - CCT Isolation Gates
  - Effluent Heat Recovery Project
  - Ground Fault Detection System Replacement
  - ICS Replacement Program
  - High Efficiency Boiler
  - PA-SED Tank Refurbishment
  - Pilot Digestion Optimization Facility
  - Power Reliability
  - SCL Refurbishment
  - Trickling Filter Refurbishment

- Regional Projects**
- WWTPs Electrical System Studies & Upgrades
  - WWTP Power Quality Monitoring and Outage Alarming Network
  - CSO Sampling Station Enhancement
  - Sewer Heat Projects
  - VSA Grit Chamber Access Improvements

**Legend**

- Projects "Approved in Progress"
- Sewer Pump
- Treatment Plants**
- Annacis Island
- Iona Island
- Lions Gate
- Northwest Langley
- Lulu Island
- GVS&DD Sewer Mains**
- Force Main
- Gravity Main
- Fraser Sewerage Area
- Lulu Island Sewerage Area
- North Shore Sewerage Area
- Vancouver Sewerage Area





To: Liquid Waste Committee

From: Peter Navratil, General Manager, Liquid Waste Services

Date: May 8, 2023 Meeting Date: May 17, 2023

Subject: **Manager's Report**

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## **RECOMMENDATION**

That the Liquid Waste Committee receive for information the report dated May 8, 2023 titled "Manager's Report".

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### **1. North Shore Wastewater Treatment Plant (NSWWTP) Project Update**

From late March to late April, PCL (the construction manager) progressed early works at the treatment plant site by completing small concrete pours for the Influent Pump Station, Operations and Maintenance Building, and the Power Distribution Building. Concrete deficiencies repairs on existing structures continued throughout the site, as did formwork and other preparations to pour concrete for the roof of the North Digester in May. Starting in early May, PCL will be expanding construction activities to include the Primary Clarifiers, Activated Sludge Tanks, and Secondary Clarifiers.

AECOM (the design consultant) advanced the detailed design through the month of April. Full-time equivalent hours have held steady on a month-to-month basis since January 2023. The team is currently focused on producing structural "Issued for Construction" drawings to allow PCL to continue construction and concrete pours on site in a timely fashion.

Metro Vancouver continues to work with PCL and AECOM to finalize an execution plan to complete the project, along with an updated cost estimate and schedule, to present to the Liquid Waste Committee for consideration in mid-2023.

Metro Vancouver issued an RFP in April to select an engineering consultant to provide additional technical services to support Metro Vancouver, PCL, and AECOM's work to complete the project. Once selected, the successful proponent will provide engineering, project management, and construction field services. We expect to present a recommendation for award to the committee in the coming months.

Looking forward to June and July, at the June 14, 2023 Liquid Waste Committee meeting, a report recapping the history of the project will be presented along with an update from the NSWWTP Expert Advisory Panel. On June 28, 2023 a tour of the NSWWTP will be available to Committee members.

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In July, the revised schedule and budget will be presented. In addition, a member of the expert panel will be on hand to provide comments and take questions from Committee members.

## **2. First Narrows Pump Station ACEC Award of Merit**

The recently completed First Narrows Pump Station, which is part of the North Shore Secondary Wastewater Treatment Plant Project, was awarded the Award of Merit in the Municipal and Civil Infrastructure category by the Association of Consulting Engineering Companies of BC (ACEC). This project was executed as a Design Build contract with WSP Engineering providing the Engineer of Record services.

