



Annacis Island Wastewater Treatment Plant

# Metro Vancouver Liquid Waste Committee Orientation

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Liquid Waste Committee Meeting - January 18, 2023  
56597519

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# BOARD AND COMMITTEE ORIENTATION

NOVEMBER

Inaugural  
Board  
Meeting

Welcome package

Updated Board  
Website

DEC

JANUARY

Committee  
Meetings

Orientation to  
Metro Vancouver  
Services

One-on-one  
sessions upon  
request

FEBRUARY

Orientation &  
Strategic  
Planning

Orientation to Metro  
Vancouver Services,  
Budget and Financial  
Plan

Come together for  
strategic planning for  
four year term

MAR

APRIL

Review  
Strategic Plan

Consider adoption  
of Board Strategic  
Plan

# LIQUID WASTE COMMITTEE TERMS OF REFERENCE

## Purpose

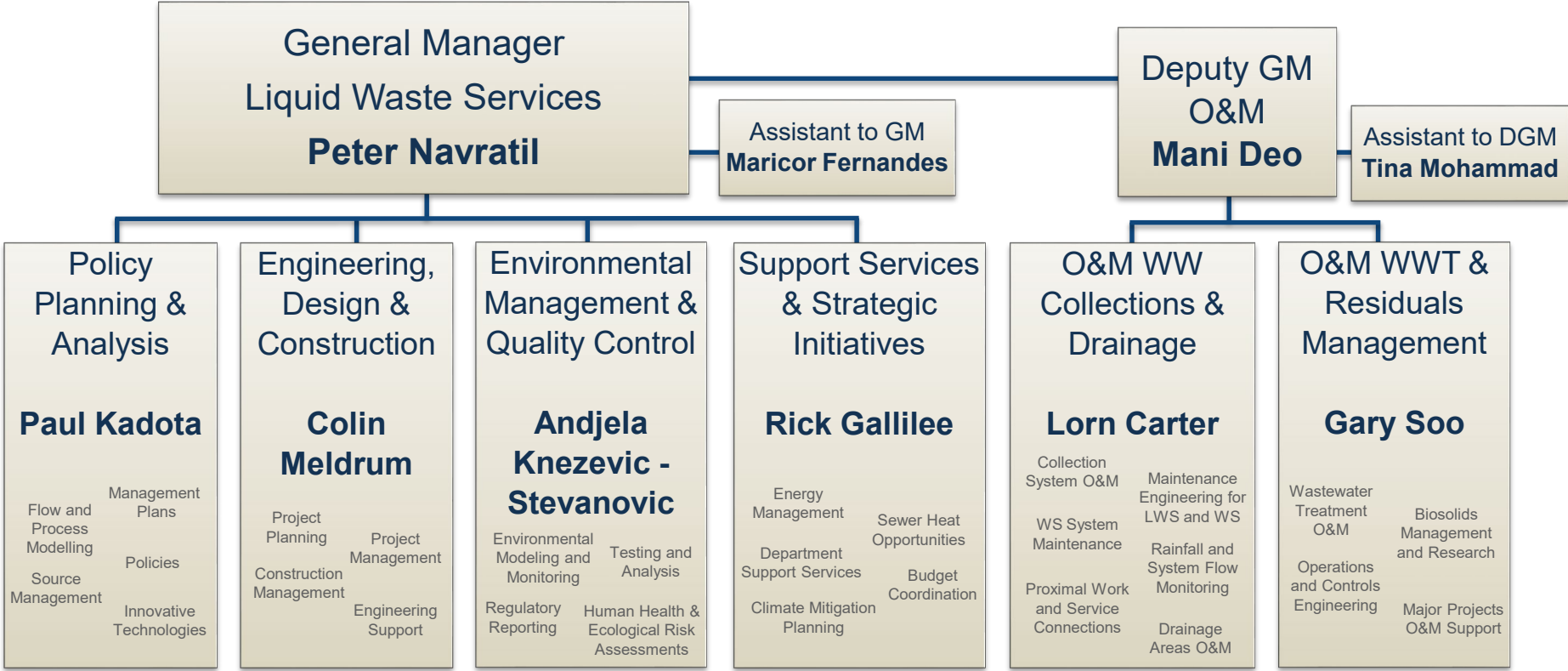
- The Liquid Waste Committee is the standing committee of the Metro Vancouver Board that provides advice and recommendations on policies, bylaws, plans, programs, budgets and issues related to liquid waste management under the GVS&DD service.

# LIQUID WASTE COMMITTEE TERMS OF REFERENCE

## Responsibilities

- Reviewing and endorsing the annual budget and five-year financial plan
- Overseeing and monitoring implementation of strategic utility plans including the *Integrated Liquid Waste and Resource Management Plan*
- Overseeing implementation of GVS&DD (liquid waste) capital programs, including award of major contracts for engineering services, materials supply, and construction
- Providing governance and oversight over key major projects
- Reviewing and receiving the annual Environmental Management and Quality Control report
- Reviewing municipal requests for sewerage area boundary expansions
- Reviewing and recommending amendments to the *GVS&DD Sewer Use Bylaw*
- Reviewing and approving Integrated Stormwater Management Plans`

# LIQUID WASTE SERVICES



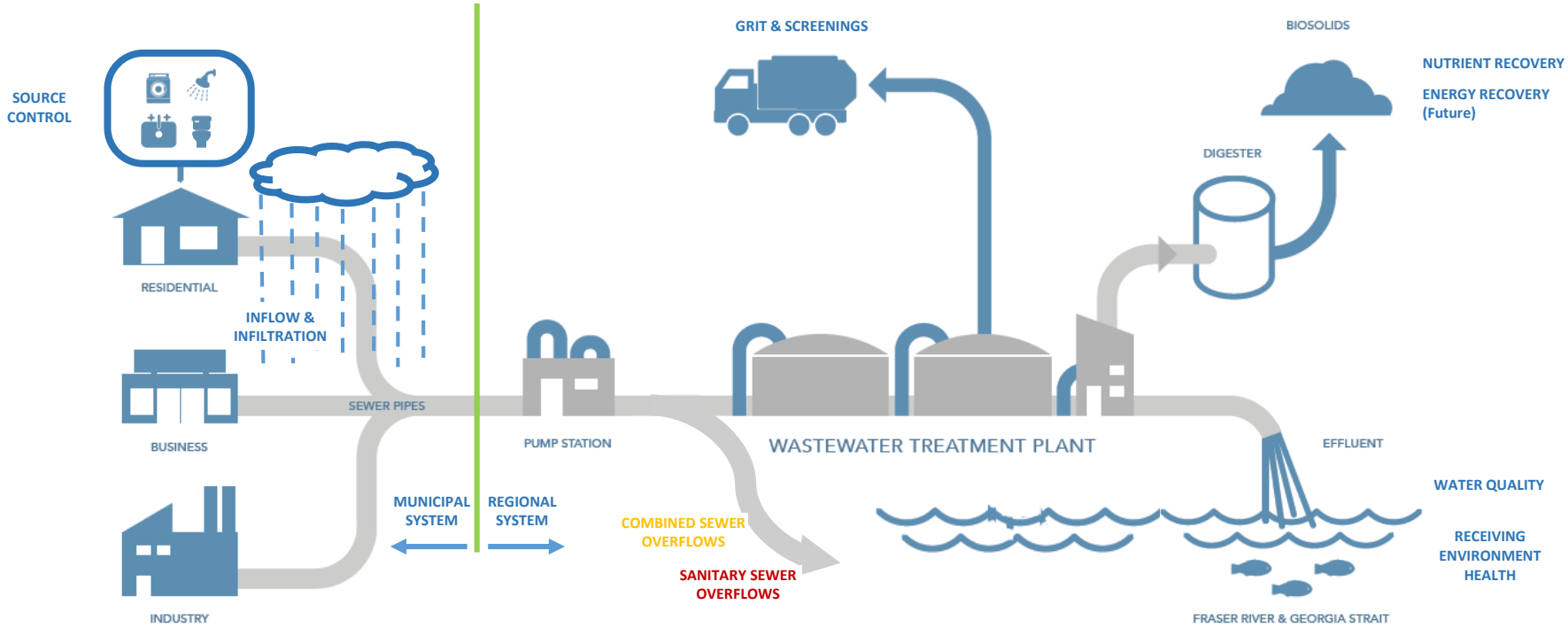
# THREE KEY MESSAGES

1. Why we are rebuilding the North Shore and Iona Island Wastewater Treatment Plants?
2. Inflow and Infiltration is the biggest threat to long term affordability
3. Sewage is full of heat, energy and nutrients, all of which helps move us towards our climate goals

# COMMITTEE ORIENTATION OVERVIEW

- The Basics – Linkages to Municipalities
- History and Overview
- Regulatory Framework
- How we Operate the System
- The Business – Service Levels, Financials and Benchmarking
- Culture of Innovation, Efficiency and Continuous Improvement
  
- Project Delivery Orientation

# Liquid Waste – Municipal Regional Connection



# VIDEO: METRO VANCOUVER'S LIQUID WASTE SYSTEM





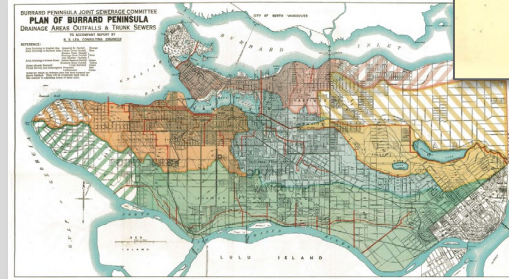
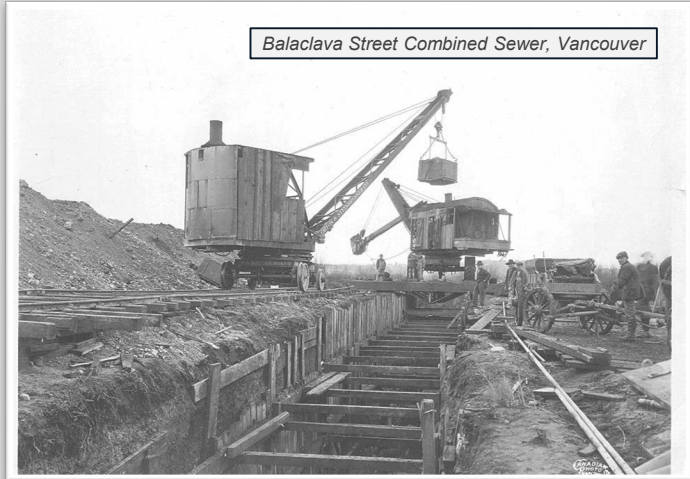
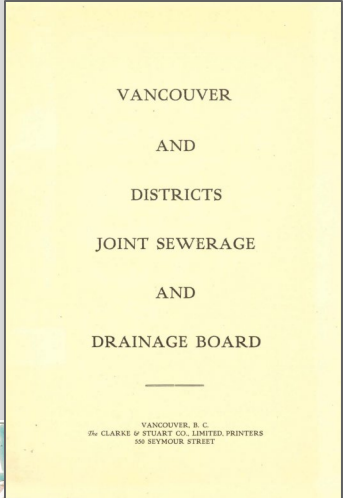
# Liquid Waste Services Overview

# HISTORICAL EVOLUTIONS

Late 1800's – failing septic systems

Lea Report (1911-1913)

- Network of pipes
- Discharge to water bodies
- Proposed separated sewers
- GVS&DD formed in 1914

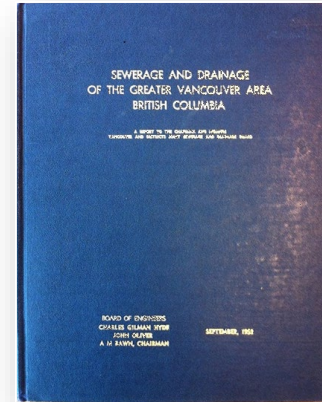
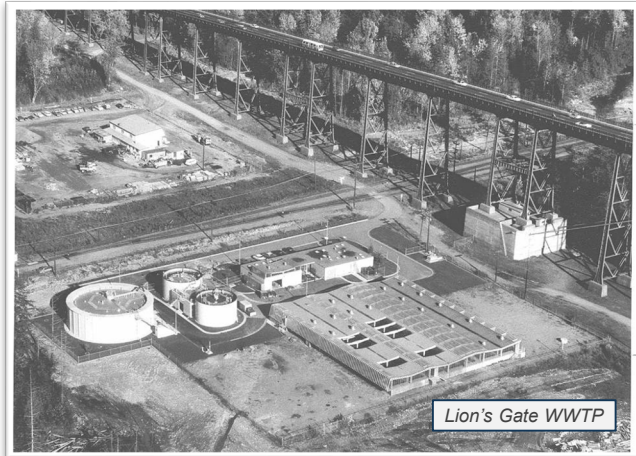
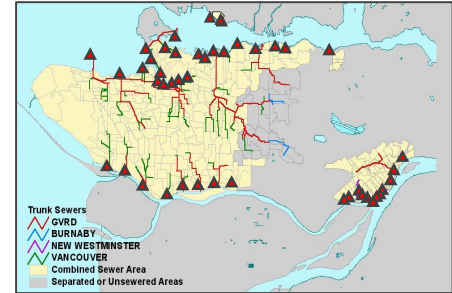


