INFRASTRUCTURE SERVICES COMMITTEE

Thursday, July 8, 2021
Held Electronically in Accordance with Ministerial Order M192 and Transmitted via the SCRD Boardroom, 1975 Field Road, Sechelt, B.C.

AMENDED AGENDA

CALL TO ORDER 9:30 a.m.

AGENDA

1. Adoption of Agenda

PRESENTATIONS AND DELEGATIONS

2. Wilbert Yang, Senior Waste Management Engineer, Tetra Tech:

a. Sunshine Coast Regional District Future Waste Disposal Options Study – Detailed Options Analysis Presentation — **⇨ADD** i - xxvi

b. Sunshine Coast Regional District Future Waste Disposal Options Analysis Study Part 3 – Detailed Analysis of Options Report — **⇨ADD** xxvii - lxxxii

REPORTS

3. Future Waste Disposal Options Next Steps — Verbal
General Manager, Infrastructure Services / Manager, Solid Waste Services
Regional Solid Waste (Voting – All)

4. Power System Replacement for Sechelt Landfill Update — **⇨ADD** 1a - j
Manager, Solid Waste Services
Regional Solid Waste (Voting – All)

5. Water Supply Update — Verbal
General Manager, Infrastructure Services

6. Request for Quotations 2137006 and 2137007 Contract Award - Pipe Supply and Contracted Equipment for Chaster Road and Henry Road — Annex A pp 1 - 4
Capital Projects Coordinator
Regional Water (Voting – A, B, D, E, F and Sechelt)

7.	Request for Proposal 2137005 Contract Award – Design, Permitting and Engineering Services for Upgrades to McNeil, Chapman, and Edwards Dams Capital Projects Coordinator **Regional Water (Voting – A, B, D, E, F and Sechelt)**	Annex B pp 5 - 7
8.	Water Supply Advisory Committee Meeting Minutes of June 7, 2021 **Regional Water (Voting – A, B, D, E, F and Sechelt)**	Annex C pp 8 – 9
9.	Solid Waste Management Plan Monitoring Advisory Committee Meeting Minutes of June 15, 2021 **Regional Solid Waste (Voting – All)**	Annex D pp 10

COMMUNICATIONS

NEW BUSINESS

IN CAMERA

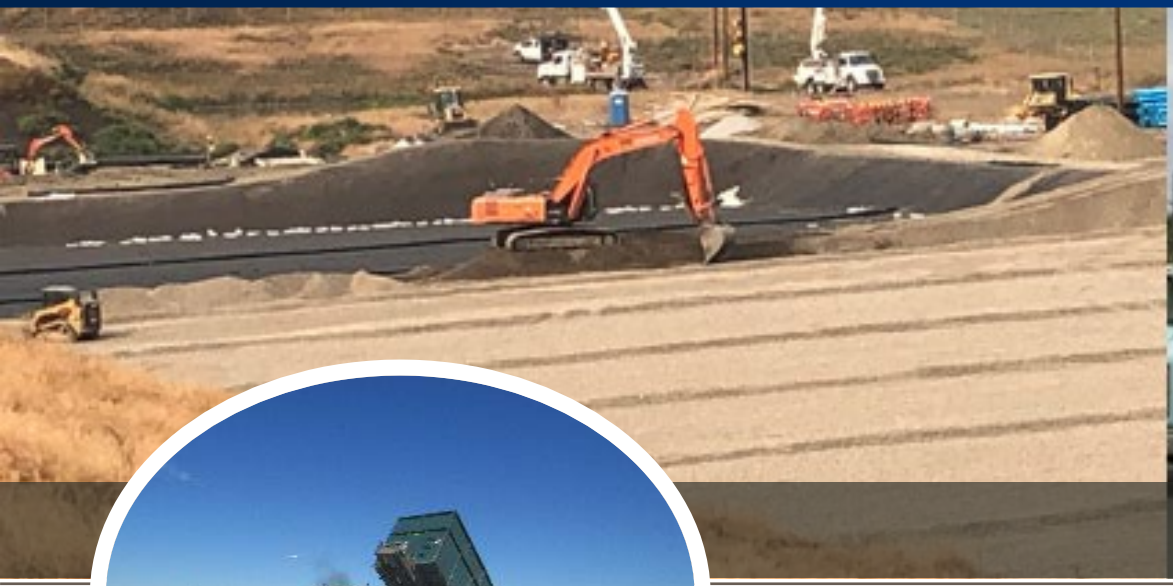
ADJOURNMENT

ADD - Item No. 2a

TETRA TECH

Sunshine Coast Regional District
Future Waste Disposal Options Study

Detailed Options Analysis



July 8, 2021

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Outline

- Project Overview
- Board Direction
- Detailed Analysis of Options
  - Transfer Station Analysis
  - Landfill Siting Feasibility
- Conclusions

Project Overview

1

Part 1 – Demand Analysis

- Estimate annual disposal for the next 30 years

2

Part 2 – Feasibility Study - Waste Management Options:

- Option 1: New landfill
- Option 2: Waste export (including new transfer station)
- Option 3: Waste to energy
- Option 4: Landfill expansion

3

Part 3 – Detailed Options Analysis

- Investigate potential landfill locations
- Refine Transfer Station cost estimates.

Board Resolution

On January 20, 2021, the SCRD Board directed staff to conduct the following:

> *THAT a **Future Waste Disposal Options Analysis Study Part 3 - Detailed Analysis proceed with conducting a detailed analysis of the feasibility of siting a landfill and a waste export facility**;*

- This includes parallel development of preliminary cost design, Class C estimates and other relevant technical analyses for a new landfill and a new transfer station (for waste export).

Detailed Options Analysis

Objectives:

1. **Transfer Station:**

Assess potential capital and operating costs

2. Landfill:

Assess potential locations, costs and feasibility of siting a new landfill

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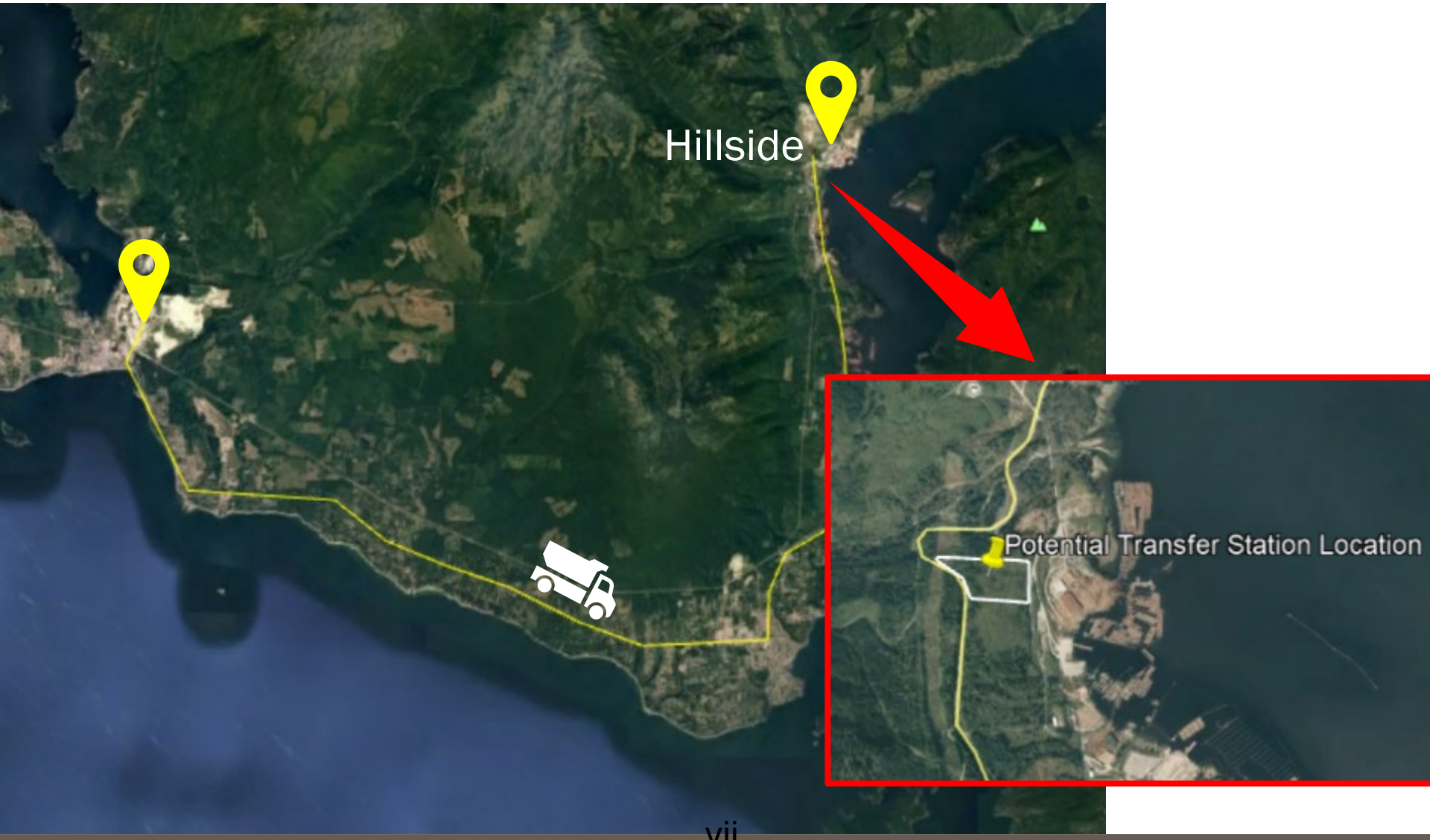
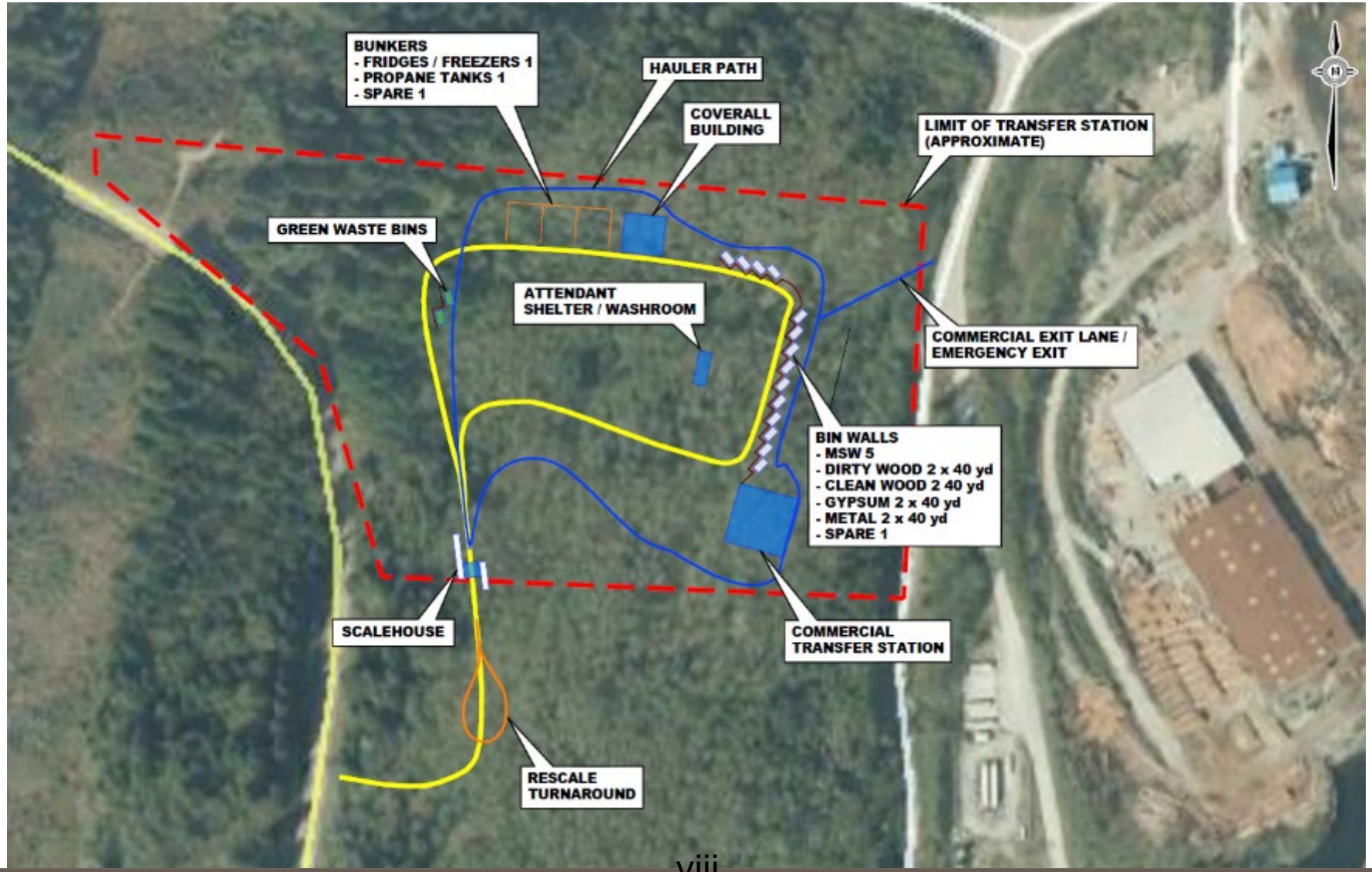
Transfer Station Analysis

- Location
- Facility Layout
- Design Elements
- Facility Considerations

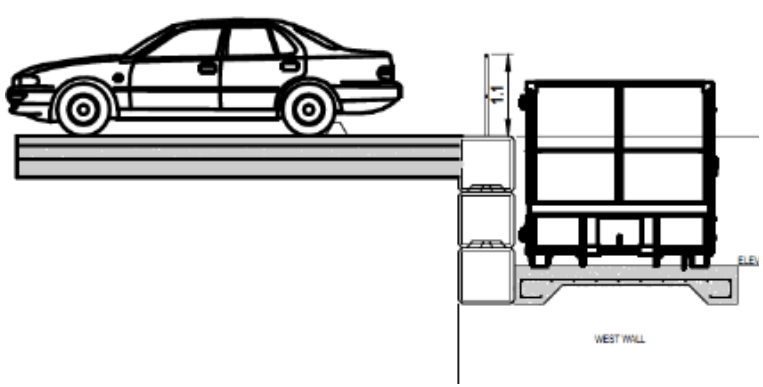
Transfer Station Location – Hillside Area

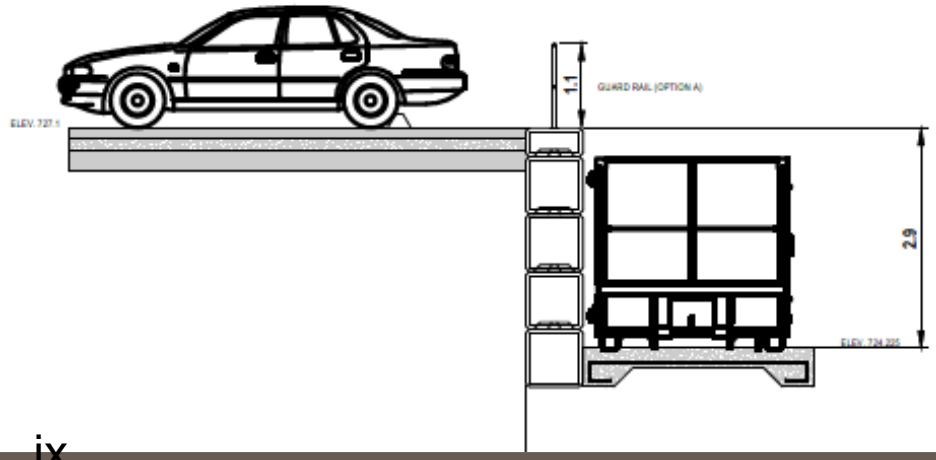


Transfer Station Facility Layout



Transfer Station Design Elements





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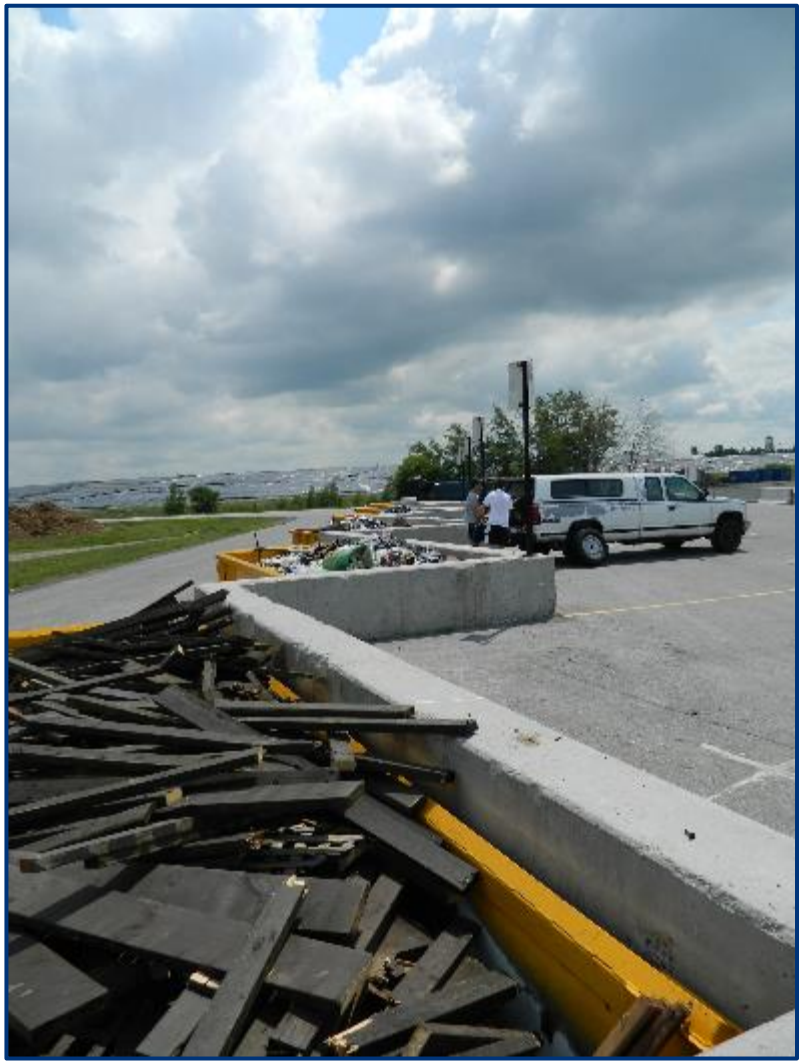
Transfer Station – Small Vehicle Drop-Off Areas