## **3. Bylaw Notice Authority for GVS&DD and GVWD**

On April 4, Metro Vancouver was advised that GVS&DD and GVWD were added to the provincial Bylaw Notice Enforcement Regulation. Almost all Metro Vancouver members and MVRD already are included in the regulation. The GVS&DD and GVWD Boards approved requesting to be added to the Bylaw Notice Enforcement Regulation on September 23, 2022. With bylaw notice authority, the Liquid Waste, Water and Solid Waste functions will be able to develop bylaw enforcement and dispute adjudication bylaws. Bylaw violation enforcement and dispute adjudication bylaws establish enforcement processes, penalty amounts for specific bylaw violations as well as dispute adjudication processes. Under the *Local Government Bylaw Notice Enforcement Act*, prescribed bodies enact bylaws with penalties up to \$500 per bylaw contravention. Where appropriate, public, stakeholder and First Nations engagement on the specifics of the bylaws would occur as part of the development of those bylaws. In the absence of implementing bylaw enforcement and dispute adjudication bylaws, Metro Vancouver's only enforcement option for GVS&DD and GVWD bylaws is through the courts. To help ensure consistency in the establishment of penalties as well as enforcement and adjudication processes, the development of a bylaw notice financial policy will be investigated.

## **4. Recreational Water Quality Monitoring Program Update**

The 2023 Recreational Water Quality Monitoring Program was initiated on April 11. As in previous years, the program includes monitoring of 114 sites across 41 locations. A minimum of five samples are collected from each site within a 30-day period. The results are reported to the local health authorities (Vancouver Coastal Health and Fraser Health) and the beach operators (member municipalities and Metro Vancouver Parks). Metro Vancouver, on a weekly basis, also calculates and reports concentration of bacteria for each beach location using an approach prescribed by Health Canada, so that compliance with appropriate guidelines can be determined. At the end of each year, the percentage of recreational water quality results not meeting applicable criteria is reported on the Metro Vancouver performance monitoring dashboard (see Reference).

In 2022, the bacteriological water quality was met for most beaches in the region from May through September. Only 1.3% of the regional beach water quality results did not meet the applicable Health Canada criteria, which is consistent with historical data. More information

about the 2022 Recreational Water Quality Monitoring Program is provided in the 2022 Environmental Management & Quality Control Annual Report for GVS&DD which will be presented at the September 13, 2023 Liquid Waste Committee meeting.

#### **5. Liquid Waste Committee 2023 Work Plan**

The updated 2023 Work Plan (Attachment) shows the status of the Committee's key priorities for the year.

#### **Attachment**

Liquid Waste Committee 2023 Work Plan

#### **Reference**

Metro Vancouver Performance Monitoring Dashboard:

<http://www.metrovancouver.org/dashboards/services/liquid-waste/Pages/Recreational-water-quality-results-that-do-not-meet-the-applicable-criteria.aspx>

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## ATTACHMENT

### Liquid Waste Committee 2023 Work Plan

Report Date: May 17, 2023

<b>Priorities</b>	
<b>1st Quarter</b>	<b>Status</b>
2023 Liquid Waste Capital Projects	Complete
2022 Wipe It, Green Bin It Campaign Results	Complete
2022 Microfibres Reduction Campaign Results	Complete
North Shore Wastewater Treatment Plant Project Update	Complete
Wet Weather Pricing - Proposed Amendments to GVS&DD Cost Apportionment Bylaw	Complete
2023 Liquid Waste Sustainability Innovation Fund Applications	Complete
Municipal Requests for Sewerage Area Boundary Amendments (as applicable)	Complete
Utility Policies (as applicable)	Complete
Contract Approvals as per <i>Procurement and Real Property Contracting Authority Policy</i>	Complete
<b>2<sup>nd</sup> Quarter</b>	
Annacis Island Wastewater Treatment Plant Project Update	In Progress
Northwest Langley Wastewater Treatment Plant Project Update	In Progress
North Shore Wastewater Treatment Plant Project Update	Complete
Liquid Waste Services Capital Expenditure Summary Update as at December 31, 2022	Complete
GVS&DD Sewer Use Bylaw and Fees Update	In Progress
2023 Update on Liquid Waste Sustainability Innovation Fund Projects	In Progress
Reclaimed Water Policy	In Progress
Municipal Requests for Sewerage Area Boundary Amendments (as applicable)	In Progress
Utility Policies (as applicable)	In Progress
Contract Approvals as per <i>Procurement and Real Property Contracting Authority Policy</i>	In Progress
<b>3rd Quarter</b>	
GVS&DD Food Sector Grease Interceptor Bylaw Amendment	In Progress
2023 Unflushables Campaign Results	In Progress
2022 GVS&DD Environmental Management and Quality Control Annual Report	In Progress
Liquid Waste Services Capital Expenditure Summary Update as at April 30, 2023	In Progress
Municipal Requests for Sewerage Area Boundary Amendments (as applicable)	In Progress
Utility Policies (as applicable)	In Progress
Contract Approvals as per <i>Procurement and Real Property Contracting Authority Policy</i>	In Progress
<b>4th Quarter</b>	
2024 Annual Budget & 5 Year Financial Plan - Liquid Waste	Pending
Environmental Management System Update	Pending
LWMP Review and Update, Report on Phase 2	Pending
Lower Mainland Estuary Management Program	Pending
Liquid Waste Services Capital Expenditure Summary Update as at August 31, 2023	Pending
Drainage Areas Policy	Pending
Sewage Catchment Area (Rawn) Amendment - Langley Servicing Plan	Pending
Municipal Requests for Sewerage Area Boundary Amendments (as applicable)	Pending
Utility Policies (as applicable)	Pending
Contract Approvals as per <i>Procurement and Real Property Contracting Authority Policy</i>	Pending