# FOULED BEACHES AND RAWN



## Rawn Report (1950-1953)

- Network of Interceptors
- Primary Wastewater Treatment
  - Lions Gate WWTP (1961)
  - Iona Island WWTP (1963)
  - Lulu Island WWTP (1972)
  - Annacis Island WWTP (1974)
  - *Northwest Langley WWTP (1978)*
- 4 - Sewer Areas
- Province created GVS&DD Act

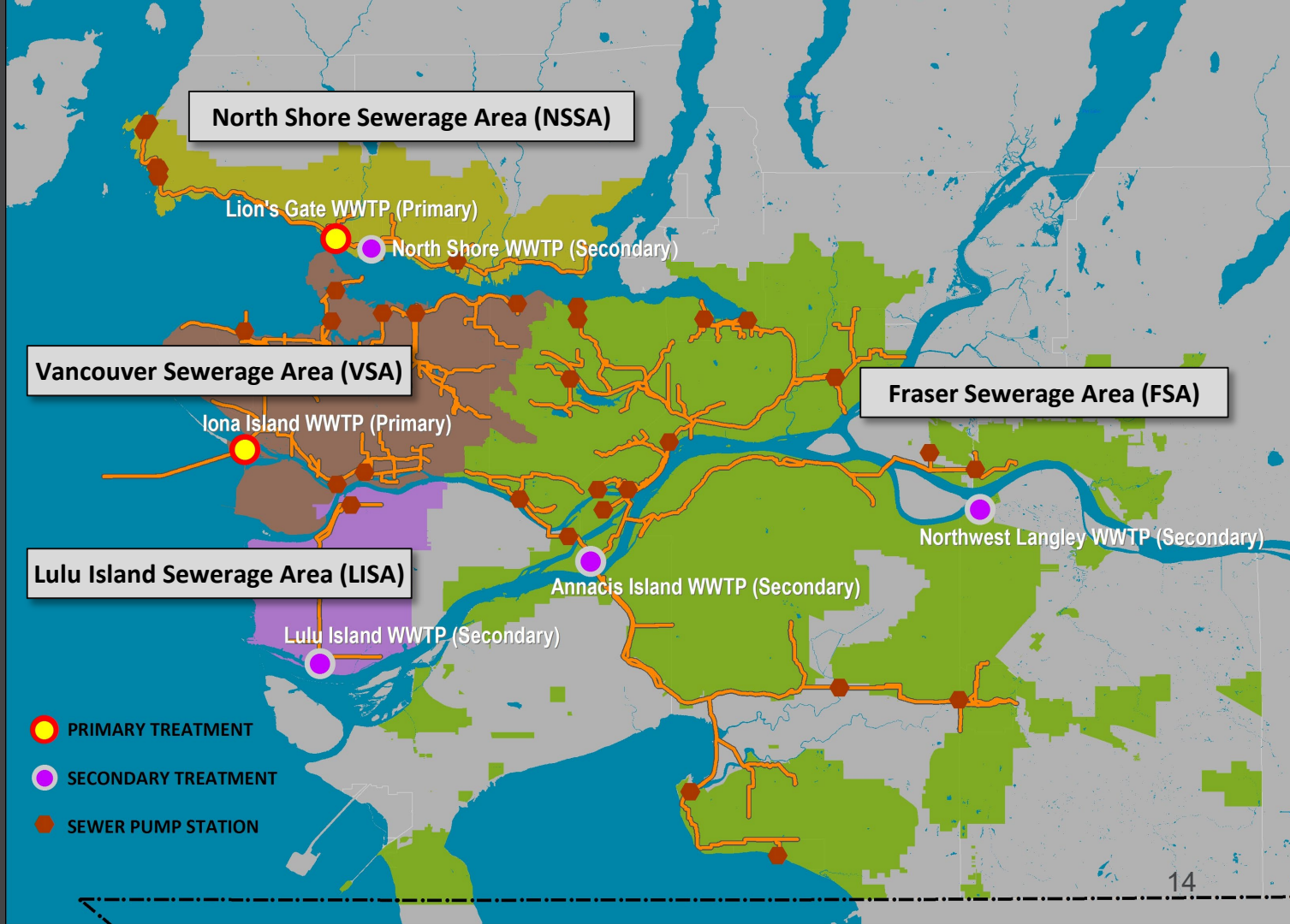


## SECONDARY TREATMENT (1995-PRESENT DAY)

- Secondary treatment upgrades Annacis and Lulu (by order)
- North Shore and Iona – 2020 and 2030 (Tertiary)
- High growth in a highly desirable region

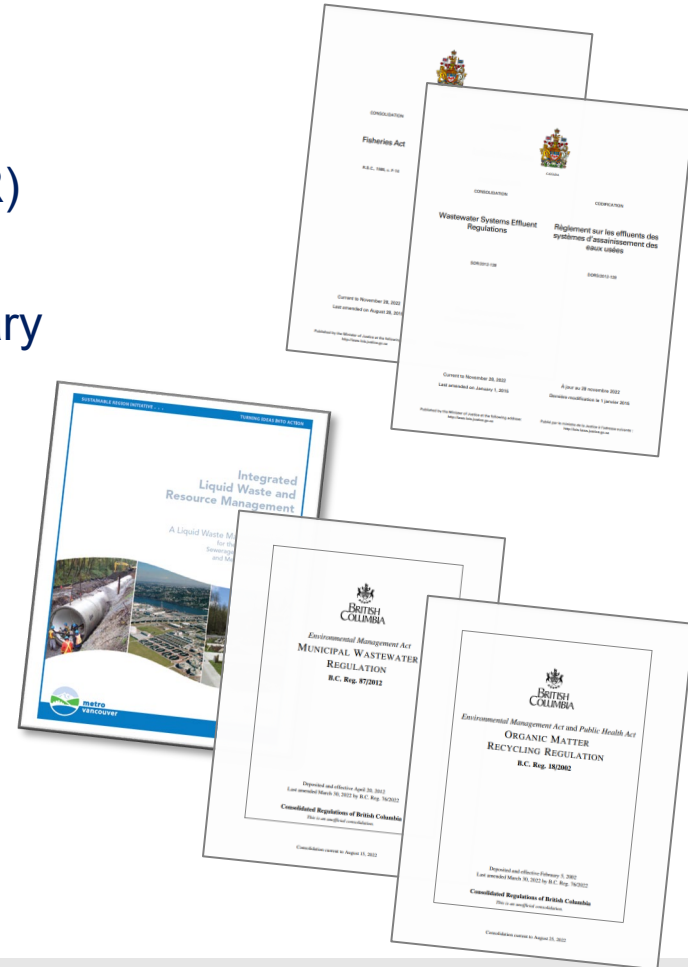


# Metro Vancouver Liquid Waste System



# ENVIRONMENTAL REGULATIONS

- Wastewater Systems Effluent Regulations (WSER)
  - Federal (Fisheries Act)
  - Transitional Authorization – primary to secondary
- Municipal Wastewater Regulation (MWR)
  - Provincial (Environmental Management Act)
  - Liquid Waste Management Plan
- Organic Matter Recycling Regulation (OMRR)
  - Provincial (Environmental Management Act)
  - Biosolids Management



# WSER TRANSITIONAL AUTHORIZATION

From the Ministry of Environment and Climate Change Canada

*“Owners or operators of a wastewater system subject to the WSER and not designed to achieve the national effluent quality standards had until June 30, 2014 to apply for a transitional Authorization.”*

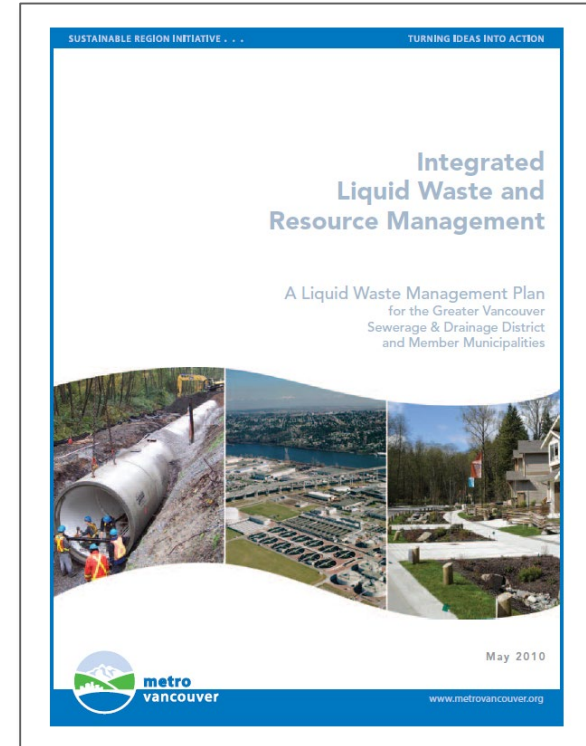
- Legislation was applied to Primary level treatment plants discharging to marine environments – 66 across Canada
- Each plant was assigned a deadline date, Dec 31 2020, 2030 or 2040
- After those dates, plants would be subject to effluent quality requirements typically provided by secondary plants
- Lions Gate was assigned a 2020 deadline and Iona 2030

# INTEGRATED LIQUID WASTE AND RESOURCE MANAGEMENT PLAN

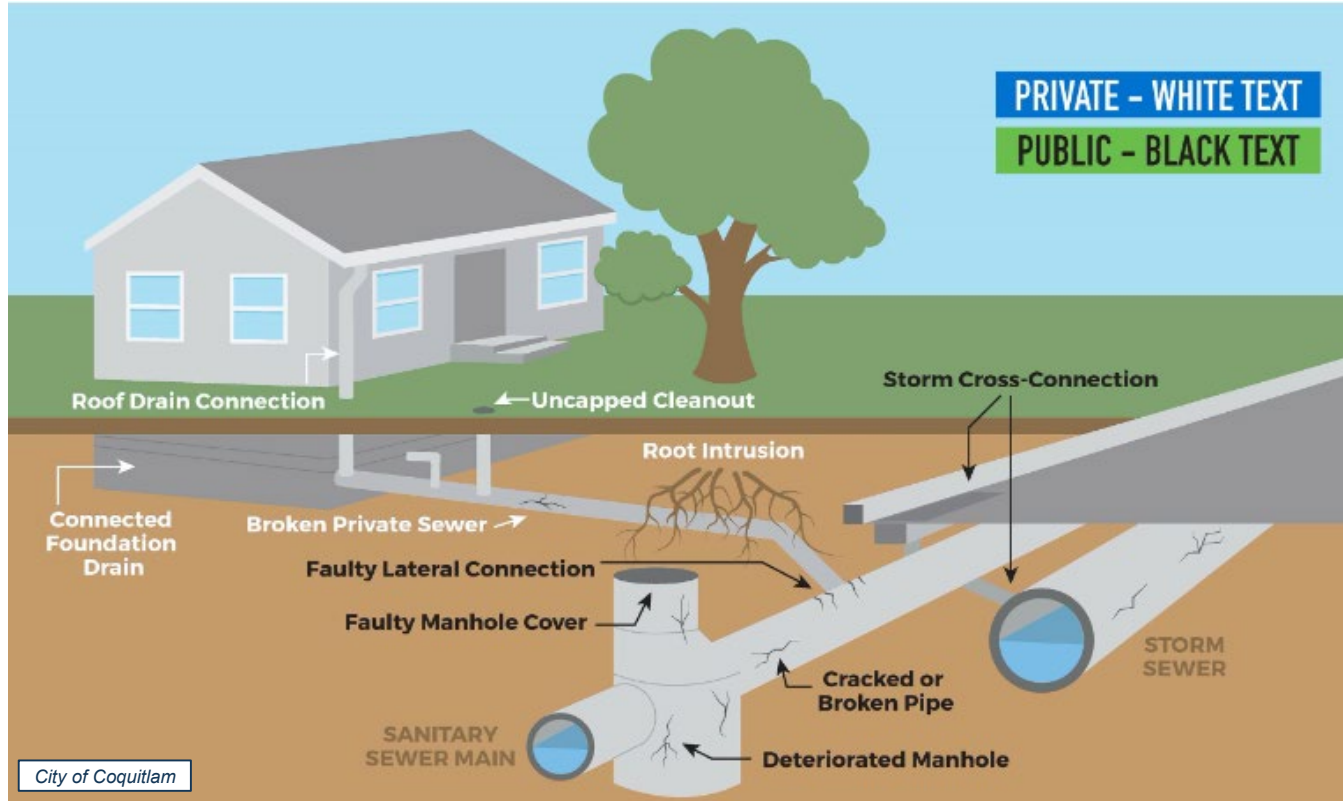
## ILWRMP Goals (2010)

1. Protect public health and the environment
2. Use liquid waste as a resource
3. Effective, affordable and collaborative management