Transfer Station – Commercial Building

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Transfer Station – Material Storage Areas

Transfer Station Considerations

- Minimum 2 years required for procurement to design and build TS
- Est. Capital Cost = $4.7M
- Cost per tonne = $175/t to $290/t
  (including transport and disposal costs)
- Disposal cost considerations:
  - Distance to end point;
  - Tipping fee at the gate; and
  - Exchange rate if it goes to the US.

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Landfill Siting Feasibility

Regulatory Feedback

Site Visits and Analysis

Siting Considerations

Potential Landfill Footprint and Airspace

Economic Analysis

Overall Summary

Regulatory Overview

- Not opposed to siting and building a new landfill
- Proposed site must meet the Landfill Criteria, and/or have engineered solutions to address deficiencies
- Recommends amending SWMP to address region's disposal system first before updating the SWMP.
  - Amendment requires public and First Nations consultation to receive approval

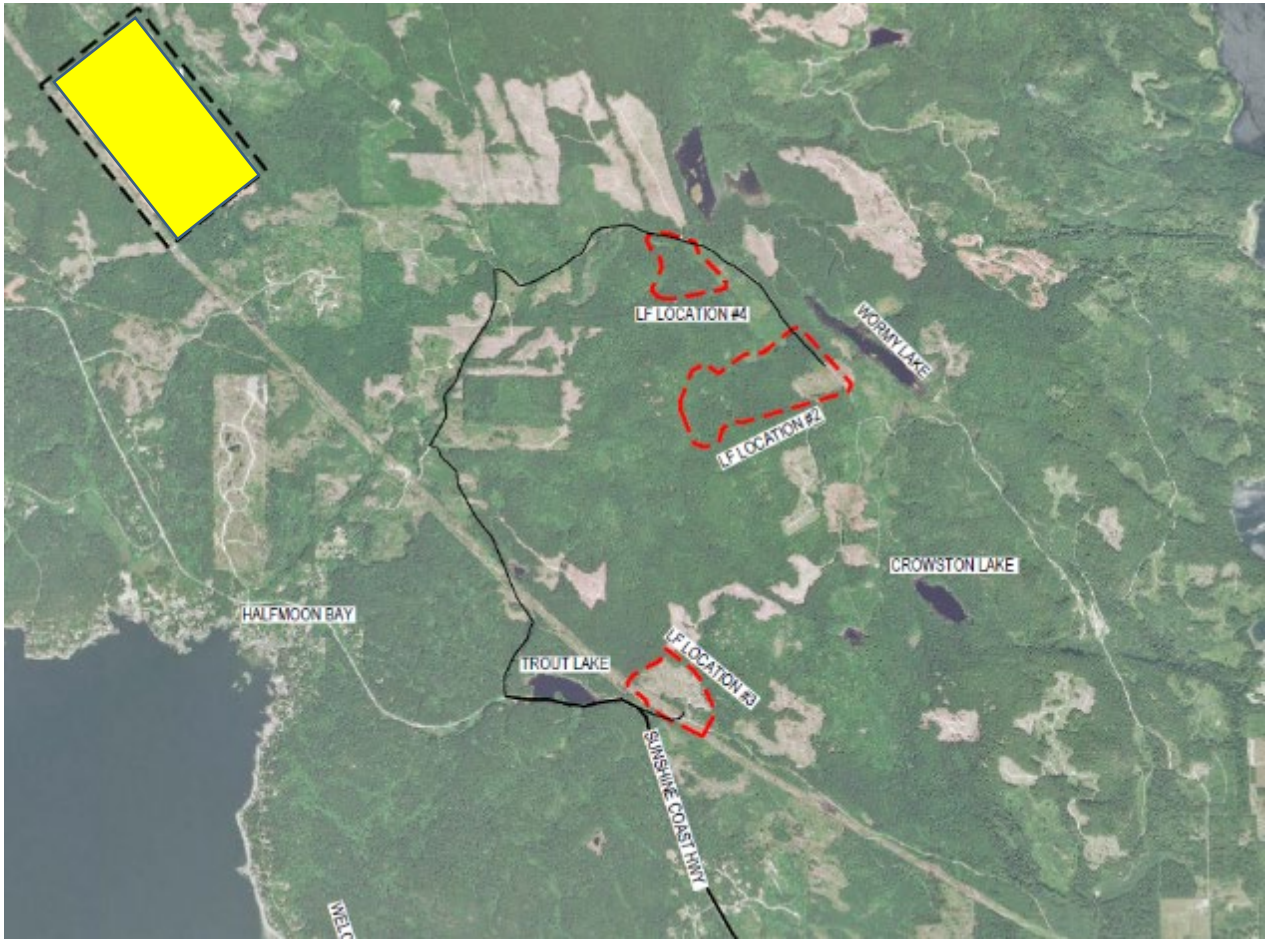
Potential Landfill Locations

Site Visits

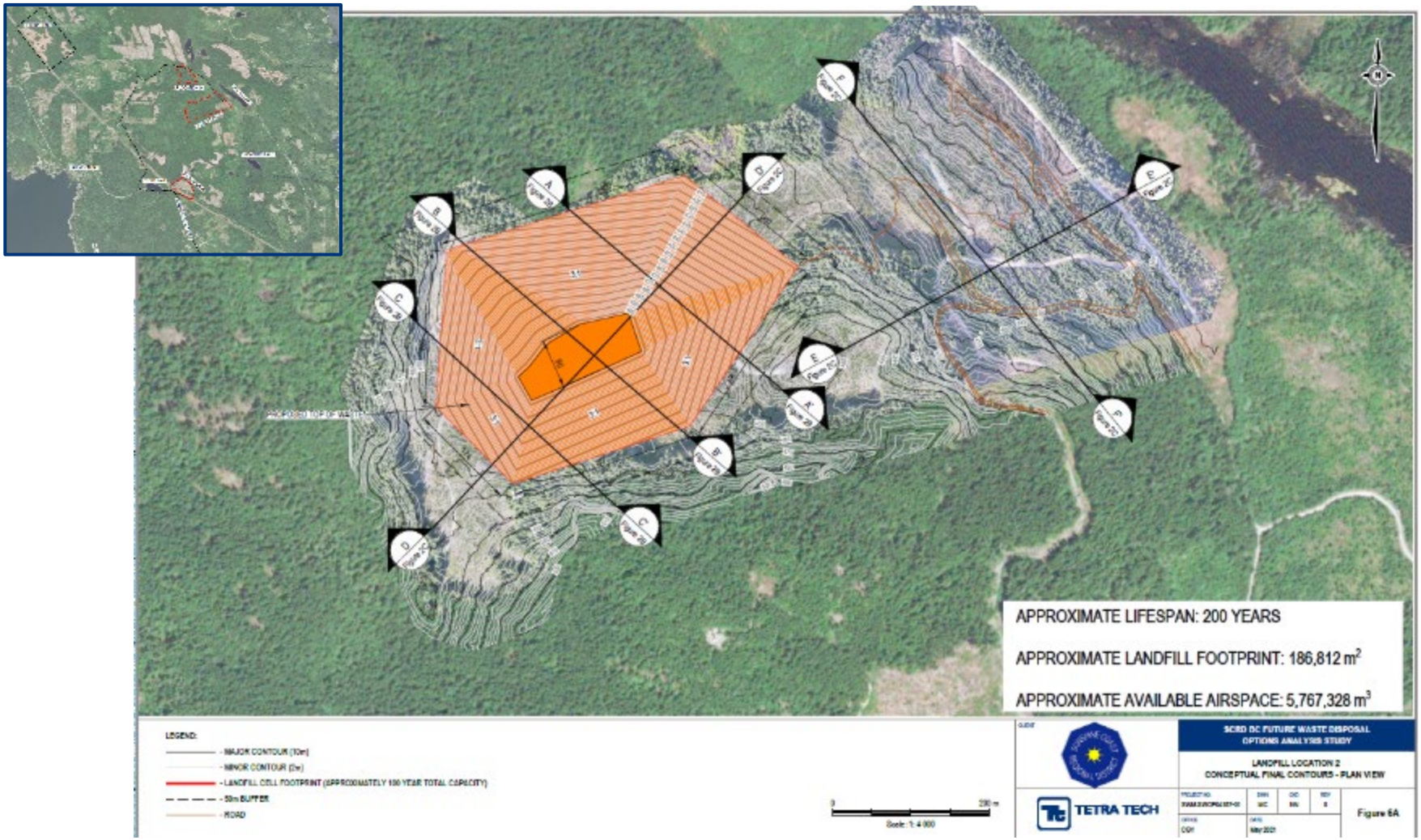
- 4 locations visited and assessed
  - One site removed because of geological issues
- Three locations surveyed to address the following:
  - BC Criteria for Municipal Solid Waste Landfills;
  - Proximity to environmentally sensitive areas;
  - Site topography;
  - Presence of industrial development (i.e., logging);
  - Anticipated ease of construction and operation; and
  - Potential landfill capacity (years of airspace).