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To: Liquid Waste Committee

From: Lillian Zaremba, Program Manager, Collaborative Innovations, Liquid Waste Services

Date: May 8, 2023 Meeting Date: May 17, 2023

Subject: **2023 Update on Liquid Waste Sustainability Innovation Fund Projects**

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The attached report dated April 21, 2023 titled “2023 Update on Liquid Waste Sustainability Innovation Fund Projects” is being presented to the Climate Action Committee for information at its May 11, 2023 meeting. The report is presented to the Liquid Waste Committee for its information only.

**Attachment**

“2023 Update on Liquid Waste Sustainability Innovation Fund Projects”, dated April 21, 2023

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To: Climate Action Committee

From: Lillian Zaremba, Program Manager, Liquid Waste Services Department

Date: April 21, 2023 Meeting Date: May 11, 2023

Subject: **2023 Update on Liquid Waste Sustainability Innovation Fund Projects**

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### RECOMMENDATION

That the Climate Action Committee receive for information the report dated April 21, 2023, titled “2023 Update on Liquid Waste Sustainability Innovation Fund Projects.”

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### EXECUTIVE SUMMARY

This report provides an update on eight projects that were approved for funding in 2017 through 2022 under the Sustainability Innovation Fund. These projects contribute to sustainability in the regional liquid waste system by optimizing operations to reduce energy use, enhancing resource recovery from wastewater, protecting the environment from micro-pollutants, restoring marine habitat, and producing low-carbon fuels that reduce greenhouse gas emissions. Of the eight projects, one is highlighted for a significant milestone and one has reached completion:

- Hydrothermal Processing – Biofuel Demonstration Facility. Detailed design has passed the 60% milestone and is nearly at the 90% milestone; and
- Pump Station Optimization. The Sustainability Innovation Fund project is complete, resulting in an energy-saving control strategy that will be implemented at Lynn Pump Station.

Attachment 1 provides more detailed updates on the other projects that are in progress.

### PURPOSE

This report provides an update on projects funded under the Liquid Waste Sustainability Innovation Fund.

### BACKGROUND

The Liquid Waste Sustainability Innovation Fund (the Fund) was created by the Board in 2004 to provide financial support to Liquid Waste Utility projects that contribute to the region’s sustainability. The GVS&DD Board adopted the *Liquid Waste Sustainability Innovation Fund Policy* on June 27, 2014, with further amendments in 2016 and 2021, to guide the use and management of the Fund. The policy requires that the Climate Action Committee be updated on an annual basis on the deliverables, outcomes and measurable benefits of the projects receiving funding.

This report presents an update on projects that have not yet been reported as complete to the Climate Action Committee, including status, amount spent, and project outcomes.