❖ *New plan under development*



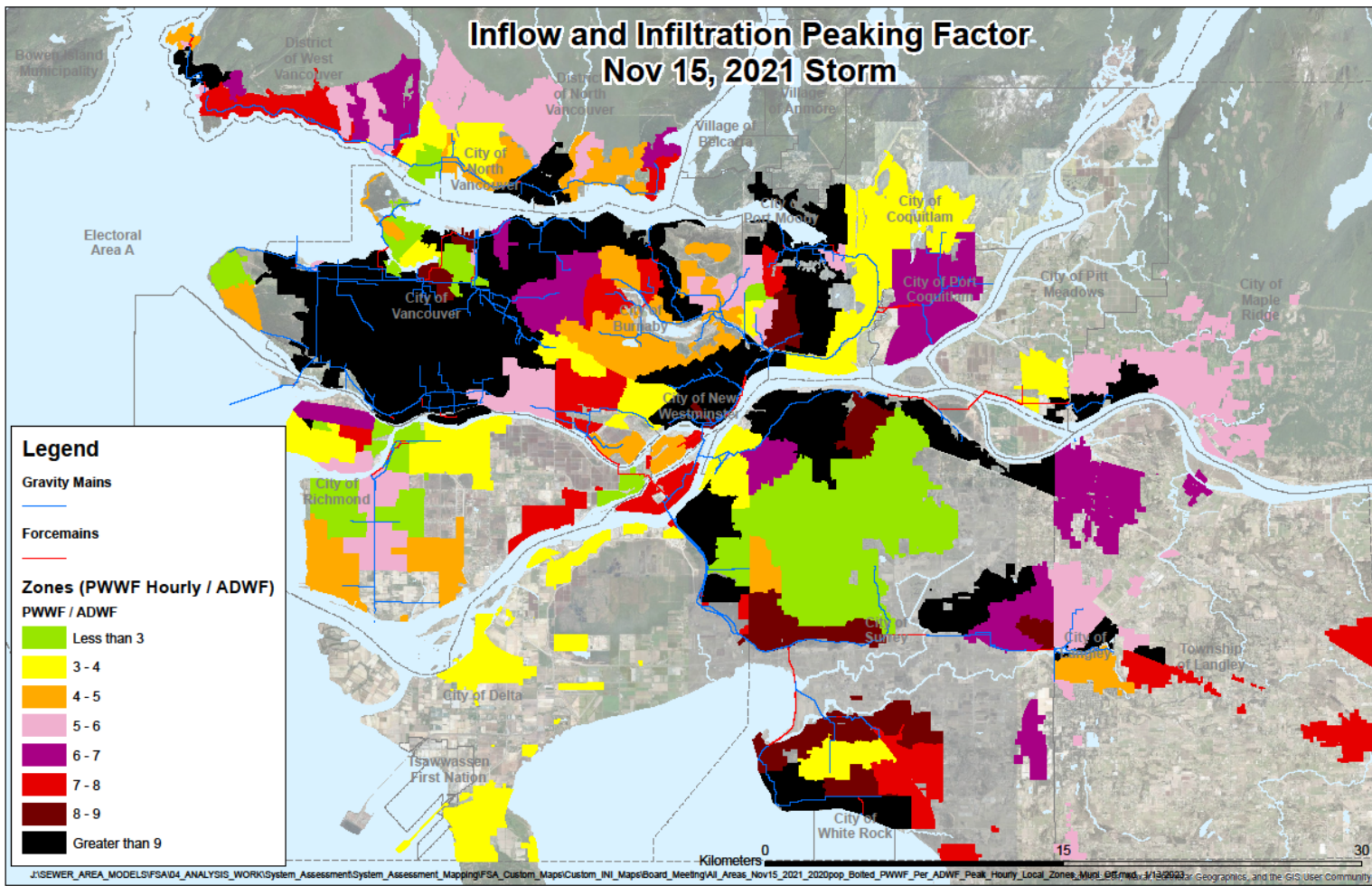
# INFLOW AND INFILTRATION (I&I)



# Inflow & Infiltration

## A Regional Challenge

### Treatment Plants designed for 2 x ADWF



# PROPOSED WET WEATHER RATE STRUCTURE

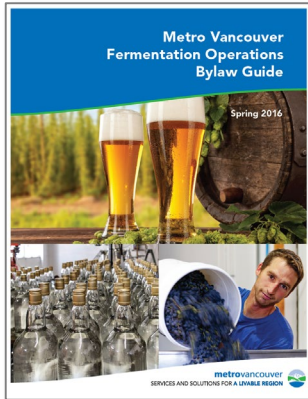
## Strengthening User-pay Principle

- Intended Outcome
  - ▶ Price incentive when system most stressed
  - ▶ User pay principle
- Phase-in period
  - ▶ 10 years
- Board Approval
  - ▶ Wet weather rates approved in 2021
- Starting year for phase-in
  - ▶ Proposed implementation in 2023 subject to Board approval



# SOURCE CONTROL AND PUBLIC EDUCATION

- Regulations and Enforcement for Industrial Discharges (and fees)
- New sewer discharge Bylaws and amendments to existing Bylaws
- Guides and other educational tools for all dischargers
- Public Education Campaigns
  - Unflushables (wipes, prescription medicines, dental floss ...)
  - Fats, Oils and Grease



# FIRST NATIONS ENGAGEMENT

- Long term plans
- Project specific
- Operating activities
- Infrastructure stories



Musqueam First Nation context  
(Iona Island WWTP)



Input to plans and projects,  
operations coordination

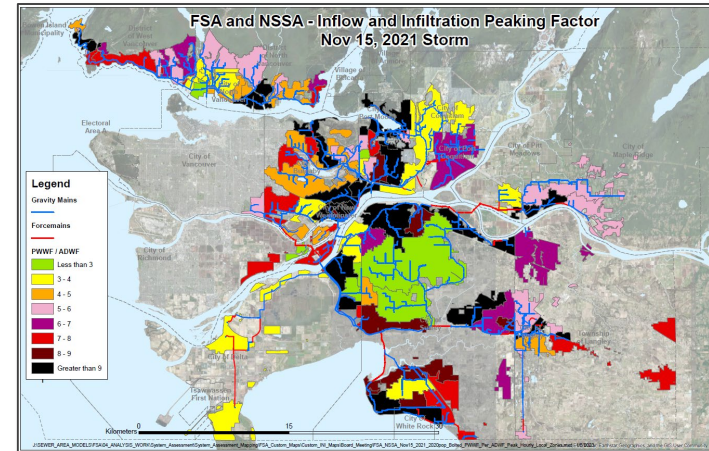


Golden Ears SSO Storage Tank  
Katzie First Nation Artist

# POLICY, PLANNING & ANALYSIS

Director: Paul Kadota

- Liquid Waste Management Plan
- Collaborative Innovations
- Growth Analysis & Hydraulic Modeling
- WWTP Process Modelling
- Source Control Program



# ENGINEERING, DESIGN & CONSTRUCTION

Director: Colin Meldrum

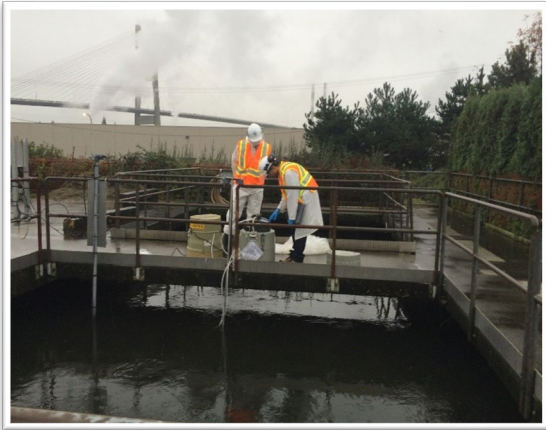
- Underground piping, pump stations wastewater treatment, odour control
- Maintenance, growth, upgrade, resilience projects
- Project management
- Engineering design services (civil, structural, mechanical, electrical)
- Construction Management
- Technical condition / seismic assessments
- Engineering support services



# ENVIRONMENTAL MANAGEMENT & QUALITY CONTROL

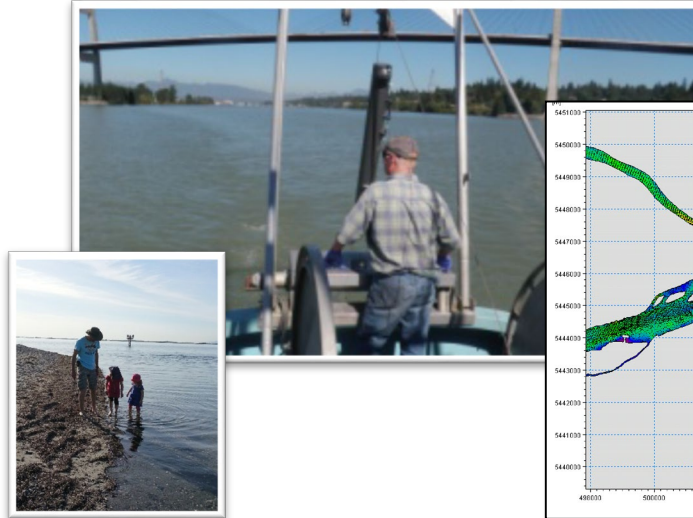
Director: Andjela Knezevic-Stevanovic

## Wastewater System and Process Monitoring



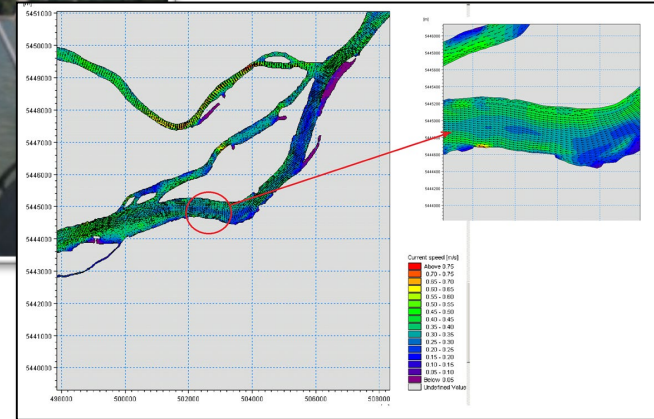
Process and chemistry laboratories  
Liquid waste characterization  
Process optimization  
Regulatory reporting

## Environmental Assessment



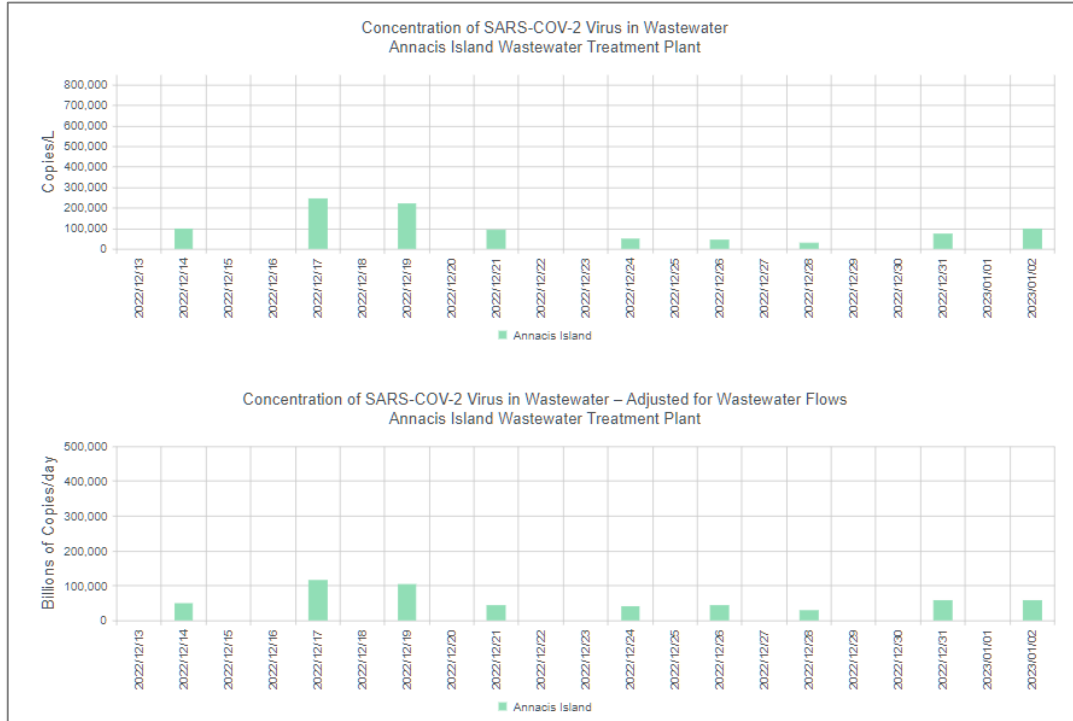
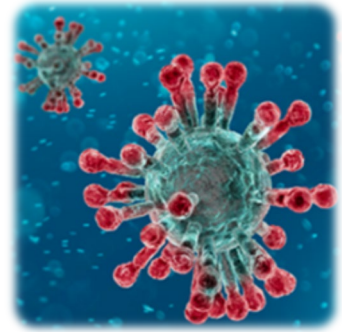
Human health protection  
Environmental effects

## Hydrodynamic and Environmental Modelling



Simulation and forecasting

# COVID 19 VIRUS – MONITORING



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**Testing for the COVID-19 Virus in Wastewater**

Home • Services • Liquid Waste • Environmental Management and Testing • Testing for the COVID-19 Virus in Wastewater

Metro Vancouver is working with the B.C. Centre for Disease Control (BCCDC) and the University of British Columbia to track the presence of SARS-CoV-2 the virus that causes COVID-19, in the region's wastewater. More comprehensive data, including trends analysis, is available through the BC Centre for Disease Control. SARS-CoV-2 shed in the faeces of people with COVID-19 and can be detected in wastewater.

Untreated wastewater is sampled and tested for the virus three times a week.