Potential Landfill Footprint and Airspace

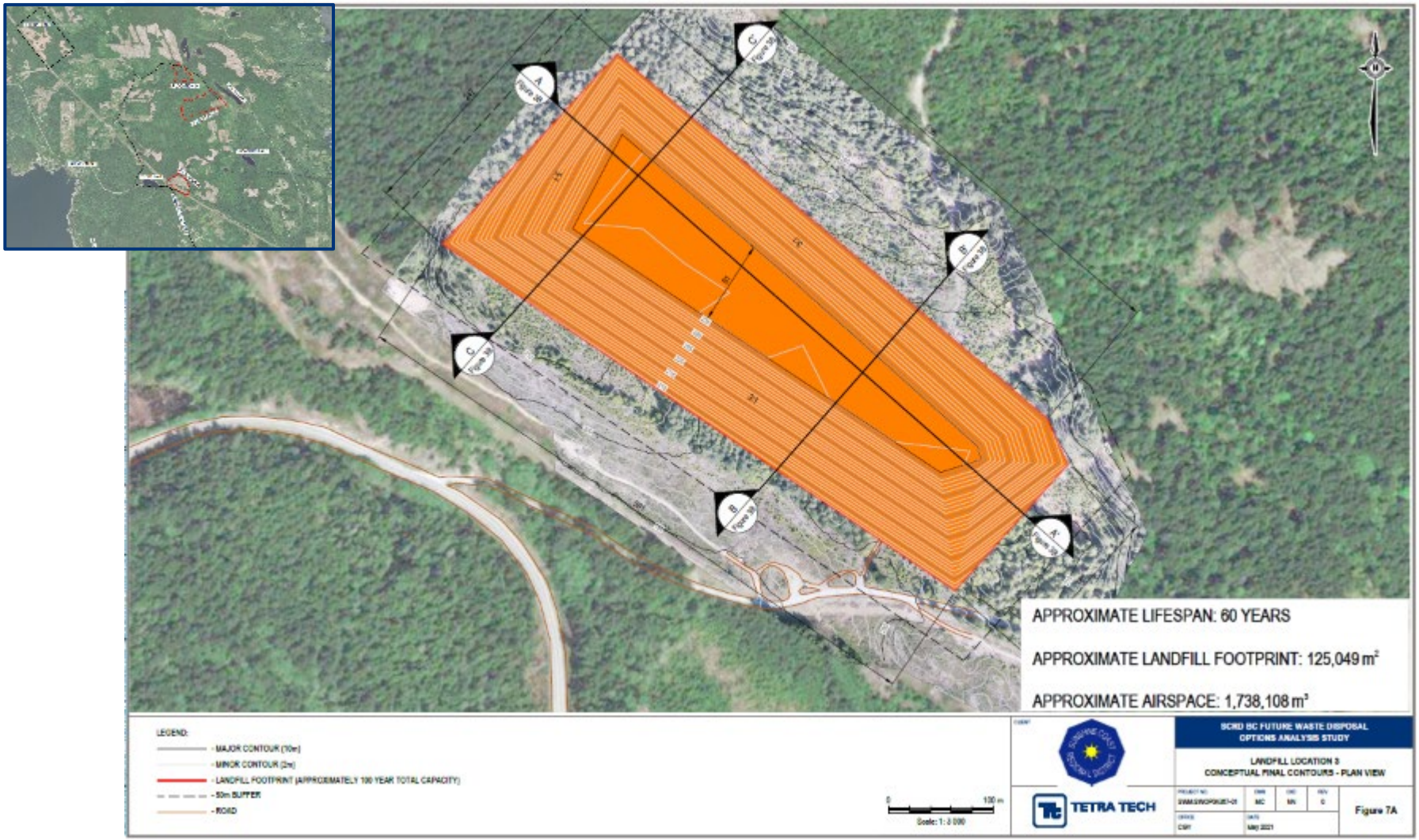
- Location 1 was excluded due to Karst topography and distance to population centres
- UAV surveys completed in April 2021 for Locations 2, 3 and 4



Potential Landfill Location 2



Potential Landfill Location 3



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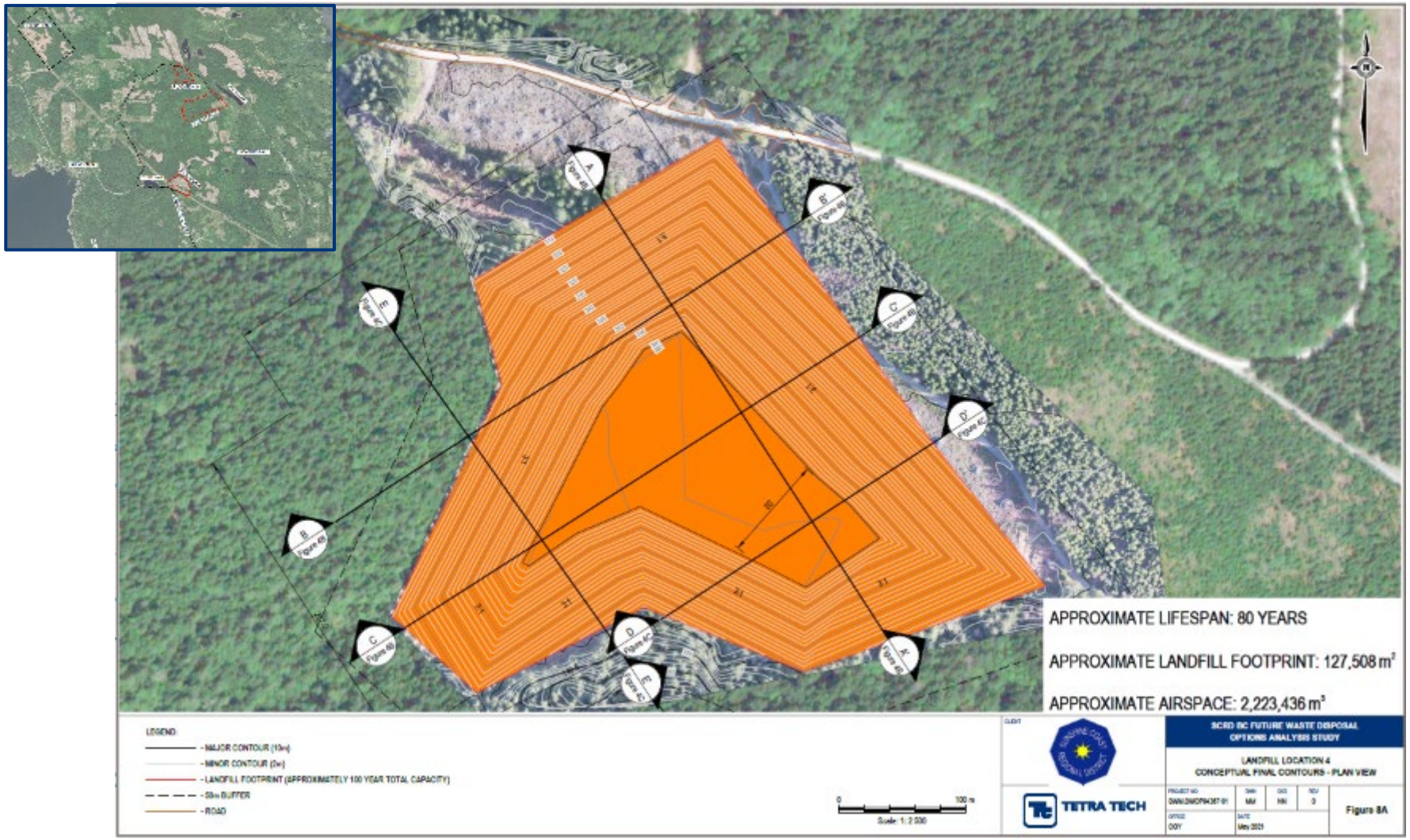
Potential Landfill Location 4



