Low Carbon Fleet Program (LCFP) Overview

November 10, 2021

Metro Vancouver Finance & Intergovernmental Affairs Committee



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Overview

- 1. Our Targets
- 2. Bus Fleet Composition
- 3. Fleet Emissions Projection
- 4. Technologies Assessed
- 5. Renewable Natural Gas
- 6. Conventional Bus Transition Plan
- 7. Emerging Opportunities

TransLink's Sustainability Commitment

Targets:

- 1. Achieve an 80% reduction of corporate GHG emissions by 2050
- 2. Utilize 100% renewable energy in all operations by 2050





e GHG emissions by 2050 perations by 2050



Conventional Bus Fleet Composition



Together all the way



Overall Fleet Emissions Projections



40% GHG reduction by 2030 from 2010

- Support/Non-Revenue
- Canada Line
- SkyTrain
- WCE
- HandyDART
- SeaBus
- Community Shuttle
- Bus Battery Electric
- Bus Trolley
- Bus CNG
- Bus Diesel Contract (WVT)
- Bus Diesel



Low Carbon Technologies Assessed







What is Renewable Natural Gas (RNG)?

Biomethane from organic waste: agricultural, landfill, wastewater treatment, wood, residential or commercial organic waste







Benefits of RNG

- Emissions are reduced when methane (CH4) is captured and repurposed as RNG, rather than being released directly into the atmosphere
- Renewable Natural Gas is carbon neutral, because it does not contribute any net carbon dioxide into the atmosphere
- Acknowledged in BC's Low Carbon Fuel Standard
- CleanBC Roadmap to 2030 committed to develop increased production capacity for made-in-B.C. renewable fuels to 1.3 billion litres per year by 2030





BC RNG Producers

- Lulu Island Wastewater Treatment Plant, Metro Vancouver
- Fraser Valley Biogas
- Glenmore Landfill
- Salmon Arm Landfill
- Seabreeze Dairy Farm
- Surrey Biofuel Facility

Upcoming projects:

- City of Vancouver landfill, Delta, BC
- REN Energy International, Fruitvale, BC
- Hartland Landfill, CRD





Seabreeze Dairy Farm



Surrey Biofuel Facility



Fraser Valley Biogas



Conventional Bus Transition Plan

- Prepare facilities and infrastructure to support battery electric buses
- Replace retiring fleet with lower carbon intensity options (including RNG)



Location	In-Service for BEBs
Port Coquitlam Transit Center	2025
Marpole Transit Center	2025
Burnaby Transit Center	2029

Experience Operating BEBs

- TransLink successfully demonstrated interoperability of buses and charging infrastructure
- Pilot has helped to inform future vehicle and infrastructure requirements
- Implementation timelines are longer than typical bus replacement projects to allow for infrastructure implementation and pilot buses
- Market is changing rapidly



Fleet Replacement Schedule

Year	2021	2022	2023	2024	2025	2026	2027	2028
To Be Retired	0	0	107 - 40 '	126 - 40' 16 - 60'	69 — 40'	197 – 40' 39 – 60'	Trolley 188 - 40'	Trolley 74 – 60'
Repl. Type & Qty.	N/A	15 – 40' •••••	57 - 40' 50 - 40' CNG	84 - 40' ••••••••••••••••••••••••••••••••••••	79* - 40'	217* - 40' 45* - 60'	188 - 40' Trolleys	74 - 60' Trolleys
Base Location	N/A	Hamilton Transit Centre	Port Coquitlam Transit Centre	Hamilton / Surrey / Port Coquitlam Transit Centre	Marpole Transit Centre	Marpole Transit Centre	Vancouver Transit Centre	Vancouver Transit Centre

*Indicates fleet size increased by 15% to account for range impacts of depot charging







Emerging Opportunities







SeaBus

- Electric alternative is feasible for new or retrofit vessels
- Funding requested to design Next Generation vessel
- **Community Shuttle**
 - Electric alternatives not currently feasible
- HandyDART
 - Electric alternatives not currently feasible
- Highway Coach/Double Decker fuel cell/electric
- Non-Revenue Fleet

Market options offer 2/3 range, 2x cost, require operator reclassification

 Market options offer 2/3 range, 2x cost, require operator reclassification - Existing fleet is new and not due for replacement for more than a decade Fuel cell technology may provide sufficient range if technology develops