**What Wastewater Testing Can (and Can't) Tell Us**

Testing wastewater can tell us if the SARS-CoV-2 is present and how it might be changing over time. This information may help health authorities evaluate the effectiveness of measures to control the virus in the community. Wastewater testing cannot tell us the number of people that are infected or contagious. COVID-19 case information is available through the BC Centre for Disease Control.

**When Are Results Posted?**

Wastewater is collected three times a week and results are posted every Friday. Results posted on Friday include samples taken up to Monday of that week.

Last update: January 6, 2023 includes results up to January 2, 2023.  
Next update: January 13, 2023 includes results up to January 9, 2023.

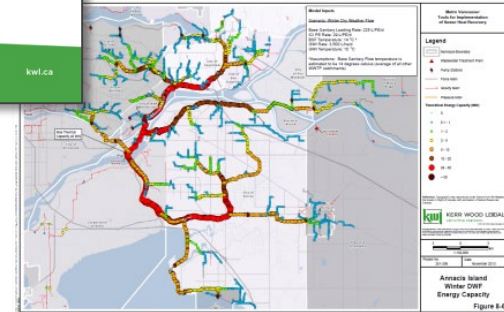
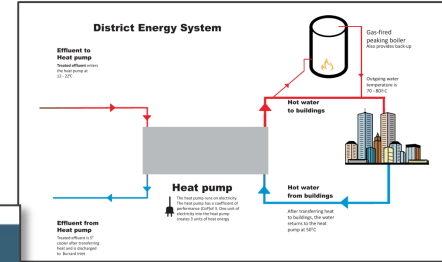
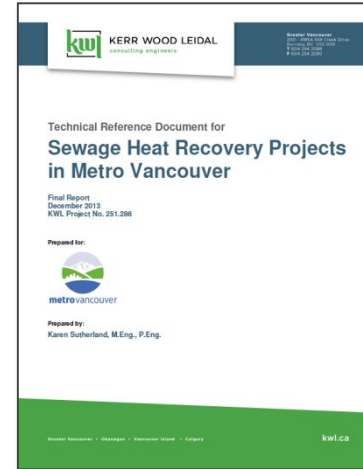
Why are results posted twice a week? Analyzing wastewater samples is complex and takes longer than a typical lab sample. To get accurate results, multiple factors and samples need to be taken into account, rather than simply analyzing one sample. The full process, including collection, transportation, processing, testing and analysis, typically takes several days to complete. Results are posted to our website as soon as we receive them from the BC Centre for Disease Control.

Click on a wastewater treatment plant icon on the map or select a wastewater treatment plant in the dropdown below to see a snapshot of COVID-19 virus trends for that area.



# SEWER HEAT OPPORTUNITIES

Active Projects	Regional GHG Reduction (tonnes/year)
Lonsdale Energy Corporation	6,700
Surrey City Centre (Phase 1)	9,700
Sapperton District	5,700
Senakw	4,600
North Vancouver District	7,600
<b>Total</b>	<b>34,300</b>
<b>Current Heat Potential</b>	<b>250,000</b>



# OPERATIONS & MAINTENANCE

Deputy General Manager: Mani Deo

Director of Wastewater Treatment: Gary Soo

Director of Wastewater Collections: Lorn Carter

- Collection System, Pump Stations and Proximal works
- WWTP O&M
- Biosolids and Residuals program



# COMMENTS & QUESTIONS

- History of GVS&DD
- Regulations and the LWMP
- Overview of Divisions

# LWS OPERATIONS AND MAINTENANCE



# OPERATIONS & MAINTENANCE

## Wastewater Collections

- Linear Assets: 531 kms of Sewer
- Facility Assets: 34 Pump Stations, 2 Storage Tanks

## Wastewater Treatment

- Facility Assets: 5 Treatment Plants
- Trucked Liquid Waste
- Utility Residuals

## Drainage

- Linear Assets: 45 kms of Drainage Network
- Facility Assets: 1 Dam



Sapperton Pump Station



Trickling Filter Pump

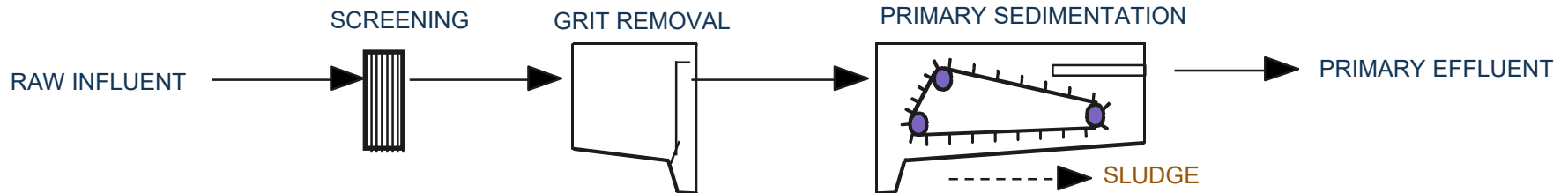


Cariboo Dam

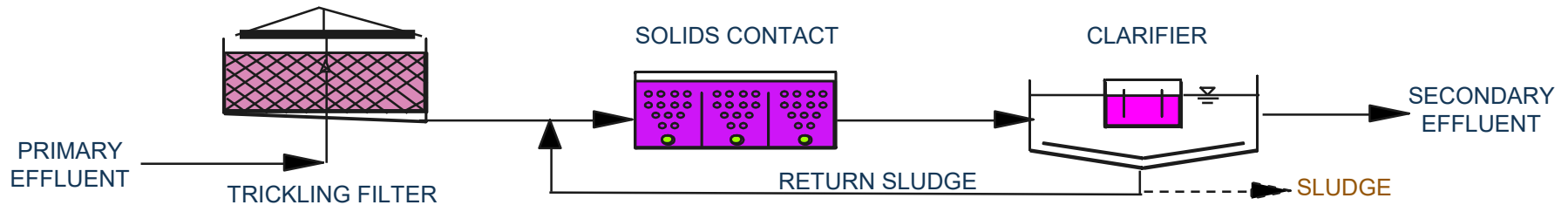
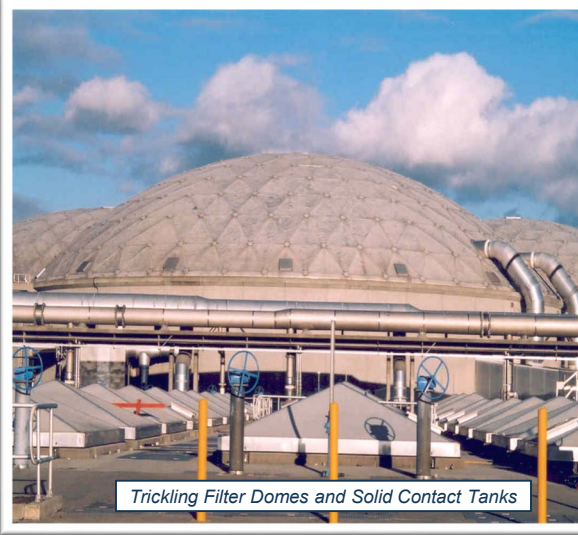
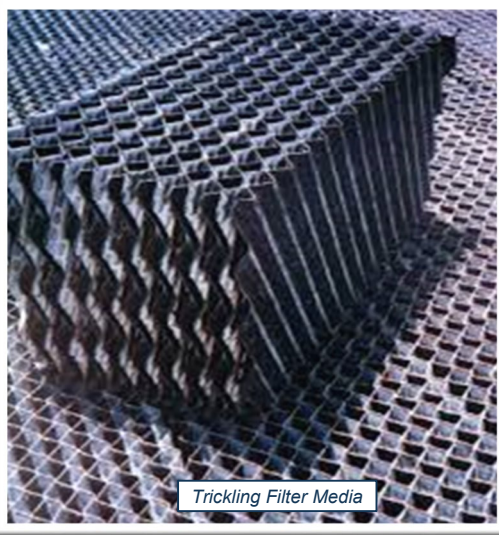
# WASTEWATER COLLECTIONS