**STATUS OF SUSTAINABILITY INNOVATION PROJECTS (APPROVAL YEARS: 2017 – 2022)**

Project	Approval Year	Amount Approved	Status
High Efficiency Aeration Demonstration	2017	\$750,000	In Progress
Intelligent Water Systems - Making Use of Sensors and Big Data Analytics	2018	\$200,000	In Progress
Hydrothermal Processing - Biofuel Demonstration Facility	2018 2021	\$8,250,000 \$6,130,000	In Progress
Multiphase Composite Coating (MCC) for Concrete Sewers	2019	\$620,000	In Progress
Pump Station Optimization	2019	\$330,000	Complete
Advanced Resource Recovery from Sludge: Industrial Research Chair Program	2019	\$2,985,000	In Progress
Handheld Wastewater Microbial DNA Monitor	2020	\$330,000	In Progress
Biorock: Innovative Building Material for Shoreline Protection, Carbon Sequestration, and Habitat Creation	2022	\$270,000	In Progress

**Hydrothermal Processing – Biofuel Demonstration Facility: In Progress**

The goal of this project is to design, fabricate, and operate a hydrothermal processing demonstration facility at the Annacis Island Wastewater Treatment Plant that will convert wastewater sludge into a liquid biofuel. Compared to the current anaerobic digestion process, hydrothermal processing promises a smaller footprint, reduced net costs, and production of biocrude that can be refined to low-carbon transportation fuels, including marine biofuel, sustainable aviation fuel, and biodiesel.

**Outcomes to Date:**

- Secured \$5 million of external funds from project partner Parkland and the Province of BC;
- Preliminary design of the hydrothermal processing unit and associated infrastructure were completed;
- As part of the detailed design currently underway, the team completed a hazard and operability study and a value engineering exercise to reduce capital costs; and
- In 2022, Metro Vancouver hosted an invitation-only workshop on hydrothermal processing organized by the Water Environment Federation that brought together experts from across North America including researchers, engineering consultants and peer utilities to discuss integration of hydrothermal processing into wastewater treatment plants, biocrude upgrading, and overcoming barriers to adoption.

**Milestone:**

- The detailed designs for the hydrothermal processing unit and for the associated infrastructure to integrate with the Annacis Island Wastewater Treatment Plant have passed the 60% milestone and are nearly at the 90% milestone.

Next steps involve completing the detailed design and awarding the fabrication phase of the hydrothermal processing unit.



**Pump Station Optimization: Complete**

The goal of this project is to investigate opportunities to improve wet weather system performance and save energy by adjusting operating strategies at sanitary pump stations. Metro Vancouver’s 33 pump stations consume electricity that costs approximately \$2.4 million per year. This project is a partnership with the UBC Sauder School of Business involved in the field of Operations Research.

**Outcomes:**

- Advanced modelling of new proposed operational controls for Metro Vancouver’s Lynn Pump Station in the North Vancouver indicate a potential 25% reduction in energy use; and
- The amended control strategy will be implemented at Lynn Pump Station in 2023.

**ALTERNATIVES**

This is an information report. No alternatives are presented.

**FINANCIAL IMPLICATIONS**

The projects summarized in this report had funding approved by the GVS&DD Board from 2017-2022. The disbursements of funds were made in accordance with the applicable *Sustainability Innovation Fund Policy* that governs the use and management of the Funds.

The table below outlines the funding approved and the amount spent to date for each project. Any unspent funds for completed projects remain in the Sustainability Innovation Fund reserve.

Project	Total Amount of Funding Approved	Est. Spent (as of Mar. 31, 2023)
<b>2017 Approval Year</b>		
High Efficiency Aeration Demonstration	\$750,000	\$199,374
<b>2018 Approval Year</b>		
Intelligent Water Systems - Making Use of Sensors and Big Data Analytics	\$200,000	\$184,562
Hydrothermal Processing - Biofuel Demonstration Facility	\$8,250,000 \$6,130,000	\$2,787,581
<b>2019 Approval Year</b>		
Multiphase Composite Coating (MCC) for Concrete Sewers	\$620,000	\$158,985
Pump Station Optimization	\$330,000	\$195,043
Advanced Resource Recovery from Sludge – Industrial Research Chair Program	\$2,985,000	\$1,240,720
<b>2020 Approval Year</b>		
Handheld Wastewater Microbial DNA Monitor	\$330,000	\$191,250
<b>2022 Approval Year</b>		
Biorock – Innovative Building Material for Shoreline Protection, Carbon Sequestration, and Habitat Creation	\$270,000	\$6,250

The balance in the Liquid Waste Sustainability Innovation Fund at Dec. 31, 2022 was \$19.37 million. Of this, a total of \$16.75 million in approved funding is committed to be spent on projects in progress (including one new project approved in 2023) over the next four years.