Planned assessment will identify opportunities for electrification

Reference Slide







2022 Application for Federal Gas Tax Funding from the Greater Vancouver Regional Fund

Metro Vancouver Finance and Intergovernment Committee November 10, 2021

Olga Kuznetsova, VP Financial Services TransLink

TRANS LINK

translink.ca

2022 Application for Federal Gas Tax Funding Context

TransLink is requesting \$358.48 million in Federal Gas Tax funding from the GVRF for the purchase of 124 new vehicles and infrastructure improvements to:

- Ensure existing transit fleet and infrastructure remain in a state of good repair, maintain reliability and modernize
- Advance the low carbon fleet strategy by purchasing 50 Conventional Buses to operate with Renewable Natural Gas, constructing TransLink's first fully electric transit centre (Marpole Transit Centre) and designing an electric SeaBus vessel
- Support Metro Vancouver's Fleet Planning and Acquisition Policy objective to "achieve continuous improvement in reducing fleet GHG"
- Support the region's environmental policies
 - Metro Vancouver's Integrated Air Quality and Greenhouse Gas Management Plan
 - Metro Vancouver 2040: Shaping Our Future
 - Metro Vancouver Climate 2050 Framework

2022 Application for Federal Gas Tax Funding *Summary of Scope and Request*

		(\$ millions)	
Vehicle Replacement Projects	Scope	Total Project Budget	GVRF Funding Request
2023 Community Shuttle Replacements	27 Community shuttle buses	\$6.90	\$6.66
2023 Conventional Bus Replacement	50 CNG buses – RNG Fueled (Note 1)	\$46.05	\$44.44
2023 HandyDART Vehicle Replacement	46 HandyDART vehicles	\$6.96	\$6.77
Next Generation SeaBus Design	Design for replacement vessel	\$2.65	\$2.51
Vehicle Replacement Total	124 vehicles	\$62.56	\$60.38

Note 1: The CNG buses will operate on Renewable Natural Gas fuel (RNG). RNG is a carbon neutral energy source that does not contribute any net carbon dioxide into the atmosphere.

		(\$ millions)		
Infrastructure Projects	Scope	Total Project Budget	GVRF Funding Request	
Marpole Transit Centre - Implementation	Facility Expansion	\$308.17	\$298.10	
Infrastructure Total		\$308.17	\$298.10	







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2022 Application for Federal Gas Tax Funding

Overall Benefits

Reduced GHG and CAC Emissions

- MTC would result in a reduction of 29,886 tonnes CO2e per year by 2031 and 42,000 tonnes CO2e per year by 2045
- Replacing the Burrard Beaver diesel SeaBus with a Next Generation battery-electric SeaBus vessel would result in 1,130 CO2e tonnes per year reduction. Design phase requested in this application is a critical step in future procurement of the vessel.
- Maintain Conventional, Community Shuttle and HandyDART buses in a state of good repair
- Improved Accessibility
 - Continue transition of stepless low-floor Community shuttles vs existing high floor shuttles

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Key Project Summary: Marpole Transit Centre (MTC)

- MTC will be home to TransLink's expanding battery electric bus fleet, a key element of advancing TransLink's Low Carbon Fleet Strategy.
- The additional capacity provided by MTC is necessary to free up space in other transit centres to facilitate future electrification and future service expansion.

Key Benefits

- Provides charging capacity for more than 300 battery-electric buses
- Enables future service expansion
- Provides storage and maintenance capacity
- Central location of this facility will allow for service to key urban centres: Vancouver, Burnaby, New West and Richmond
- Reduced bus fleet emissions by replacing diesel vehicles with battery electric
- Mode-shift away from automobile travel to transit which will reduce vehicle congestion and associated GHG emissions





Overview of Renewable Fuels



Renewable Natural Gas (RNG)



Renewable fuels provide GHG reductions with little or no infrastructure requirements or range limits during transition to electrification





Hydrogenated-Derived Renewable Diesel (HDRD)

- Made via hydrogenation of vegetable oils using normal refinery processes
- ✓ Not bio-diesel
- ✓ Can be used in current buses
- Production cost is \$0.26 to \$0.40 per liter more than petroleum diesel, but
 - ✓ Up to \$0.05/L lower carbon tax
 - ✓ Up to \$0.31/L carbon credit
- ✓ Net cost should be on par with diesel
- Available in Vancouver at wholesale
- Could be made available to fleets
- Sourced from Singapore





Iona Island Wastewater Treatment Plant Projects

REVISED DESIGN CONCEPT

Cheryl Nelms, P.Eng., Ph.D. GENERAL MANAGER, PROJECT DELIVERY Brett Young, M.Sc., MBA, P.Eng. DIRECTOR, INWWTP PROGRAM, PROJECT DELIVERY