# PRIMARY TREATMENT



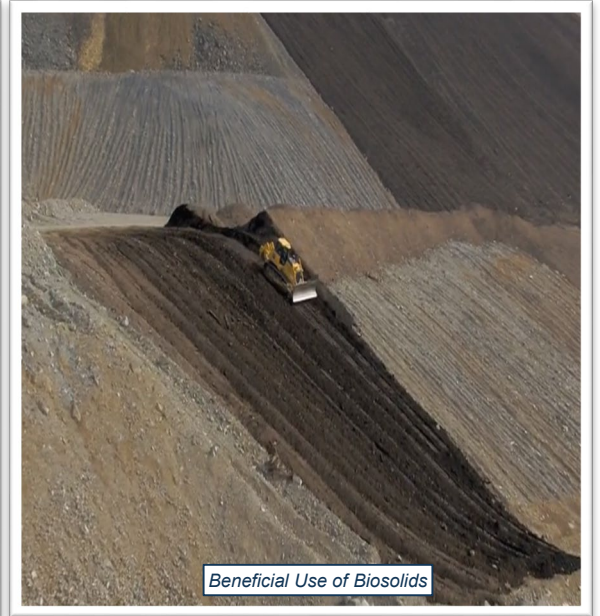
# SECONDARY TREATMENT



# SECONDARY TREATMENT



# BIOSOLIDS



# BIOSOLIDS





# Iona Island WWTP – Primary



# Lions Gate WWTP – Primary



# Annacis Island WWTP – Secondary

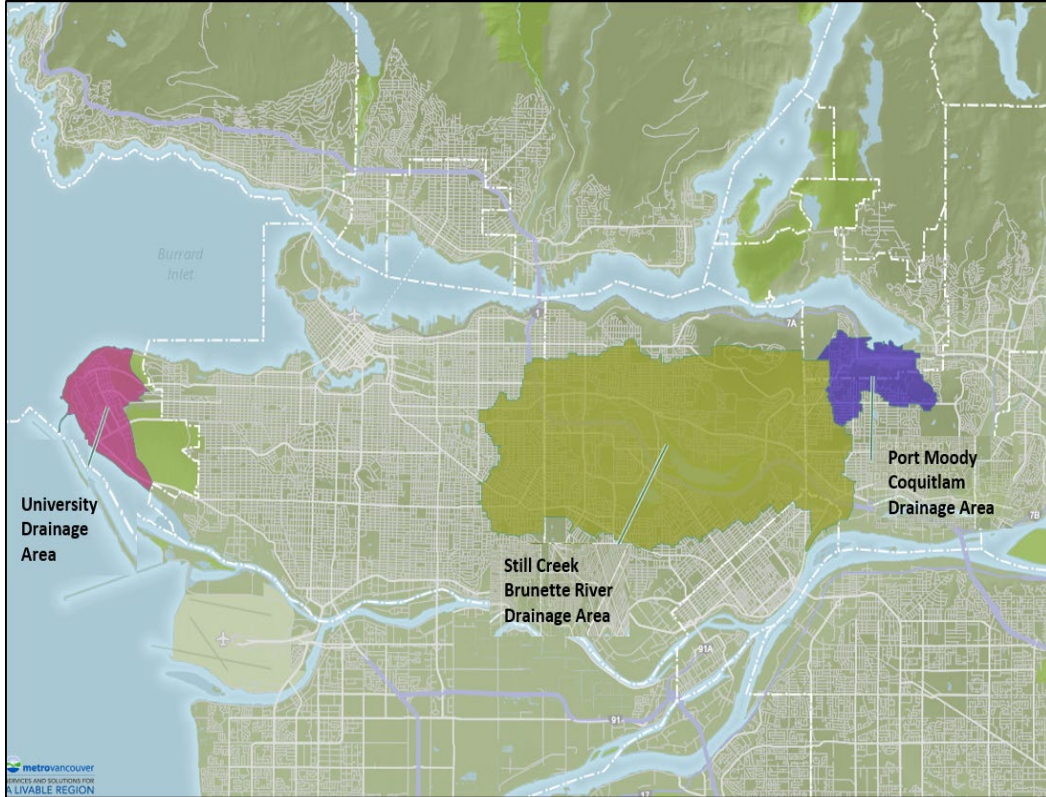


# Northwest Langley WWTP – Secondary



# Lulu Island WWTP – Secondary

# GVS&DD - DRAINAGE AREAS



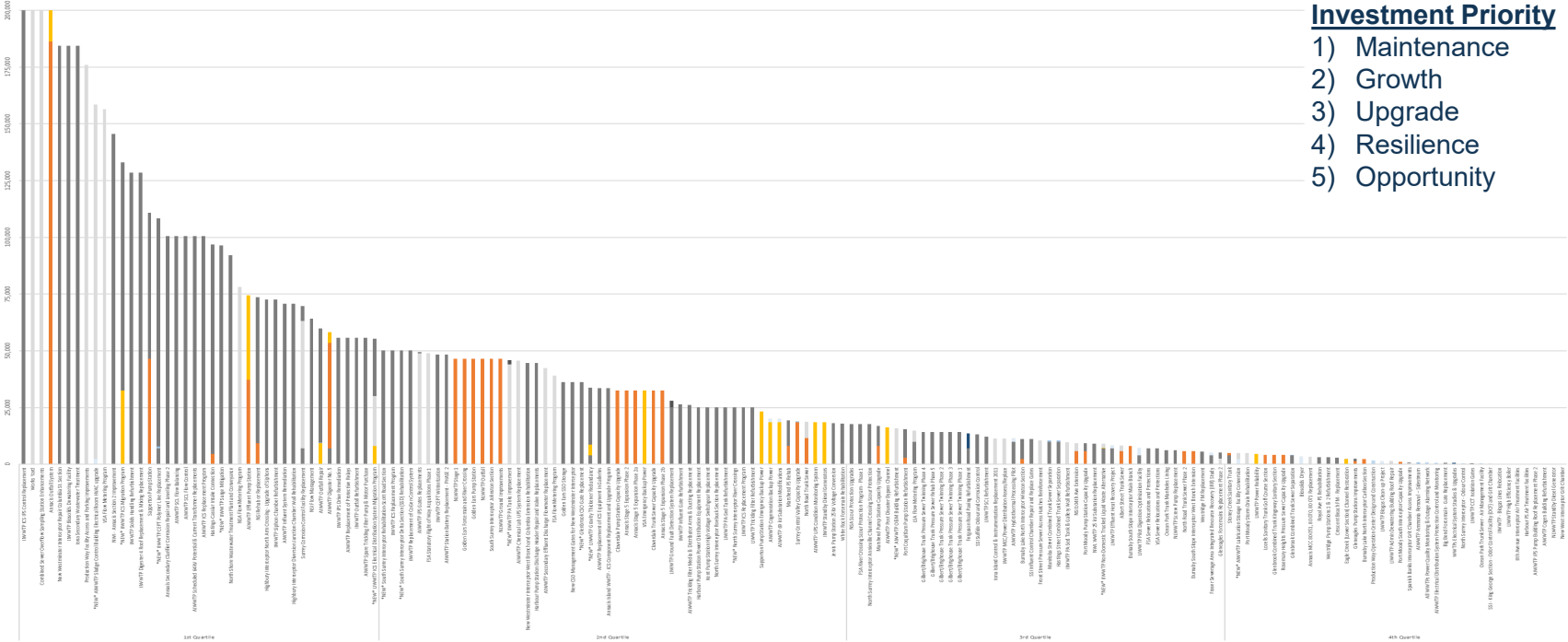
# SERVICE OBJECTIVES



Service Objective	KPI Metric	Current (2021)	Target (2030)	Goal
<b>Eliminate Overflows from the Sewer System</b>	Sanitary Sewage Overflow (SSO) events (#)	82	50	0 (2040)
	Combined Sewage Overflow (CSO) volume (ML)	38,525	30,000	0 (2075)
	Rainfall derived inflow and infiltration (RDII) (ML)	45,010	30,000	10,000 (2040)
	Facilities not meeting basic service or regulations in next 10 years (%)	34%	15%	0% (2035)
<b>Protect Public Health and the Environment – Authorized WWTP Discharges</b>	Duration of events not in compliance with operational certificates (hrs)	51.7	0	0 (2030)
	Duration of events not in compliance with WSER (hrs)	8,760	0	0 (2040)
	Recreational water quality (% of tests not meeting criteria)	1.3%	0	0 (2040)
<b>Improve Environmental Stewardship</b>	Biosolids beneficially used (%)	100%	100%	100% (2030)
	Net GHG emissions (kg of CO2 / ML treated)	18.7	14.0	0 (2050)
	Odour complaints (#)	13	10	0 (2035)
<b>Minimize Timeline to Recover from a Major Event</b>	Targeted assets resilient to seismic event (%)	Undefined	Defined	100% (2050)
	Targeted assets resilient to power outage event (%)	97%	100%	100% (2035)
	Targeted assets resilient to climate change event (%)	Undefined	Defined	100% (2100)

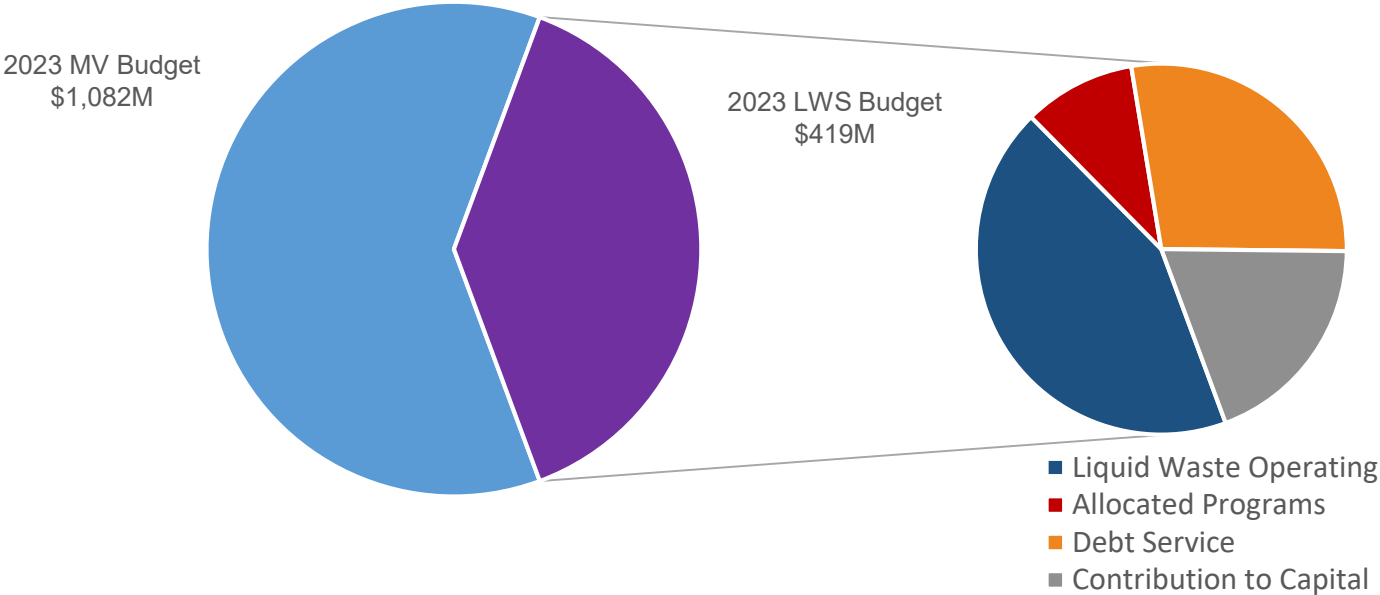
# LIQUID WASTE SERVICES CAPITAL PROJECTS

## Project Ranking

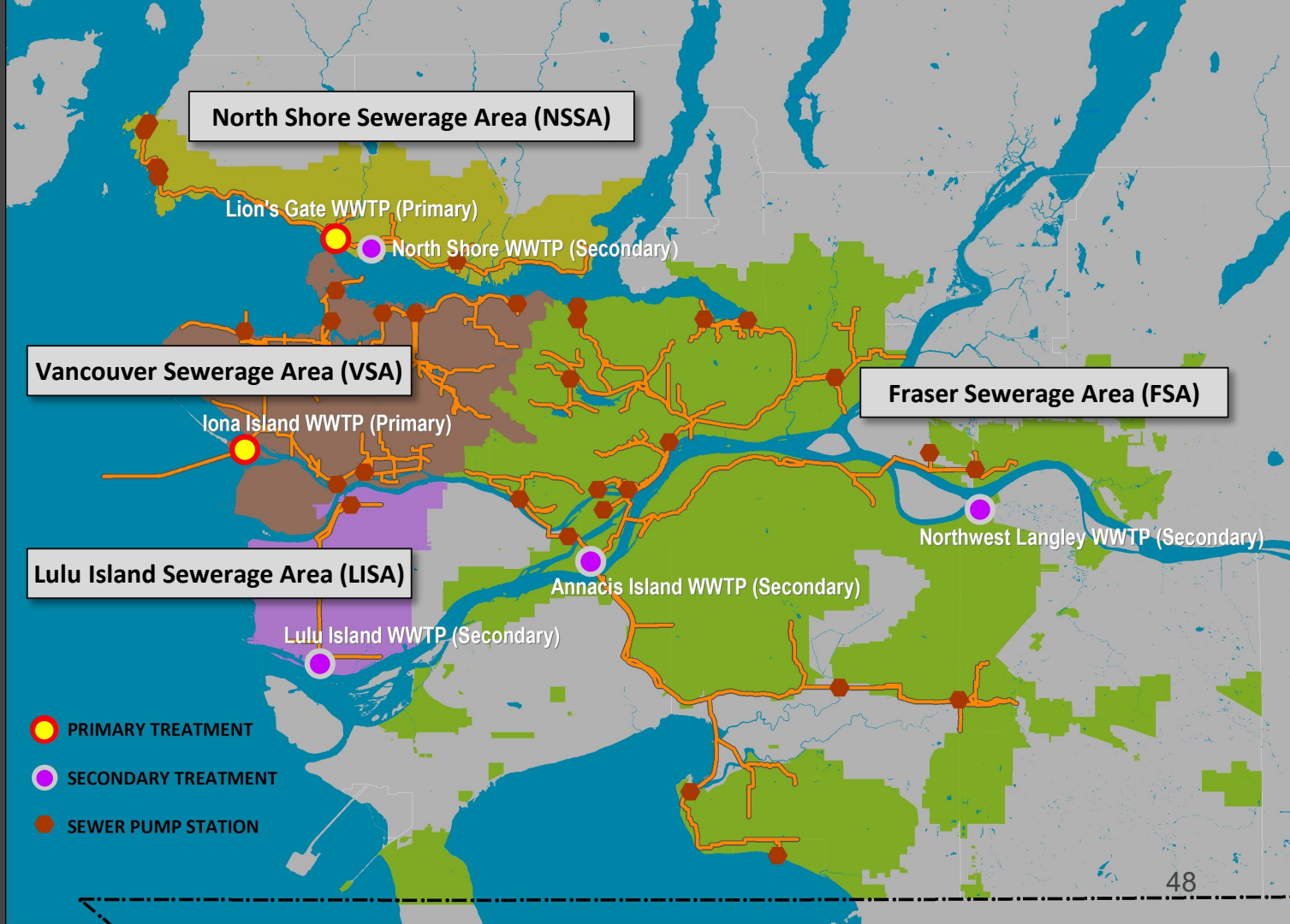


# BUDGET OVERVIEW

## 2023 Operating Budget Breakdown – Liquid Waste Services



# Metro Vancouver Liquid Waste System



# COST APPORTIONMENT

Expenditure Category	Description of Expenditure	Sewerage Area Share (Costs Allocated to Sewerage Area)	Regional Share (Costs Allocated to All Sewerage Areas)
Operating	Operating & Maintenance Costs	100%	0%
Capital (Tier I)	Capital: Conveyance System	100%	0%
Capital (Tier II)	Capital: Wastewater Treatment Primary and Secondary	30%	70%
Capital (Tier III)	Capital: Wastewater Treatment Tertiary, Resource Recovery	0%	100%

# BENCHMARK OF UTILITY COSTS

Liquid Waste (\$ CAD)

<b>Liquid Waste</b> (Average household rate)	
Metro Vancouver (2023)	\$295
MV municipal regional average (MV 2023 + 2023 estimated municipal household rate)	\$295 + \$395 = \$690
Capital Regional District + City of Victoria (2022)	\$580
Waterloo (2022)	\$615
Seattle (2022)	\$1,210
San Francisco (2022)	\$1,410

# COMMENTS & QUESTIONS

- O&M
- Treatment Principles
- Service Levels
- Financial

# INNOVATION / CONTINUOUS IMPROVEMENT – Imbedded in our work Culture

- Biogas – produces \$5.5M of electricity and generate nearly \$1M in revenue at Lulu
- Water Reclamation – offsets \$8.8M of potable water/year
- Nutrient Recycling – Biosolids recovers 40% of nutrients, 100% of biosolids were beneficially used in 2022
- Sewer Heat / Effluent Heat
- Hydrothermal Process – Pilot Facility
- Staff led - Efficiency Incubator and Inventor teams