## **CONCLUSION**

This report provides an update on eight projects funded under the Liquid Waste Sustainability Innovation Fund. The projects cover a range of topics including optimizing operations to reduce energy use, recovering resources from wastewater, protecting the marine environment, and creating low-carbon fuels. The Fund was created by the Board in 2004 to provide financial support to Liquid Waste Utility projects that contribute to the region's sustainability.

## **Attachments**

1. Update on Other Liquid Waste Sustainability Innovation Fund Projects in Progress
2. "2023 Update on Liquid Waste Sustainability Innovation Fund Projects" presentation by Lillian Zaremba, dated April 21, 2023.

**UPDATE ON OTHER LIQUID WASTE SUSTAINABILITY INNOVATION FUND PROJECTS IN PROGRESS****High Efficiency Aeration Demonstration: In Progress**

In wastewater treatment processes, aeration introduces air into the wastewater to provide oxygen to the microbes that degrade organic matter. Aeration is energy-intensive – it can consume more than half of the energy required by a wastewater treatment plant (WWTP). This project will assess the performance at pilot scale of the Perlemax Fluidic Oscillator, a new device that has shown its ability to improve aeration energy efficiency by 25% in small tanks. Project partners are the District of Columbia Water and Sewer Authority (DC Water), where the testing will be conducted, and the Water Research Foundation (WRF), who are coordinating third-party validation by an independent panel of experts.

**Outcomes to Date:**

- Detailed design of the pilot aeration tank was approved by all project partners;
- The Perlemax Fluidic Oscillator has been built and delivered to DC Water; and
- DC Water has retained a construction contractor and most of the ancillary equipment for the pilot has been procured.

Pilot installation at DC Water’s facility is scheduled for spring 2023, with testing to be completed by fall 2023. The third-party technology validation will compare aeration performance with and without the Perlemax technology, which will provide the basis for Metro Vancouver to quantify potential energy savings and determine the optimal design for potential future use at our WWTPs.

**Intelligent Water Systems – Making Use of Sensors and Big Data Analytics: In Progress**

Metro Vancouver and its member jurisdictions monitor and collect large amounts of data. As increasing numbers of less expensive sensors are deployed, the volume of data is expected to increase exponentially. The purpose of this project is to identify and evaluate innovative tools and techniques to help regional and municipal liquid waste utilities create information from the wave of “Big Data” that is transforming the industry. The project partner is the Water Research Foundation.

**Outcomes to Date:**

- In partnership with the WRF, a consultant has been retained to explore how Big Data techniques can be unified and leveraged with artificial intelligence to enable predictions, adapt operational rules, schedule maintenance and the like. Other considerations include integration of databases for precipitation, land use, population, and environmental monitoring.

Next, the consulting team will engage various departments within Metro Vancouver to evaluate the Intelligent Water Infrastructure Systems Engineering (iWISE) framework being developed in this project. The framework will help utilities plan for and implement the effective use of sensor-based monitoring information to assist with real-time and future focused decision-making. Our involvement with the development of the iWISE framework and participation as a case study is advancing Metro Vancouver on its path to becoming a digital utility.

### **Multiphase Composite Coating (MCC) for Concrete Sewers: In Progress**

The overall goal of this project is to field test and validate the performance of a new coating material developed by UBC with the potential to protect both new and existing concrete sewer pipes from biological corrosion, which can dramatically reduce the service life of sewer networks and result in significant repair and replacement costs. The project partners are UBC's Department of Civil Engineering, Ocean Pipe, and Metro Testing & Engineering.