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Potential Landfill Footprint and Airspace

Criteria	Location 2	Location 3	Location 4
Surveyed Area	70 hectares	30 hectares	23 hectares
Potential Landfill Footprint	18.7 hectares	12.5 hectares	12.8 hectares
Approximate Airspace	5.8 million m^3	1.7 million m^3	2.2 million m^3
Approximate Lifespan	200 years	60 years	80 years

BC Landfill Criteria Considerations

BC Landfill Criteria mostly met

Need to assess the following:

- Proximity to heritage and archeological sites
- Proximity to environmentally sensitive areas
- Depth to groundwater table
- Faults and sensitive area

Landfill Cost Considerations

Cost Breakdown	New Landfill Estimated Costs ($/tonne)		
	Location Two	Location Three	Location Four
Capital Costs	$10 - $11	$18 - $24	$18 - $23
Operating Costs (Net Present Value)	$140 - $195	$140 - $195	$140 - $195
Total	**$150 - $206**	**$158 - $219**	**$158 - $218**

Overall Summary

Characteristic	Transfer Station	Location Two	Location Three	Location Four
Capital Costs ($/tonne)	$7	$10 - $11	$18 - $24	$18 - $23
NPV Operating Costs ($/tonne)	$169 - $280	$140 - $195	$140 - $195	$140 - $195
Estimated Road Length to Highway	0.5 m	6.5 km	0.5 km	5.5 km
Key Considerations	▪ Minimum 2 years to design and commission a facility ▪ Potential for cost fluctuations outside of the SCRD's control (transportation and disposal fees) ▪ Requires land purchase at fair market value	▪ Requires longest haul road development and maintenance ▪ No nearby power connections ▪ Challenging landfill construction and operation due to site topography ▪ Public and First Nations support is key for approval	▪ Location meets the buffer criteria for water bodies but is within 450 m of Trout Lake which may present a risk to public support ▪ Public and First Nations support is key for approval	▪ Location is remote, requiring long-haul road development and utility connection ▪ Location is upgradient from a stream but meets buffer criteria ▪ Public and First Nations support is key for approval

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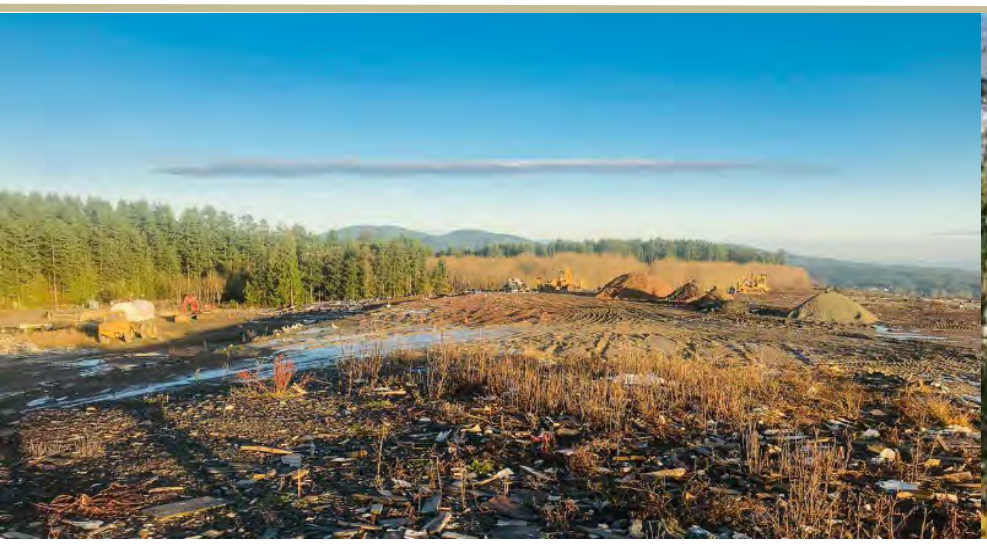
Sunshine Coast Regional District
Future Waste Disposal Options Analysis Study
Part 3 – Detailed Analysis of Options



PRESENTED TO
Sunshine Coast Regional District

JUNE 29, 2021
ISSUED FOR USE
FILE: 704-SWM.SWOP04367-01

Tetra Tech Canada Inc.
Suite 1000 – 10th Floor, 885 Dunsmuir Street
Vancouver, BC V6C 1N5 CANADA
Tel 604.685.0275 Fax 604.684.6241

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APPENDICES

ACRONYMS & ABBREVIATIONS

Acronyms/Abbreviations	Definition
BC	British Columbia
ENV	British Columbia Ministry of Environment and Climate Change
GHG	Greenhouse Gas
MSW	Municipal Solid Waste
qRD	qathet Regional District
RMOW	Resort Municipality of Whistler
SCRD	Sunshine Coast Regional District
SWMP	Solid Waste Management Plan

LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of the Sunshine Coast Regional District and their agents. Tetra Tech Canada Inc. (Tetra Tech) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than the Sunshine Coast Regional District, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this document is subject to the Limitations on the Use of this Document attached in the Appendix or Contractual Terms and Conditions executed by both parties.

1.0 INTRODUCTION

Tetra Tech Canada Inc. (Tetra Tech) was retained by the Sunshine Coast Regional District (SCRD) to conduct an analysis of future waste disposal options for waste generated in the Sunshine Coast.

The Sechelt Landfill is expected to reach its capacity within the next five years and the disposal options analysis is intended to assist the SCRD in determining how residual solid waste could be managed in the future. Important considerations for this analysis include an understanding of future trends in the solid waste industry, market factors affecting tipping and shipping costs, and long-term risk factors including changes to environmental regulations and waste export regulations.

1.1 Background

Residual solid waste generated on the Sunshine Coast is currently delivered to one of two locations – the Pender Harbour Transfer Station and the Sechelt Landfill. The Pender Harbour Transfer Station receives waste from the northern portion of the Sunshine Coast which is then transferred to the Sechelt Landfill for burial. Waste from the remaining part of the Sunshine Coast is directly delivered to the Sechelt Landfill. Both facilities are owned by the SCRD.

In 2020, approximately 13,361 tonnes of waste was buried at the Sechelt Landfill, with approximately 1,290 of that tonnage transferred from the Pender Harbour Transfer Station.

Solid waste is managed according to the SCRD's Solid Waste Management Plan (SWMP)[1] last updated in 2011. The SWMP includes the following key themes:

- **Zero Waste:** To maximize the reduction of solid waste disposal and to encourage reuse, recycling and recovery of resources across the region.
- **Social and Environmental Sustainability:** To establish a state in which future needs of the present generation are met without compromising the ability of future generations to meet their own needs.
- **Financial Sustainability:** To maintain service obligations to the public and employees without increasing the debt or tax burden relative to the economy in which it operates.
- **Greenhouse Gas Reduction:** To reduce greenhouse gas (GHG) emissions in the region.

1.2 Project Objectives

The overall scope of work is divided into three parts:

- Part 1 - Demand Analysis;
- Part 2 - Feasibility Study; and
- Part 3 - Detailed Analysis.

[1] AECOM Canada Ltd & SCRD Infrastructure Services Department. (2011). Solid Waste Management Plan – The Foundation for Zero Waste Plan – Final Draft. August 2011.

The demand analysis estimated the quality and quantity of materials expected to be disposed over the next 30 years. The feasibility study identified and explored four options for residual waste management: (Option 1) siting a new landfill, (Option 2) disposal at a third-party facility, (Option 3) development of a waste to energy facility, and (Option 4) landfill expansion. These options were evaluated and prioritized using multi-criteria analysis based on the information developed by Tetra Tech and evaluation criteria input from the SCRD. The findings were presented under separate cover to the SCRD in January 2021. At the direction of the SCRD Board of Directors, SCRD staff was directed to undertake the scope for Part 3 to focus on the following:

- Assessing potential capital costs and locations for a transfer station to support waste export; and
- Assessing potential locations, costs and feasibility of siting a new landfill.

The report presented herein presents the findings of this detailed analysis.

2.0 TRANSFER STATION ANALYSIS

One option under consideration is construction of a transfer station to export waste out of the SCRD. Waste is currently being exported from several nearby communities, including Resort Municipality of Whistler (RMOW), Cowichan Valley Regional District (CVRD) and qathet Regional District (qRD). Establishing a transfer station and a waste export arrangement typically involves four to five years of planning including:

- Transfer station design and purchase of property;
- Transfer station construction; and
- Transfer and disposal contract procurement.

2.1 Transfer Station Location

During the previous phase of this project, it was determined that the Hillside Industrial Park area northeast of Langdale would be suitable for a transfer station in the SCRD. The potential site is located approximately 40 km from Sechelt and the current Sechelt Landfill as shown on Figure 1. The area is readily accessible via the Port Mellon Highway. While designated as a sensitive ecosystem, the Howe Sound Biosphere Region is home to ongoing industrial operations throughout the area including previous gravel mining in several locations. There are several water wells and watercourses located within the Hillside Industrial Park, mainly located on the flatter areas closer to the shoreline. Where possible, any future transfer station development should avoid impacting sensitive habitats such as the riparian areas surrounding existing watercourses.