# INNOVATION / CONTINUOUS IMPROVEMENT



Anaerobic Optimizer

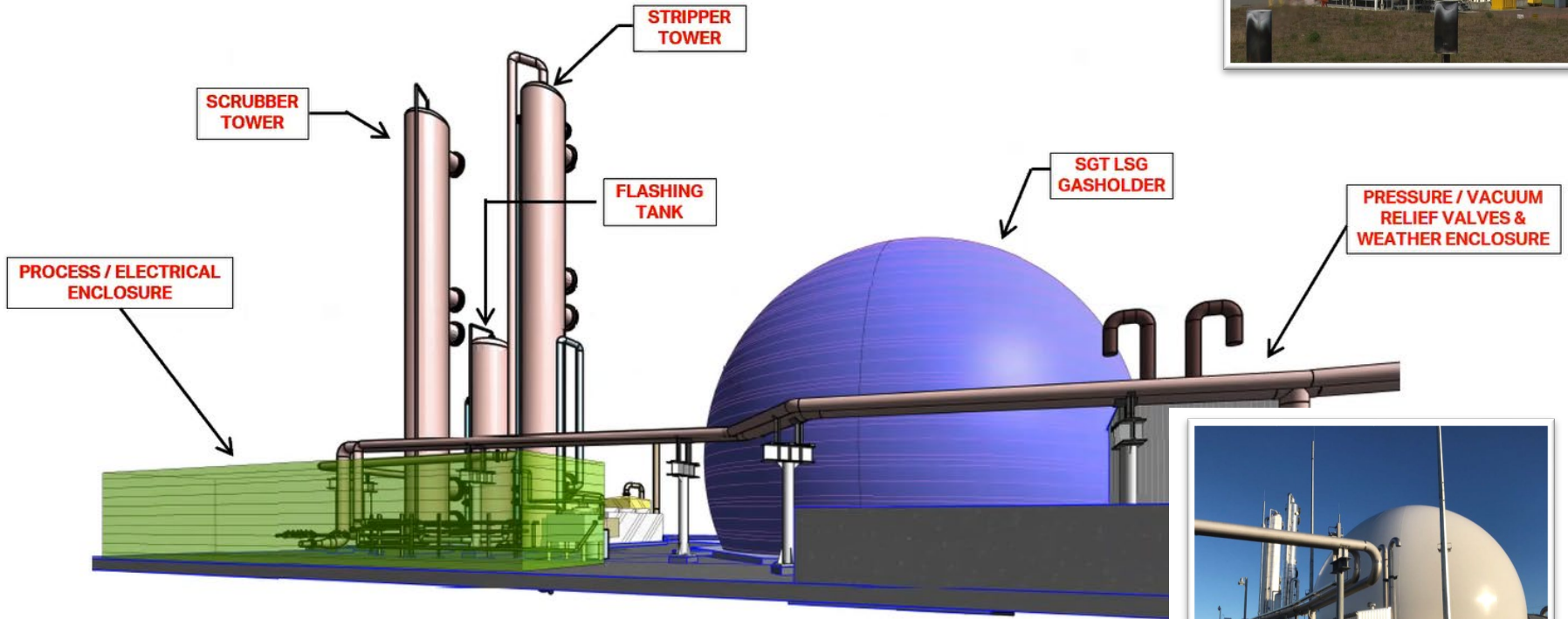


Aerobic Granular Sludge Pilot



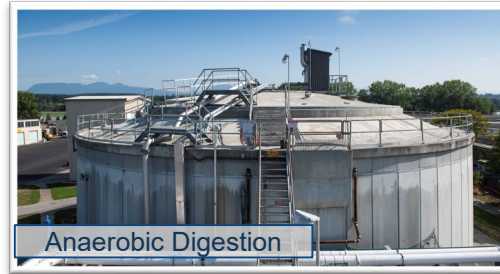
Multiphase Protective Coatings

# DIGESTER GAS TREATMENT SYSTEM



# HYDROTHERMAL PROCESSING (HTP)

Biomass to biofuel



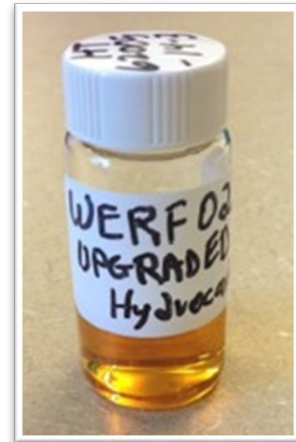
Wastewater sludge

HTP  
→



Biocrude

Refining  
→



Low-carbon fuel

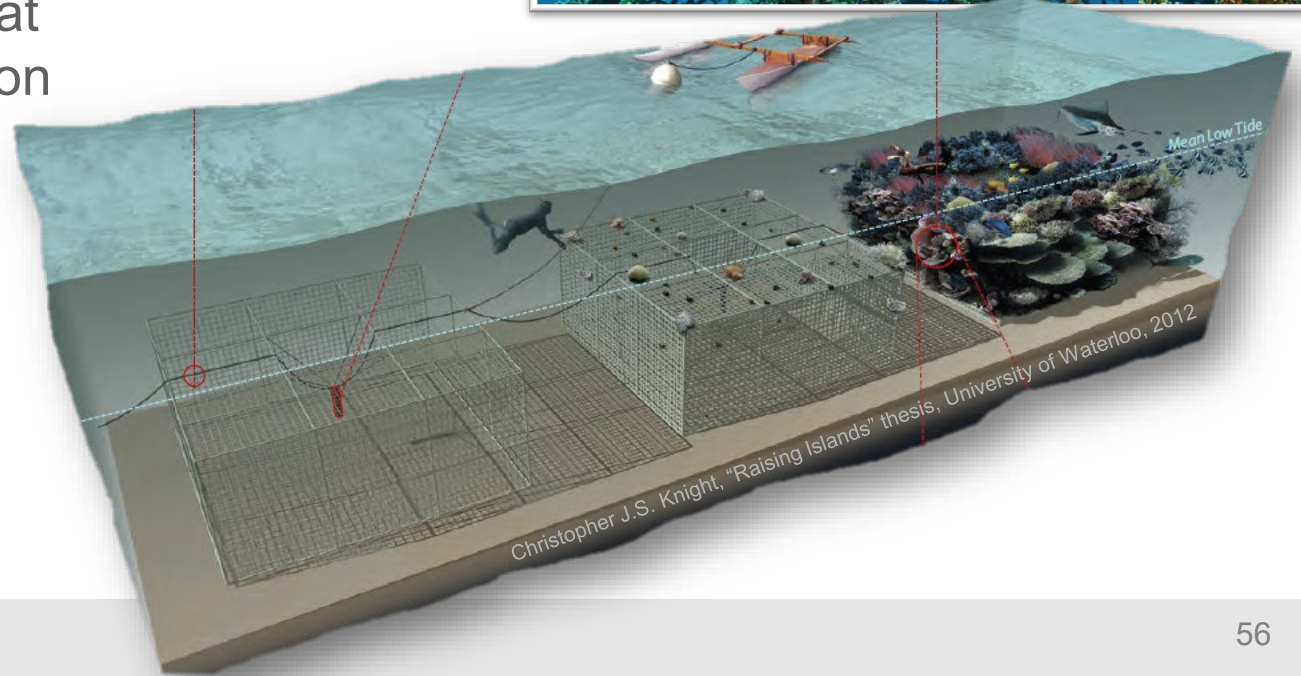
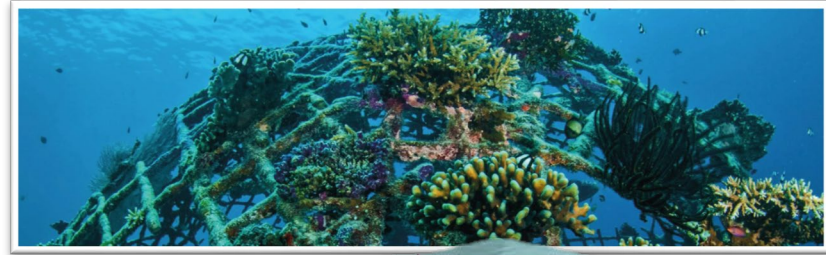
# BIOROCK DEMONSTRATION AT IONA ISLAND

## Benefits

- Carbon sequestration
- Ecosystems habitat
- Shoreline protection

## Feasibility

- Design
- Consultation
- Permits
- Cost estimate



# CONTINUOUS IMPROVEMENT - 2022

## Liquid Waste Services

Initiative	Outcomes
Wet Weather Rate Structure	Incentivize action to address rainwater Inflow & Infiltration into public and private infrastructure
Transition to Renewable Natural Gas	835 t / year reduction in Greenhouse Gas emissions
Safety Management	Implemented data-driven safety improvement strategies that resulted in a 67% reduction in loss time accidents and 29% reduction in injuries.
Lions Gate WWTP Effluent Quality	Operating changes to reduce effluent loading as much as possible and public campaign to reduce influent loading
Collection System Models	Improved estimates for timing of growth needs and optimization of operating strategies

# CONTINUOUS IMPROVEMENT - 2023

## Liquid Waste Services

Initiative	Outcomes
Sapperton District Sewer Heat Recovery	Sewer heat recovery for New Westminster district energy system. 5,700 tonnes/y GHG reduction (total project)
Lions Gate WWTP Disk Filter Pilot	Further potential for reduction of effluent loading
Lulu Digester Optimization Pilot	Test innovations for full-scale implementation. Potential 1,200 tCO <sub>2</sub> e/yr GHG reduction and \$500,000/yr RNG sales
O&M Business Optimization	Establishment of a structured program to improve operational performance and increase efficiency
Efficiency Incubator	Grass roots – staff led efficiency think tank

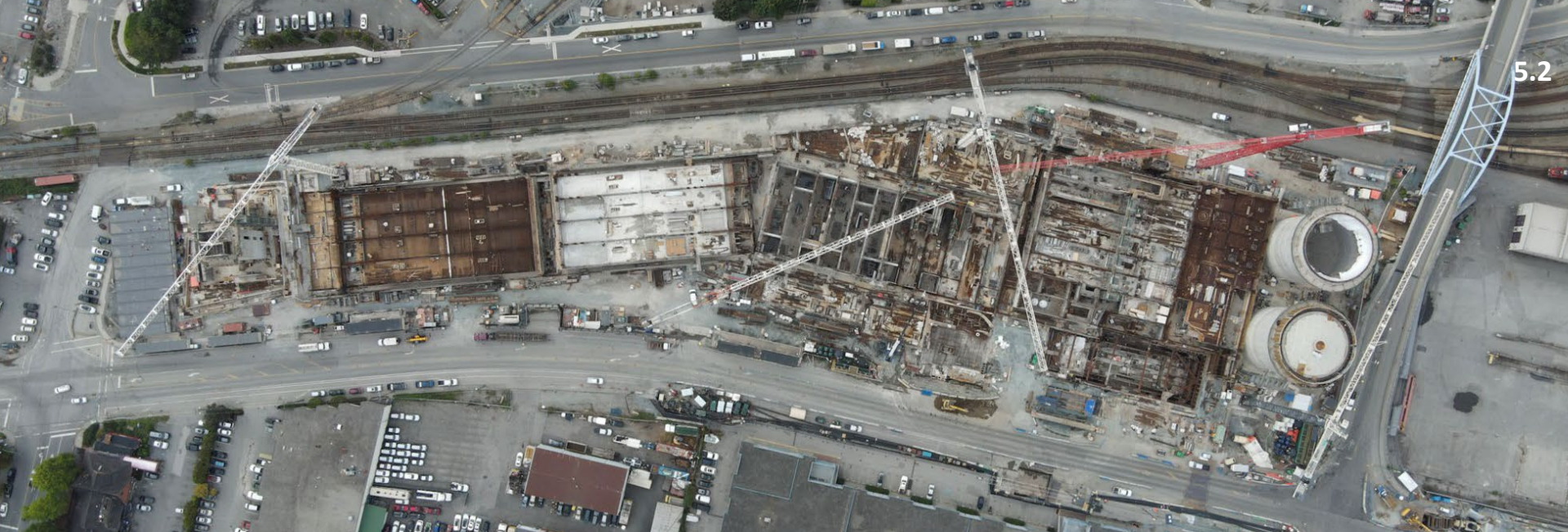
# THREE KEY MESSAGES

1. Primary plants are no longer permitted. Transitional authorizations under WSER have and will expire
2. Policy tools like wet weather pricing will be a financial lever to drive better I&I management at the municipal level
3. Opportunity investments into district energy systems, beneficially using our biosolids, and selling RNG to Fortis are recent examples of our commitment to GHG reductions



Thank you.





Aerial view – North Shore Wastewater Treatment Plant site

# Project Delivery – Liquid Waste Committee Overview

Cheryl Nelms, P.Eng., Ph.D.

General Manager, Project Delivery

Liquid Waste Committee Meeting - January 18, 2023

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**metrovancouver**

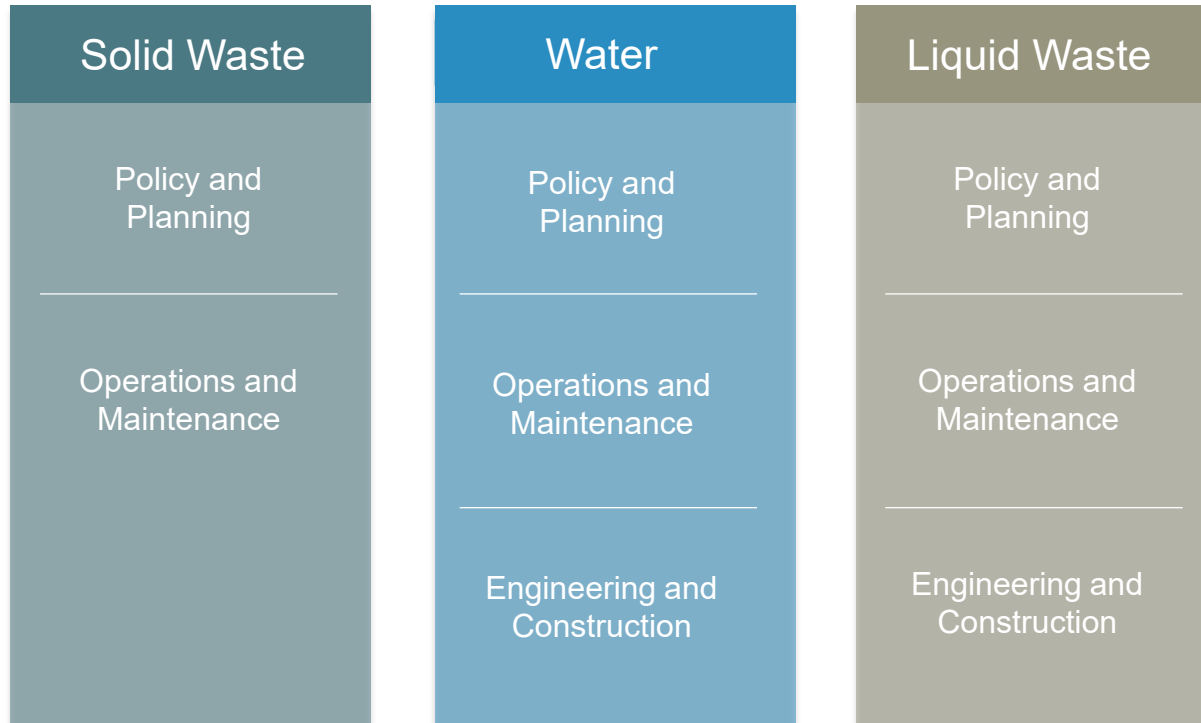
# PROJECT DELIVERY

## Liquid Waste Committee Orientation

- Creation of Project Delivery Department – 2020
- Overview
- Project Management Office
- Major Projects – Liquid Waste
  - North Shore Wastewater Treatment Plant Program
  - Iona Island Wastewater Treatment Plant Projects
  - Northwest Langley Wastewater Treatment Plant Projects
  - Annacis Island Wastewater Treatment Plant Stage 5 & Outfall