#### Outcomes to Date:

- Laboratory testing of coating material in progress at UBC.
- A spray-on version of the coating is under development at UBC with plans for piloting on a small scale rehabilitation project.
- Field and laboratory testing is progressing on the pilot application of the coating material in a heavily corroded concrete sewer chamber in Delta. Physical, chemical and mechanical properties of the coating are currently being evaluated and showing positive results.
- Significant laboratory work has been done on the yield stress and viscosity of the material to allow the coating to be sprayed more effectively, increasing its potential for commercial viability. This represents a major jump in the development of this coating material.
- An NSERC proposal was approved in 2022 for additional funding to further develop the spray placement of the MCC coating using robotics and artificial intelligence.

Performance testing of the pilot application will continue through 2023 and 2024. Results will inform decisions to use the new coating material to economically repair, protect and extend the service life of existing sewerage pipes, manholes and chambers that are exposed to corrosive environments.

### **Advanced Resource Recovery from Sludge: In Progress**

The main goals of this five-year project are to (i) assess the integration of hydrothermal processing and anaerobic digestion and characterize the potential for nitrogen and phosphorus recovery, (ii) evaluate the effectiveness of hydrothermal processing in destroying a range of micro-pollutants, and (iii) develop a prototype and pilot-scale bioreactor that can augment biomethane production. Advancing the recovery of resources from wastewater to produce value-added outputs for use by other industries can help build a stronger circular economy. The project partners are UBC School of Engineering and the Natural Sciences and Engineering Research Council.

#### Outcomes to Date:

- UBC successfully tested a wide range of configurations and identified the optimal arrangement for integrating hydrothermal processing and anaerobic digestion.
- UBC investigated options to recover phosphorus from the solid precipitate byproduct of hydrothermal processing into a form that could be used as a solid fertilizer.
- UBC's hydrothermal processing research results were disseminated in six journal articles and five conference presentations.
- UBC's prototyping provided valuable insights for pilot-scale bioreactor scoping and design.
- Preliminary design was initiated for a pilot-scale bioreactor to be tested at Lulu Island WWTP; the bioreactor portion of the project has transitioned from UBC at bench scale to an engineering consultant at pilot scale.

Next steps for UBC's research include exploring the fate of compounds of environmental concern in hydrothermal processing. The results of UBC's research will inform the operation of the HTP demonstration facility at Annacis Island WWTP, as well as informing integration of HTP into WWTPs in future full-scale implementation. The research will also inform pathways for recovering nutrients from HTP by-products that can contribute to the business case for full-scale HTP.

Next steps for the bioreactor are to complete detailed design for the pilot test at Lulu Island WWTP. The pilot results will be evaluated to determine the increase in biomethane production and will inform whether to proceed with full-scale implementation of the bioreactor at a Metro Vancouver WWTP.

### **Handheld Wastewater Microbial DNA Monitor: In Progress**

The goal of this project is to adapt a DNA sequencer to test the microbes in wastewater samples taken from treatment processes, which will provide quantitative results to support existing visual assessments. Combined with the development of artificial intelligence, this system could provide early warning of treatment process upsets, allowing greater time to take corrective action and prevent process failure.

#### **Outcomes to Date:**

- UBC researchers have been collecting wastewater samples from various points throughout Annacis Island WWTP.
- The DNA extraction and sequencing preparation has been automated using robots.
- A high-throughput approach to identify and quantify the microbial communities has been developed and validated using samples from Annacis Island WWTP.
- The team began building a species-level database of the microbial communities in Annacis Island WWTP.

Integration with an artificial intelligence platform will begin after the microbial database is complete. The project will deliver standard operating procedures and digital tools that Metro Vancouver can integrate with an out-of-the-box portable DNA sequencing device to provide rapid analysis for wastewater process control.