The SCRD owns much of the property within the Hillside Industrial Park. Any future transfer station development will require the SCRD to officially purchase the property for fair market value. Tetra Tech reviewed the available topographical data for the area along with zoning and land ownership records to identify an industrially zoned, relatively flat property owned by the SCRD that does not intersect any fish-bearing watercourses. The preferred property is identified on Figure 2.

2.2 Transfer Station Design Elements

The potential future transfer station is assumed to provide residual waste collection and consolidation to optimize long-haul waste transfer to a landfill outside of the region. Based on the SCRD's objectives this facility will not

provide services overlapping those currently available at the Gibsons Recycling Depot. This section provides an overview of individual design elements of the potential transfer station. The transfer station is expected to:

- Receive standard household garbage from residential self-haul and municipal curbside collection;
- Receive green waste from residential and commercial sector;
- Receive and segregate bulky items such as scrap metal, dirty wood waste, clean wood waste and gypsum;
- Receive fridges, freezers and propane tanks; and
- Receive commercial garbage.

An overview of the site is presented on Figure 3. The cross-sections of the transfer station site (as indicated as “Section A” and “Section B” on Figure 3) are presented on Figure 4. Approximately six (6) hectares of land is required to provide all desired services as shown on Figure 3.

2.2.1 General Site Works

Customers would access the transfer station via the Port Melon Highway through an access road east of the highway. Site roads would be paved with asphalt and constructed to accommodate the small and heavy vehicle traffic expected to use the site.

The natural topography slopes north and east toward Howe Sound. The site would be graded to promote drainage in all areas. Surface water would be managed through a series of drains, ditches, culverts, and swales. A combination of vegetation and geosynthetic materials are expected to be required to prevent erosion on and around the facility.

A pond would be constructed to temporarily retain and settle surface water before it is discharged to the surrounding environment. The pond would also provide capacity for emergency firefighting.

2.2.2 Traffic Flow

The site would be designed to accommodate the expected small vehicle traffic, municipal collection vehicles, commercial haulers, and long-haul transfer.

Residential and commercial customers would enter and exit the transfer station from the south end of the property. A second commercial and emergency exit would be constructed on the east side of the facility with access to the Hillside Industrial Park Road. Where possible, small and large vehicle traffic would be separated to maximize customer safety.

Site roads would be designed to allow residential traffic to scale more than once to facilitate differential tipping fees for various materials.

2.2.3 Scales and Scale House

The scale and scale house would be designed to provide both inbound and outbound features with digital local load transducers. For the purposes of the cost estimate, it is assumed that two 60-foot scales would be constructed to provide separate inbound and outbound lanes.

A small scale house would be constructed to accommodate a single scale operator and house the required scale operations technology. The building is expected to be a prefabricated trailer-type structure with positive pressure climate-controlled ventilation to prevent vehicle fumes from entering the building.

2.2.4 Attendant Shelter

An attendant shelter would be constructed adjacent to the bin walls and bunkers to provide office space and shelter for the site attendant. A prefabricated trailer-type structure on a gravel or concrete pad is envisioned to provide space for facility staff.

2.2.5 Bin Wall

The facility is anticipated to include retaining walls (or bin walls) on the east and west side of the site to provide grade-separated collection bins for various materials. The west bin wall would provide space for approximately two roll-off bins within approximately 25 linear metres of wall. The east bin wall is roughly 179 linear metres, accommodating a 14-bin precast concrete lock-block wall structure.

The bin walls are anticipated to be constructed with precast concrete lock blocks, equipped with wheel stops, and providing steel security guard rails. For each linear metre of lock-block wall, an estimated 15 m of stabilizing geogrid would be needed. Cast-in-place concrete pads would provide the foundation for each roll-off bin. A sample bin wall configuration is provided on Figure 2-1.

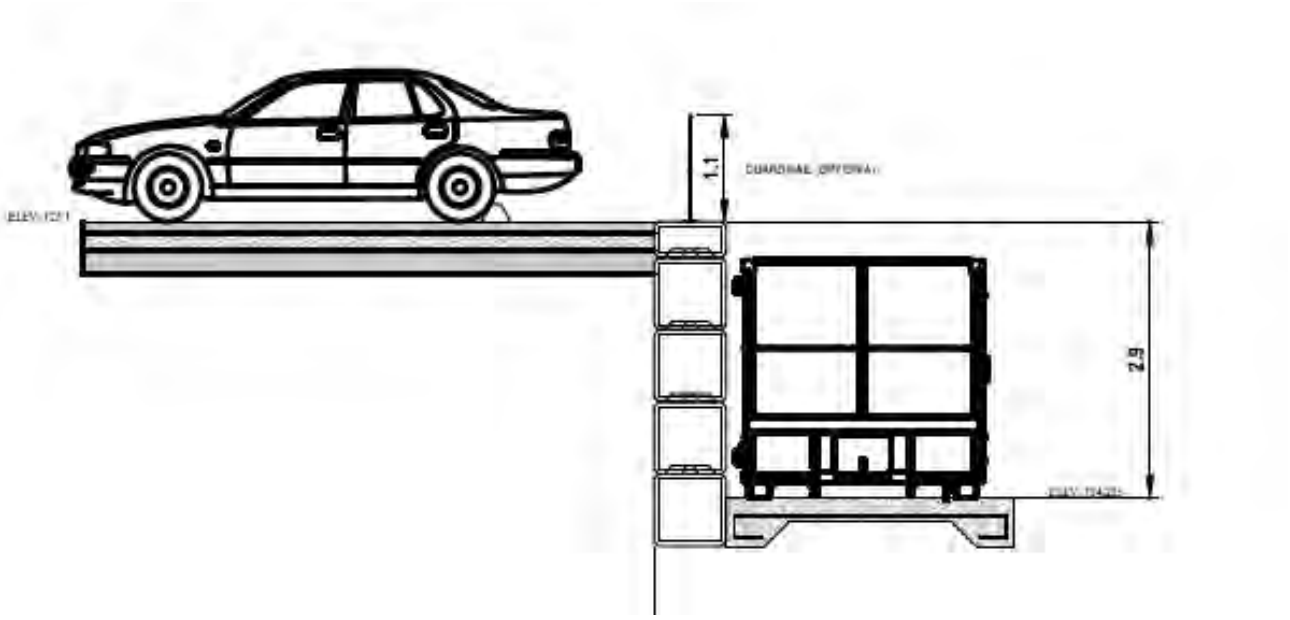


Figure 2-1: Sample Bin Wall Configuration

2.2.5.1 Bins

Based on input from SCRD staff, a total of 16-40 cubic yard roll-off bins are expected to be required to collect materials on the site. Required bins will include:

- Municipal Solid Waste (MSW) – 5 bins
- Green Waste – 2 bins
- Clean Wood – 2 bins
- Dirty Wood – 2 bins
- Gypsum – 2 bins
- Metal – 2 bins
- Spare (Future Materials) – 1 bin

2.2.6 Safety

A safety railing would be installed along the top of the bin wall for fall protection. Typical safety railing height is approximately 1.1 m. Precast concrete curb-stops would be spaced approximately 3.0 m from the top of the bin walls to limit risk of vehicles backing over the edge of the wall and limit the outward force on top of the retaining wall structure.

2.2.7 Signage

Signage would be installed for all storage and transfer areas, as well as the site entrances and exits. Large approach signage would indicate the material stream collected at each location. Smaller point-of-use signage would provide a detailed list of which materials are accepted in each bin. Signage would be targeted toward the general public to aid in public communication and education.

2.2.8 Bulky Goods Bunkers

Several bunker areas would be constructed for material storage using utility-grade lock blocks on gravel or asphalt pads.

2.2.9 Coverall Structure

An open-walled fabric-covered structure is envisioned to provide short-term storage for select divertible materials including mattresses. The structure is anticipated to have a total floor area of approximately 41 m^2.

2.2.10 Commercial Transfer Station

The proposed commercial transfer station would be of a fully enclosed two-bay pre-engineered steel building. The floorspace required is approximately 325 m^2 (3,500 ft^2). The following components would be incorporated:

- Tipping floor design to accommodate:
  - Load inspection; and
  - Storage capacity in the event of delay in the arrival of transfer station trailer.
- Bays, upper and lower, equipped with automated steel roll-up doors to mitigate bird and vector concerns.

The commercial transfer station would be sized for peak flows of MSW and green waste from the commercial sector.

2.3 Updated Capital Cost Estimate

Capital costs have been estimated for the elements described in Section 2.2 and presented in Table 2-1. Costs were estimated based on recent transfer station construction tendered by Tetra Tech and verified by the SCRD. An engineering and construction administration allowance has been assumed at 15% of capital costs. A contingency of 20% has been included to reflect the current lack of design certainty for the facility. The total transfer station capital cost is estimated at approximately $4,660,000 without GST. This estimate excludes the cost of purchasing land at fair market value in the Hillside Industrial Area.