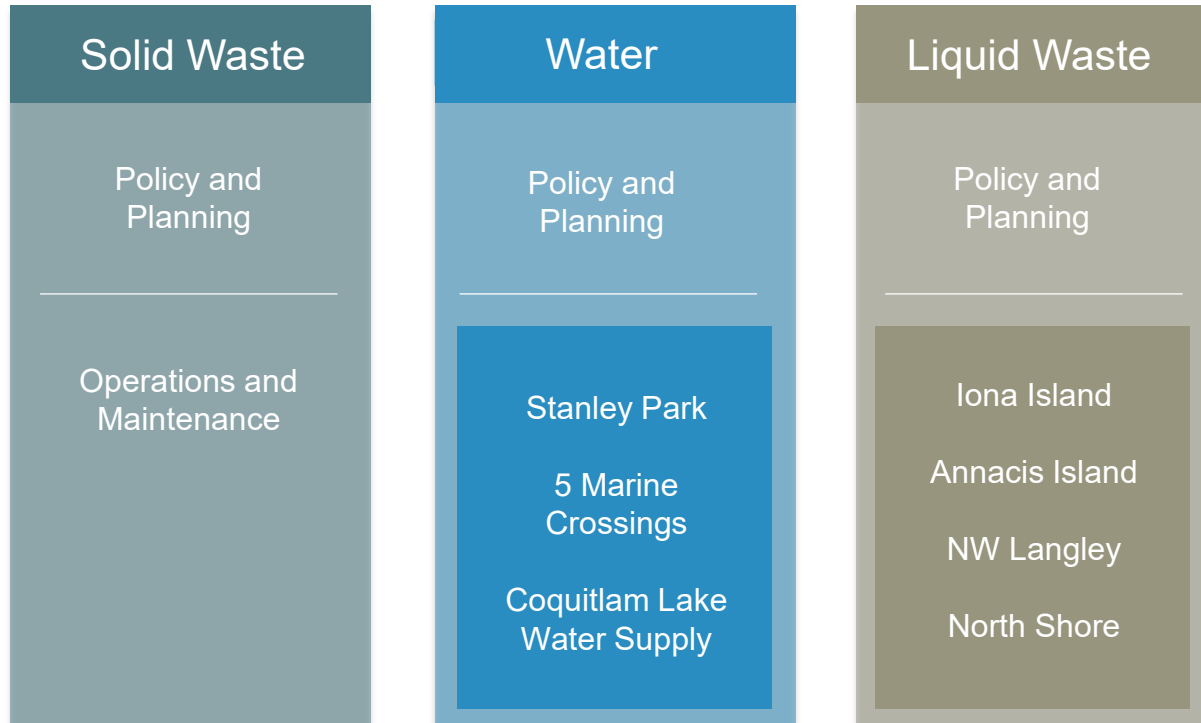
# BEST PRACTICES RESPONSE 1: RE-ORGANIZATION

2012-2019 Organizational Structure



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2012-2019 Organizational Structure



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2012-2019 Organizational Structure



# PROJECT DELIVERY DEPARTMENT

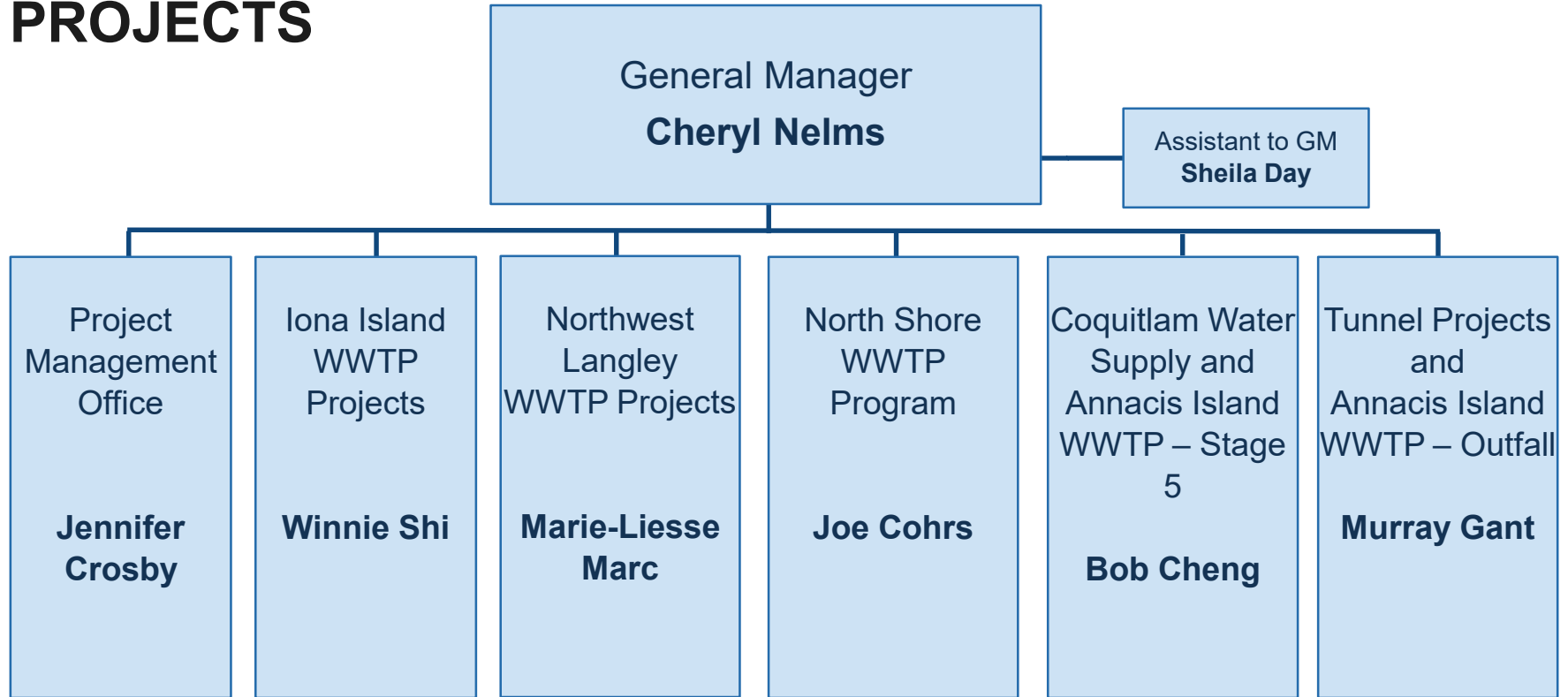
## Overview

Providing services and oversight to deliver highest value, risk, consequence projects and enable continual improvement in project, quality, and asset management across Metro Vancouver

- Major projects in planning, design, construction
- Water treatment, wastewater treatment, resource recovery, tunnels
- Corporate support on asset management, quality, project & technical standards



# PROJECT DELIVERY – PMO & LIQUID WASTE PROJECTS



# PROJECT MANAGEMENT OFFICE

## Integrated Asset Management

- Asset Management Strategies & Services
- Asset Management Systems & Processes

## Quality Management

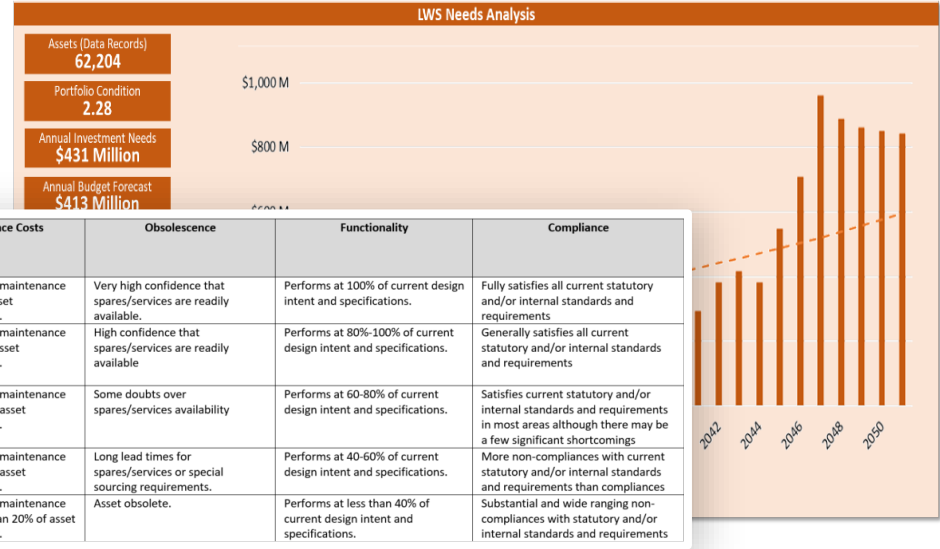
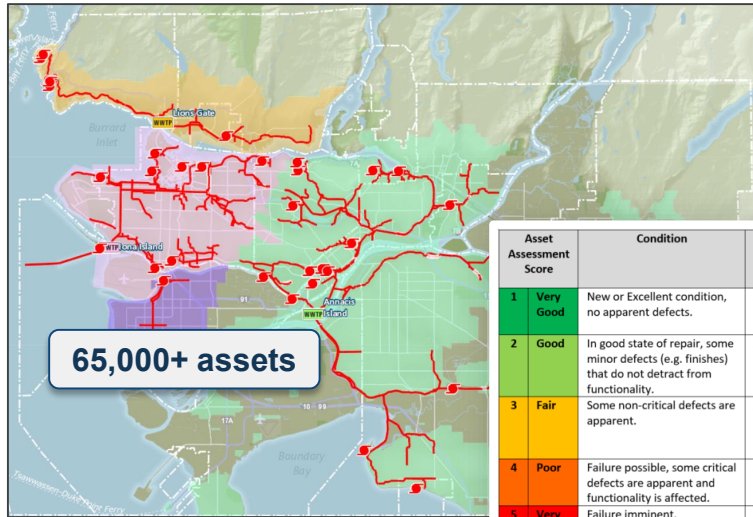
- PGA Compliance Project
- Quality Management System Dev't & Oversight
- Technical Engineering Standards
- Utility Benchmarking & Performance Reporting Services

## Project & Portfolio Management

- Project Management Framework
- Stage Gate Framework
- PM expertise, training and services
- P&PM Systems & Tools

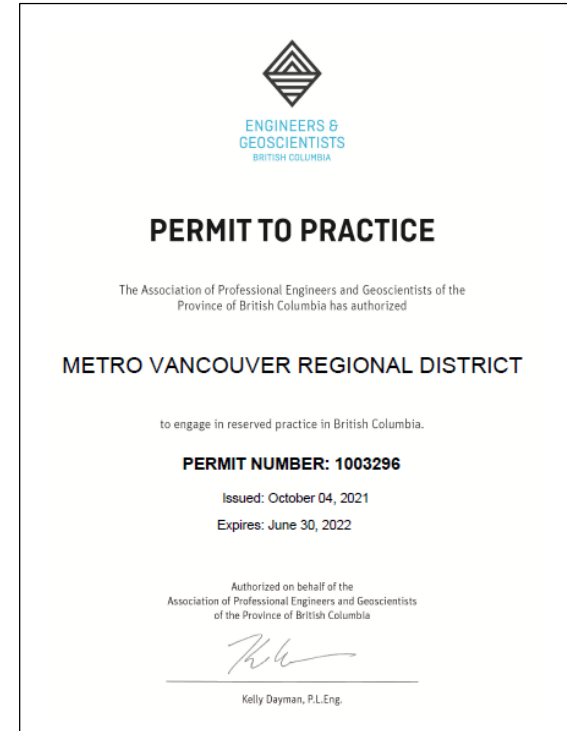
# INTEGRATED ASSET MANAGEMENT

Optimizing lifecycle value of corporate assets and a consistent corporate approach to data management and decision making