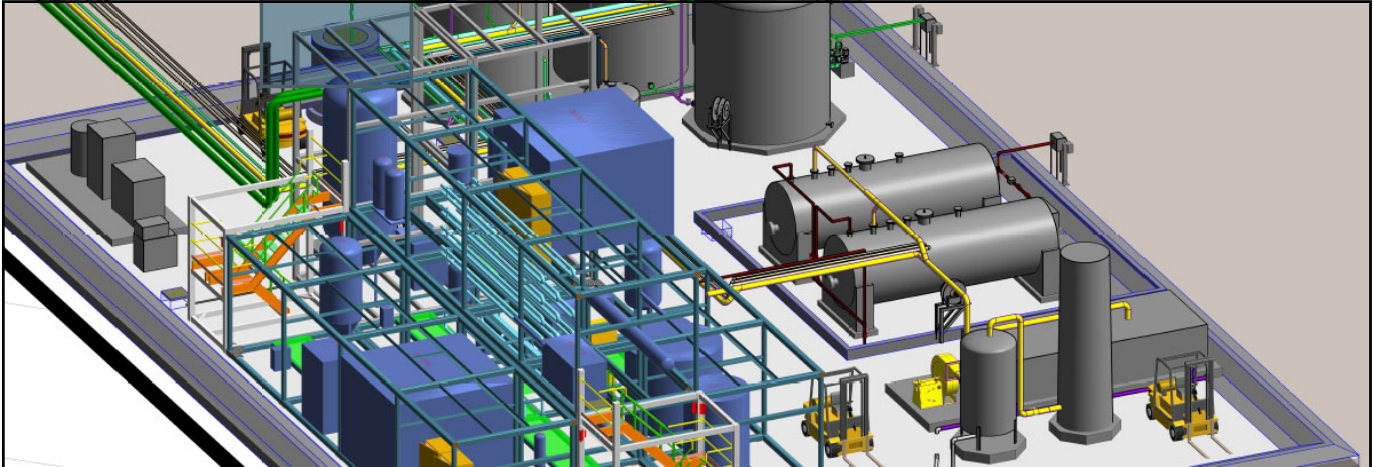
### **Biorock – Innovative Building Material for Shoreline Protection, Carbon Sequestration, and Habitat Creation: In Progress**

The purpose of this project is to explore the feasibility of Biorock for shore protection and habitat creation near our coastal infrastructure. Biorock uses electric current and naturally occurring ingredients in sea water to accumulate concrete-like material on a submerged metal frame, constructing underwater marine structures that grow and strengthen over time.

#### **Outcomes to Date:**

- A UBC Sustainability Scholar completed research on living breakwater design, aquatic species and habitat needs. The end product was a series of conceptual designs with various features for increasing ecosystem diversity, density and resilience when using Biorock in local waters, which will be used to inform the design of a Biorock pilot.

Consultants will be retained to confirm the feasibility and complete the design of a Biorock pilot including a cost estimate. A positive assessment will result in submission of a separate Sustainability Innovation Fund application for fabrication, installation, and monitoring of a Biorock pilot to demonstrate its performance in local waters.



Rendering of Hydrothermal Processing Demonstration Facility

# 2023 Update on Sustainability Innovation Fund Projects

## LIQUID WASTE SERVICES

Lillian Zaremba, MSc, PEng.  
Program Manager, Collaborative Innovations

Climate Action Committee: May 11, 2023  
59080398



## HYDROTHERMAL PROCESSING (HTP) DEMONSTRATION

In progress

Purpose:

- Convert sludge to biocrude and sustainable transportation fuels

Progress:

- Detailed design underway, nearly at 90%



## PUMP STATION OPTIMIZATION

Complete

Purpose:

- Improve performance and save energy

Progress:

- New control strategy to be implemented



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## HIGH EFFICIENCY AERATION DEMONSTRATION

In progress

Purpose:

- Improve energy efficiency of aeration

Progress:

- Fluidic oscillator constructed and delivered to DC Water for testing



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## INTELLIGENT WATER SYSTEMS