Table 2-1: Transfer Station Updated Conceptual Design Capital Cost Estimate

Item	Estimated Cost
General Site Grading and Preparation	$1,028,000
Transfer Station Area	$2,010,000
Equipment	$416,000
Subtotal (Capital Construction)	**$3,453,000**
Engineering and Construction Administration (15% of Capital)	$518,000
Contingency (20% of Capital)	$690,000
Total Capital (Without GST)	**$4,660,000**

2.4 Transfer Station Economic Evaluation

A range of costs is presented in Table 2-2 to account for the potential variation transfer station operational costs, waste transfer costs, and disposal tipping fees. The capital costs are presented as present-day values. The operating costs are presented as Net Present Value (NPV), assuming an inflation rate of 1.47% and a rate of return requirement of 2.0%. The estimated amount of MSW that will require disposal in the SCRD is 1,216,348 tonnes between 2026 and 2085. The capital cost per tonne was calculated based on the total tonnage expected over the facility's lifespan. The operating cost per tonne was calculated based on an estimated cost of transfer and disposal provided by a third party service provider as well as the cost of operating the transfer station in the Hillside Industrial Area..

Table 2-2: Transfer Station Economic Evaluation

Cost Category	Cost Sub-Category	Transfer Station Costs	
		Low-End	High-End
Capital Costs	Initial Capital Costs	$4.7 Million	
	Sustaining Capital Costs	$3.9 Million	
	$/tonne	**$7**	
NPV Operating Costs (2026-2085)	Annual Operating Costs	$3.5 Million	$5.8 Million
	$/tonne	**$169**	**$280**

2.5 Transfer Station Regulatory Considerations

In British Columbia, there is no provincial permitting specific to transfer stations provided the facility operates in a way that does not create environmental impacts. As with all industrial developments various permits will be required including building permits, a development permit, approval to access the highway, and environmental investigations related to sensitive habitats. There is also a need to confirm that any future transfer station does not create bird strike hazard for any local airports.

The following items should be considered in parallel to any transfer station siting and design process:

1. Transfer stations should be listed within the regional solid waste management plan.
2. Development permits and building permits should be obtained from the local government. Access permits should be obtained from the relevant local or provincial authorities.
3. The facility's design will be required to meet local, provincial, and federal regulations. The most common relevant requirements related to protection of sensitive habitats, watercourses, and contaminated site regulations.
4. Additional permits or approvals may be required to collect or store specific materials and the materials being stored will influence the design requirements of storage structures on the site.
5. Agreements will be required with extended producer responsibility organizations to participate in their programs.

3.0 LANDFILL SITING FEASIBILITY

The feasibility of siting a new landfill was presented to the SCRD Board of Directors in January 2021. A GIS-based suitability analysis was undertaken to identify areas suitable for a new landfill. This was based on a review of publicly available environmental, geotechnical, and topographical information. The analysis focused on the suitability of several locations (i.e., east of Halfmoon Bay, the mine site near Egmont, and the Hillside Industrial Park north of Langdale) based on the requirements of the BC Landfill Criteria for Municipal Solid Waste (Landfill Criteria)[2]. Landfill siting criteria and constraints were superimposed to identify areas meeting key siting requirements. The analysis recommended further examining several locations east of Halfmoon Bay to assess potential for landfill development. Areas where trees had been removed were preferred for ease of further assessment and because LiDAR coverage was not available across all the areas being assessed.

Building on the previous analysis, several locations were further assessed to confirm site access, topography, presence of watercourses, and overall suitability for landfill development. The following sections summarize the analysis completed to assess and prioritize the potential landfill siting locations for further consideration. The discussions and illustrations showing possible landfill configurations are speculative. Confirmation of site suitability would be required, as well as conducting detailed assessments prior to public and regulatory consideration of potential sites.

[2] BC Ministry of Environment and Climate Change. (2016). Landfill Criteria for Municipal Solid Waste – Second Edition. Retrieved from https://www2.gov.bc.ca/assets/gov/environment/waste-management/garbage/landfill_criteria.pdf

3.1 Regulatory Discussion

Following the initial suitability analysis, Tetra Tech met with the British Columbia (BC) Ministry of Environment and Climate Change Strategy (ENV) to confirm priorities, preferences, and timing in the landfill siting process. The following key messages were conveyed during this meeting:

- ENV considers regional Solid Waste Management Plans (SWMPs) to be the primary governing documents for solid waste management as they receive Ministerial approval. ENV recommends updating the SCRD's SWMP to reflect the desired approach to waste disposal in order to facilitate the landfill approval process, if that is the direction that the SCRD intends to take.
- ENV considers all requirements outlined in the Landfill Criteria in assessing applications for landfill siting. If a location does not meet any of the requirements for siting a new landfill, the application must provide justification including engineered solutions to mitigate any related impact.
- Based on the timeline required to site a new landfill prior to closure of the Sechelt Landfill, the SCRD should consider a SWMP amendment focused on changing the region's approach to residual waste disposal. Like a full SWMP update, an amendment requires demonstrated public and First Nations consultation to receive approval from the Minister, but a focused amendment can typically be completed within a few months whereas a full SWMP update typically takes one to two years.
- ENV can be engaged throughout the SWMP update or amendment and landfill siting processes to provide feedback on methodology and coordinate timely review of any submission.

3.2 Site Reconnaissance

The objective of site reconnaissance activities was to assess potential landfill development locations based on their anticipated development costs and the feasibility that they could be transformed into a working landfill. Three locations were pre-selected for additional site reconnaissance based on the following:

- Suitability based on the BC Criteria for Municipal Solid Waste Landfills[3];
- Proximity to environmentally sensitive areas based on available GIS data;
- Site topography;
- Presence of industrial development including previous disturbance or deforestation;
- Anticipated ease of construction and operation; and
- Potential for future expansion to accommodate more than 100 years of airspace.

The three potential locations are in the Halfmoon Bay area, all of which are east of the north-south utility corridor.

On March 19, 2021, Tetra Tech performed landfill site reconnaissance in the undeveloped areas directly east of Halfmoon Bay. In addition to evaluating the three targeted areas of interest, additional sites in deforested areas were reviewed for potential suitability. One additional site (Location Four) was identified and flagged for further analysis. The four potential landfill locations are presented on Figure 5. All examined locations are located on crown land.

[3] BC Ministry of Environment and Climate Change. (2016). Landfill Criteria for Municipal Solid Waste – Second Edition. Retrieved from https://www2.gov.bc.ca/assets/gov/environment/waste-management/garbage/landfill_criteria.pdf

Each site was evaluated for general suitability for landfill development including the following aspects:

- Existing access to confirm that a road either exists or could be reasonably constructed;
- Potential haul distances;
- Proximity to existing utilities;
- Adjacent land uses and potential for future expansion;
- Water courses and whether the area may contain sensitive habitats; and
- Site topography.

3.2.1 Location One

Location One is the northern-most potential location that was identified prior to the in-person landfill reconnaissance. As depicted on Figure 3-1, the potential site (red border) is located approximately 2.25 km east of the area of Secret Cove and is adjacent to the utility corridor.