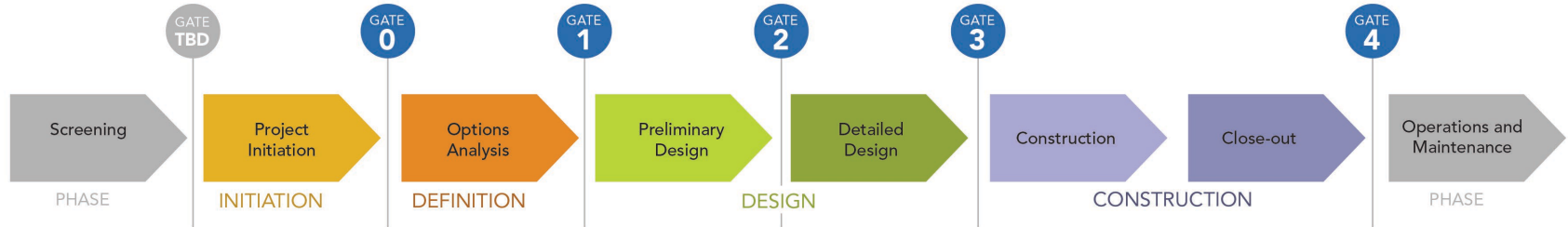
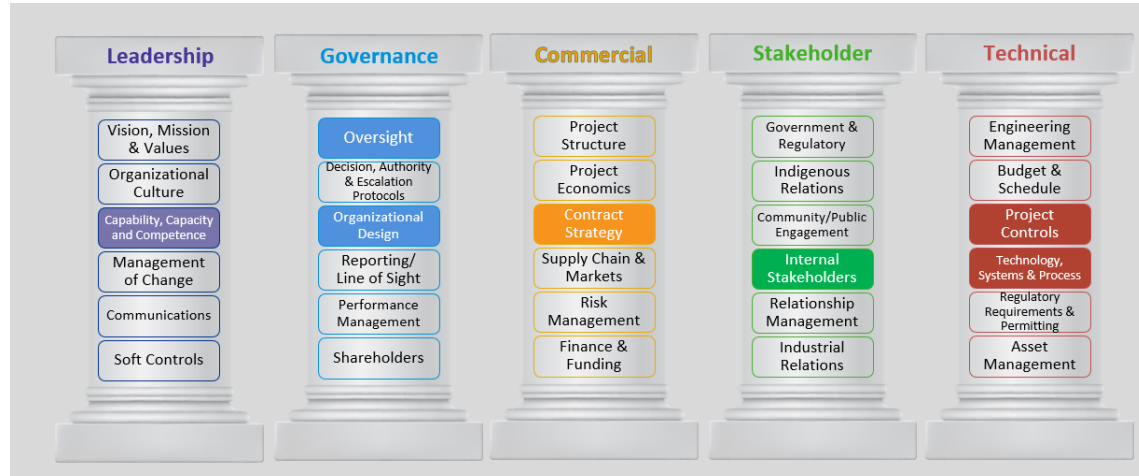
# QUALITY MANAGEMENT

Ensuring compliance, quality and continuous improvement of professional activities by Metro Vancouver staff, to meet the *BC Professional Governance Act*



# PROJECT & PORTFOLIO MANAGEMENT

Providing a consistent approach in the planning and delivery of projects for risk, cost and schedule management



# NORTH SHORE WWTP PROGRAM

## Regulatory

- Treatment plant, conveyance, and preliminary design for decommissioning
- Construction started 2018
- Pump station & conveyance complete
- New treatment plant contractor
- Early works in progress



# NORTH SHORE WWTP PROGRAM

## 2023 Priorities

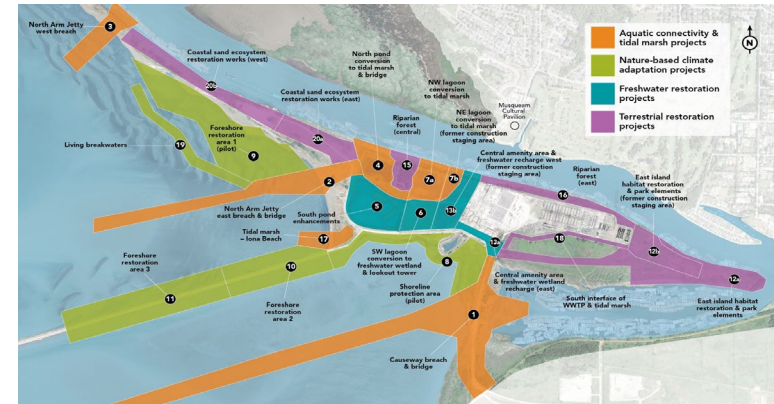
- Complete detailed design
- Rectify major design and construction deficiencies
- Full construction restart
- New baseline cost estimate and schedule



# IONA ISLAND WWTP PROJECTS

## Regulatory

- Project definition completed 2022 – conceptual design includes:
  - WWTP upgrade to tertiary treatment
  - Resource recovery opportunities
  - Ecological restoration projects
- 5 years late for regulatory compliance (2030)



# IONA ISLAND WWTP PROJECTS

## 2023 Priorities

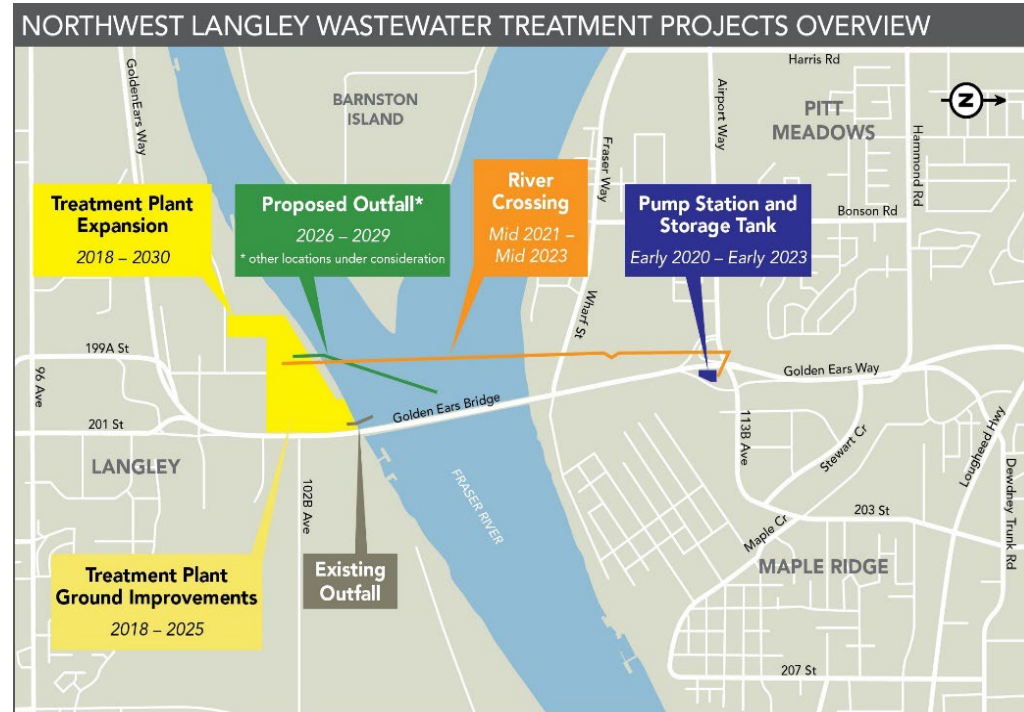
- Early construction to prepare site
- Advance preliminary design
- Contract awards for 2023
  - Outfall rehabilitation
  - WWTP design
  - Ecological restoration projects design
- Market engagement – procurement strategy for design and construction
- Funding strategy
- Stakeholder communications, including Vancouver Sewerage Area
- Musqueam partnership opportunities



# NORTHWEST LANGLEY WWTP PROJECTS

## Expansion

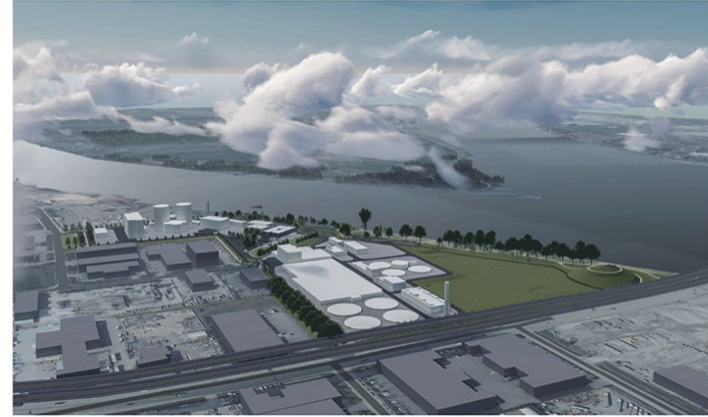
- 3 projects in construction:
  - Pump Station & Sanitary Sewer Overflow (SSO) Tank
  - Forcemain River Crossing
  - Ground Improvements (Archaeology)
- Treatment plant
  - Design underway
- Outfall
  - Conceptual Design



# NORTHWEST LANGLEY WWTP PROJECTS

## 2023 Priorities

- Complete construction of pump station/SSO tank and Fraser River crossing
- Advance design of WWTP and outfall
- Stage Gate approval
- Contract awards/amendments for 2023
  - Archaeology and Ground Improvements work
  - WWTP design
- Ongoing engagement with Katzie First Nation



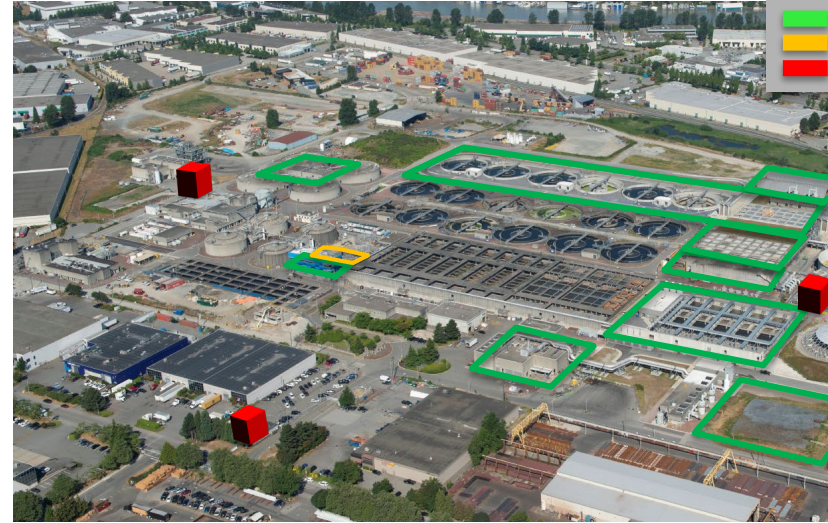
Design concept looking northwest toward the Township of Langley



# ANNACIS ISLAND WWTP STAGE 5 EXPANSION

## Expansion

- WWTP capacity upgrade (additional 250,000 residents)
- Keep odour to a minimum
- Improve seismic performance
- Over 20 separate projects divided into three phases
- Construction started in 2011
- Completion anticipated in the early 2030s



Annacis Island Wastewater Treatment Plant

# ANNACIS ISLAND WWTP STAGE 5 EXPANSION

2023 priorities

- Continue construction of gravity thickeners
- Commence detailed design of new trickling filters, pump station, centrifuges and workshop
- Project Definition for Biosolids dryer and digester No. 5

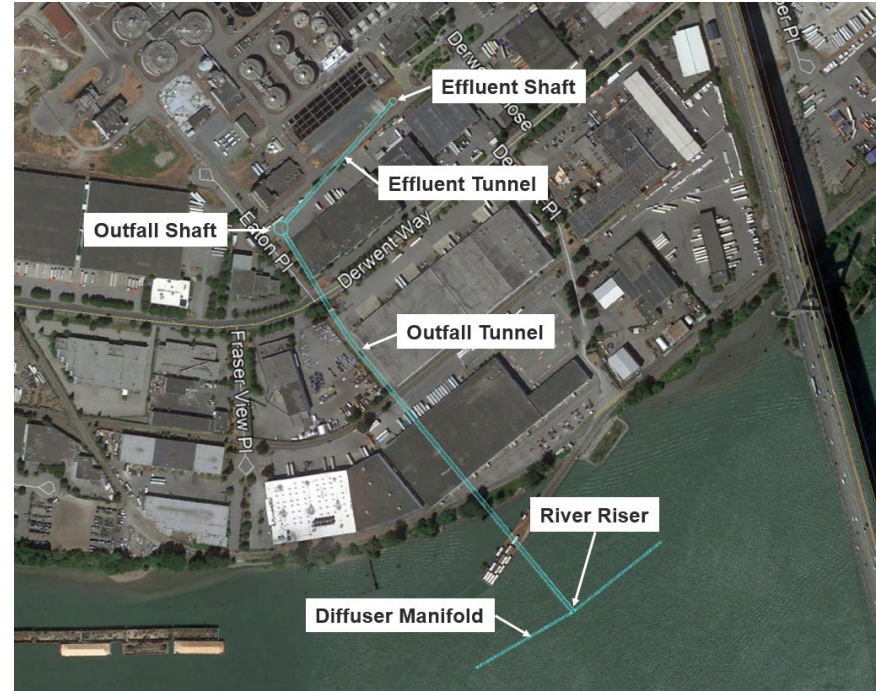


Annacis Island Wastewater Treatment Plant Trickling Filters

# ANNACIS ISLAND WWTP OUTFALL

## Expansion

- Expand WWTP capacity with new effluent tunnel and outfall
- Construction nearing completion
- Target 2023 in-service



Annacis Island Wastewater Treatment Plant Outfall



Fraser River Crossing pipe installation – Northwest Langley WWTP Projects

Thank You

**metrovancouver**  
Together we make our region strong