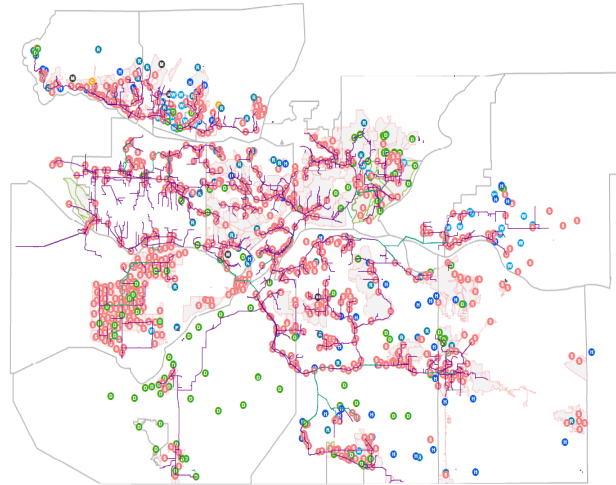
In progress

Purpose:

- Leverage big data and artificial intelligence to develop tools

Progress:

- Consultant retained by WRF to complete case studies



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## MULTIPHASE COMPOSITE COATING FOR CONCRETE SEWERS

In progress

Purpose:

- New material to protect concrete sewers from corrosion

Progress:

- Field trial being monitored
- Improvements of spraying effectiveness



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## ADVANCED RESOURCE RECOVERY FROM SLUDGE

In progress

Purpose:

- Assess integration of HTP and anaerobic digestion, including potential nutrient recovery
- Evaluate destruction of micropollutants by HTP
- Develop pilot bioreactor to increase biogas

Progress:

- Options for phosphorus recovery from HTP
- Preliminary design of pilot bioreactor underway



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## HANDHELD WASTEWATER MICROBIAL DNA MONITOR

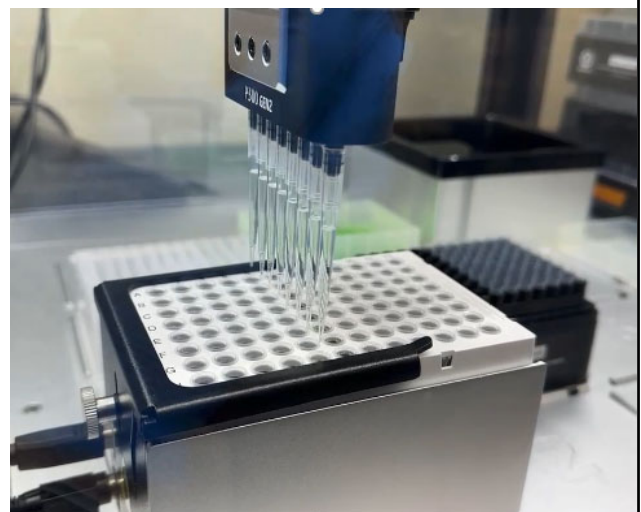
In progress

Purpose:

- Early warning of wastewater treatment process issues

Progress:

- Automated robot for DNA extraction and sequencing
- Database of microbes



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## BIOROCK – INNOVATIVE BUILDING MATERIAL

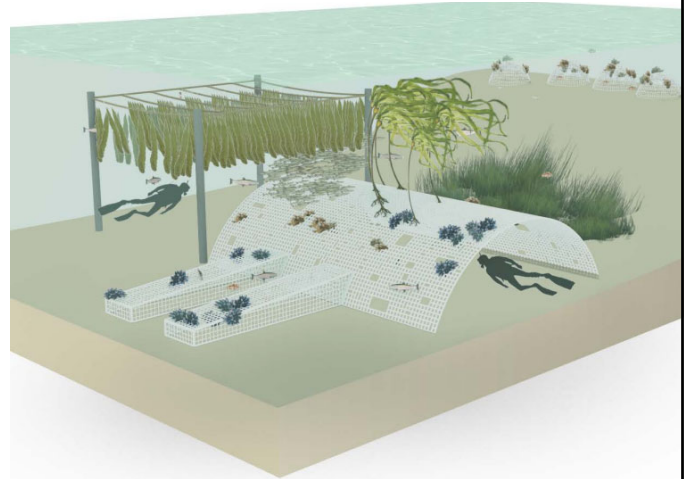
In progress

Purpose:

- Explore feasibility for shore protection, habitat creation, carbon sequestration

Progress:

- Conceptual design



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Iona Island Wastewater Treatment Plant

Thank you

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Together we make our region strong

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