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Finance and Intergovernment Committee, November 10, 2021 48982887

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AGENDA

- 1. Background
- 2. Expert Panel Recommendations and Options Evaluation
- 3. Revised Design Concept
- 4. Public and First Nation Engagement
- 5. Regional Park Impacts and Benefits
- 6. Next Steps to Finalize Project Definition Report (PDR)
- 7. Liquid Waste Committee November 4, 2021
- 8. Recommendation

STAGE GATE PROCESS



Iona Island WWTP Projects

Background

JULY 2020 DESIGN CONCEPT

Criteria	Concept 1 Base Secondary	Concept 2 Tertiary Filtration	Concept 3 Tertiary MBR
Operational Complexity	Medium	Low	High
Maintenance Requirements	High	Low	High
Health and Safety Risks	High	Low	High
Odour Release Risks	High	Medium	Low
Footprint	Large	Medium	Small
Ability to Adopt Future Technological Innovations	Medium	High	Low
Net Energy Use	Medium	Low	High
Greenhouse Gas Emissions	Medium	Low	High
Capital Costs (2020 Dollars)	Highest	Lowest	Medium
Annual Operating Cost	Medium	Lowest	Highest

Evaluation of three alternate concepts for upgraded WWTP (not just a comparison of treatment technologies)

What's changed since then?

- Further work on constructability, cost estimates, risks, and schedule
- Ground improvement cost assumptions changed materially
- Costs and risks of interim solids
 handling addressed in fall 2020 study



Challenges identified in July 2021 Information Report

CHALLENGES IDENTIFIED

July 2021 Information Report

Solids handling	 Interim trucking sludge to other WWTP for ~ 7 years
Constructability	Limited working space and flexibility in contract packaging
Schedule	 Compliance with regulatory deadline ~2034 (4 years late) Completion of solids treatment facilities ~ 2041
Capital costs	\$6.7B in 2021 dollars\$10.4B with escalation and risk reserve



ADDRESSING CHALLENGES

July 2021 Information Report

- Steps to Address Challenges
 - Value engineering
 - Expert panel challenge review
 - Identify and evaluate options
 - Structured decision making
- Revised Design Concept
 - Present to November 2021 Board for endorsement

Independent Expert Panel

Roy Simm – Stantec Ken Abraham – HDR Viji Fernando – Golder Frank Margitan (Rtd) – Kiewit Jeff Plant – Major Projects Advisor Pippa Brasher – Scape Studio Brendan Avery – Francl Architecture Shannon Katt – PMA Consultants Ryan Ziels – UBC

Expert Panel Recommendations & Options Evaluation

EXPERT PANEL RECOMMENDATIONS

- Total of 35 recommendations from Challenge Review
 - wastewater treatment process design
 - ecological, community/park integration and resource recovery
 - construction considerations
- To address costs and other challenges, panel made specific recommendations related to:
 - additional seismic modelling to refine ground improvement cost estimates
 - wastewater treatment process design options, including technologies with smaller footprints to offset the high costs of ground improvements

SHORT-LIST OF TREATMENT OPTIONS

- 1. Base Case (July 2020 design concept)
- 1a. Modified Base Case
- 2. Membrane Bioreactor (MBR)
- 3. Aerobic Granular Sludge (AGS)

PRELIMINARY COST COMPARISONS



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ADDRESSING CHALLENGES & OTHER CRITERIA

Summary Evaluation Criteria	Option 1 Base Case	Option 1A Modified Base Case	Option 2 MBR	Option 3 AGS		
Addressing the Challenges	Addressing the Challenges					
Capital costs	Higher	Higher	Medium	Medium		
Operations & maintenance costs	Medium	Medium	Higher	Lower		
Total project life cycle costs (2034-71)	Medium	Medium	Medium	Medium		
Potential to mitigate regulatory compliance delay	Lower	Lower	Medium	Medium		
Avoidance of costs/risks re interim solids handling	Lower	Higher	Higher	Higher		
Improve constructability and contract flexibility	Lower	Medium	Medium	Medium		
Other Criteria and Trade-Offs						
GHG emissions from operations	Medium	Medium	Higher	Lower		
Net gain in regional park land area	Higher	Medium	Higher	Higher		
Layout extends to undisturbed east park lands	Lower	Higher	Medium	Medium		
Risk of delay related to land tenure issues	Lower	Medium	Medium	Medium		
Transition to year-round Nitrogen (nutrient) removal	Medium	Medium	Higher	Medium		
Proven at similar scale; multiple technology vendors	Higher	Higher	Medium	Lower		

WHAT'S CHANGED FROM EARLIER EVALUATION

Nature of Change	Example of Change
Addressing challenges	Summary table includes each challenge
Criteria not shown that are similar for all options or do not influence decision	 Odour control and potential risks are similar in nature for all of the options Operational complexity and maintenance requirements are reflected in O&M costs
New criteria added for options evaluated	 Impacts on park lands and land tenure Proven applications at scale and market competition among technology vendors

Public and First Nation Engagement

PUBLIC AND FIRST NATION ENGAGEMENT

July 30 to October 22, 2021

Audience	Virtual Meeting Dates
Musqueam Indian Band	July 30, Sept 14
Vancouver Airport Authority (YVR)	Sept 22
Deering Island Homeowners Society	Sept 24
Georgia Strait Alliance	Sept 29
Vancouver Fraser Port Authority	Oct 4
Birders and naturalists	Oct 18
Online community meetings	Oct 12 and 14 (55 participants)
Online public comment period	Sept 27 to Oct 22 (52 submissions)
CoV, VSA, REAC, RAAC, RFAC	Sept, Oct

PUBLIC AND FIRST NATION ENGAGEMENT

What We Heard



Interest in and concern with ratepayer impacts

Concern with delay and missing regulatory deadline



Desire for higher levels of treatment



Desire to protect and enhance Iona Island's ecosystems and habitat for birds and fish



Interest in understanding how Metro Vancouver is engaging with First Nations

Revised Design Concept

REVISED DESIGN CONCEPT

- Concurrent construction of digesters and compact-footprint secondary treatment process (MBR or AGS)
 - Offer capital cost savings in the order of 10%
 - Flexibility to validate performance and costs in next phases
 - Address commercial considerations as part of due-diligence
- What's not changing
 - Tertiary level wastewater treatment
 - Odour control
 - Ecological restoration projects
 - Resource recovery opportunities



REVISED DESIGN CONCEPT – WASTEWATER TREATMENT





MEMBRANE BIOREACTOR (MBR)

Conceptual Rendering





AEROBIC GRANULAR SLUDGE (AGS)

Conceptual Rendering



REMAINING CHALLENGES & RISKS

Issues to address in subsequent phases

Challenges

MBR

- higher energy use and O&M costs
- periodic replacement of membranes
 AGS
- limited proven applications of scale at lona
- Commercial considerations for proprietary technology





Schedule risk if land tenure resolution is delayed

Regional Park Impacts and Benefits

LAND REQUIREMENTS

Revised Design Concept layout requires ~3 ha of MVRD park land

- Concurrent digester construction
- Eliminates trucking sludge off-site
- Protects desired Musqueam views
- Net gain in park land, including
 ~ 18 ha transfer from GVS&DD



IONA ISLAND LAND TENURE – CURRENT



IONA ISLAND LAND TENURE – PLANNED



IONA ISLAND – PARK ENHANCEMENTS





Freshwater wetlands and tidal channels



Tidal marsh south of treatment plant



View from knolls looking west



Foreshore restoration

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Next Steps to Finalize Project Definition Report

WORK TO FINALIZE PDR

for March 2022 Board approval

- Refine conceptual design and layouts
- Advance land tenure transfer (MVRD and GVS&DD)
- Update schedule and budget
 - constructability review
 - risk assessment
 - cost estimates
 - cash flows
- Update financial model to estimate rate impacts (HHIs)
- Update delivery strategy recommendations
- Finalize project definition report



Liquid Waste Committee – November 4, 2021

LIQUID WASTE COMMITTEE

November 4, 2021

Key discussion topics:

- Appreciation for significant team effort over past several months
- Support for planned island ecosystem benefits
- Cautioned against rushing land transfers to preserve construction flexibility
- Interest in breaking out mega-projects into smaller contract packages
- Adaptability to incorporate future technology advances and regulatory changes

Recommendation passed as presented

Recommendation

RECOMMENDATION

That the GVS&DD Board endorse the revised design concept for the Iona Island Wastewater Treatment Plant projects, as presented in the report dated October 27, 2021 titled "Iona Island Wastewater Treatment Plant Projects – Revised Design Concept"; and direct staff to finalize the project definition report for Board approval in March 2022.