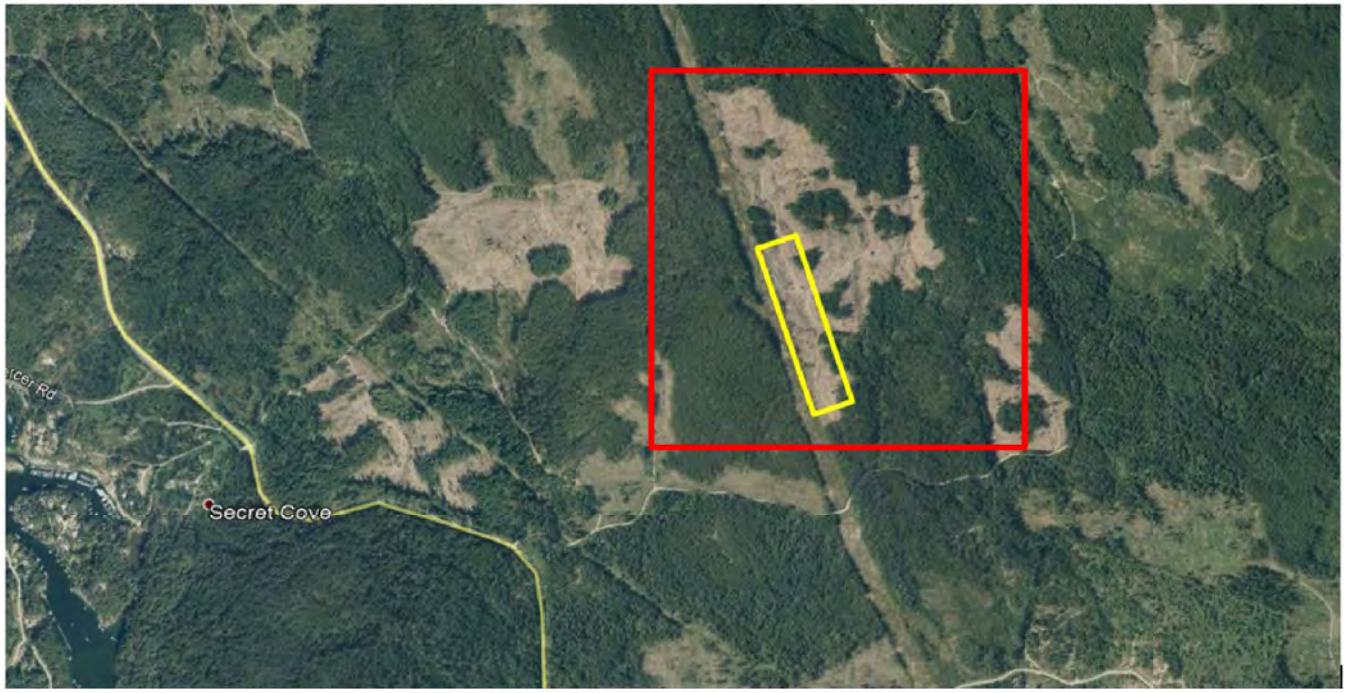


Figure 3-1: Potential Landfill Location One

The southwest corner of the site has the greatest potential for landfill development due to its shallow grade. This area is delineated by the yellow border on Figure 3-1. The topography of the remainder of the site is considered unsuitable for development, including the northern and eastern portions. The gradation of the 1.25 km access road from the Sunshine Coast Highway to the site is expected to be suitable for the municipal and commercial collection vehicles.

The Karstic limestone geology and topography as identified by local signage in the area poses a potential geohazard that may limit landfill development. Karst landscapes are composed of soluble limestone rock, are often associated with the creation of caves and sinkholes causing local instability of the ground surface as well as preferred and rapid drainage paths. If present in the potential footprint, Karst formations would impede landfill development, though this would need to be confirmed via a geotechnical analysis of the area.

Location One is also located near a campground and day-use area located approximately 500 m away presenting a likely challenge to receiving public support. The existing buffer to these adjacent facilities is suitable under the BC Landfill Criteria.

Table 3-1 presents an evaluation of Location One based on the results from the preliminary site reconnaissance activities. Photos of each site are included in Appendix B.

Table 3-1: Location One Evaluation Summary

Evaluation Criteria	Description
Road Access	The existing unnamed dirt access road to this location is in good condition and is at a fairly low grade.
Existing Utilities	High potential for tie-in to electricity via the power lines. If a potential landfill at this location were to develop renewable natural gas from landfill gas, the primary natural gas line is less than one km away.
Existing Land Uses and Potential for Expansion	The area has been logged previously, though not recently. The site is located next to a utility corridor and does not have much opportunity for expansion due to the steep grades to the north and east.
Water Courses and Sensitive Habitat	One minor water course was noted during the visit to Location One, in a north-south orientation in the middle of the yellow-bordered area. A photo of this water course is provided in Appendix B. However, the nearest major water course is located adjacent to the campground, approximately 500 m south of the proposed landfill location.
Site Topography	The area denoted in the yellow-bordered area on **Figure 3-1** s relatively flat and clear of mature vegetation. However, the potential for karst topography is a concern. Geotechnical analysis would be required to confirm suitability of the site for development.
Site Characteristics	
Estimated Haul Distance	Approximately 1.25 km from the Sunshine Coast Highway

3.2.2 Location Two

Location Two is approximately 3.1 km from the nearest building. As depicted on Figure 3-2 below (red box), the potential site is located approximately 1 km west of Phare Lake/Wormy Lake. Due to road closure and active logging, the intended location was not directly reviewed during the landfill reconnaissance. Tetra Tech staff examined two alternative locations directly north of the road closure (Location 2A and Location 2B). Location 2A is delineated by the yellow box and Location 2B is delineated by the green box on Figure 3-2.

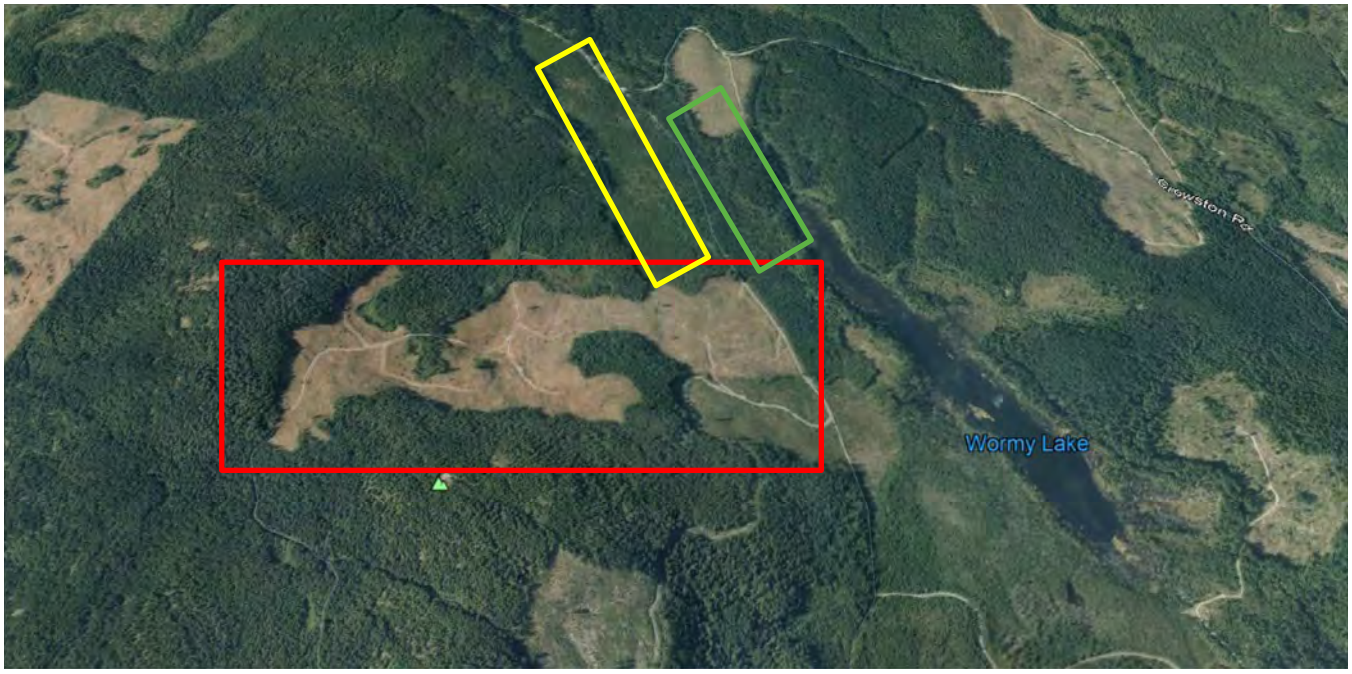


Figure 3-2: Potential Landfill Location Two

Based on available information, no human residents were apparent within a three-km radius of Location Two, limiting the potential for concerns arising from neighbouring residents and/or property owners. A considerable length of access road improvement would be required for all-weather access to this site. It is estimated that vehicles would need to travel nearly seven kilometers (km) from the Sunshine Coast Highway to reach this potential location, corresponding to a 12 to 15-minute drive. Location Two can be reached by travelling up Trout Lake Rd. to Halfmoon-Carlson Forest Service Road.

Location 2A is a large area that has previously been logged, though the newly planted trees have matured to an approximate height of 2.0 to 2.5 m. The existing slope in the area is undesirable for landfill development.

Location 2B is located east of the existing access road. The area is flat but is completely covered with mature trees. Additionally, the flat area is narrow (approximately 100 m wide) before the grade increases significantly towards Phare Lake/Wormy Lake.

Table 3-2 presents an evaluation of Location Two based on the results of the preliminary site reconnaissance activities. Site photos are presented in Appendix B.

Table 3-2: Potential Location Two Evaluation

Evaluation Criteria	Description
Road Access	The dirt access road is in good shape and does not seemingly approach any grades too steep for commercial vehicles. However, upgrading the road to accommodate commercial vehicles may result in considerable cost. Location Two can be reached by travelling up one of the two arms of Trout Lake Rd. to Halfmoon-Carlson Forest Service Road. There are residences on the more northerly arm of Trout Lake Rd although this arm of the road is in better condition.
Existing Utilities	No utilities nearby.
Existing Land Uses and Potential for Expansion	Evidence of extensive logging in the area.
Water Courses and Sensitive Habitat	No water courses were noted in this area, though Phare Lake/Wormy Lake is within one km of Location Two (including Location 2A and Location 2B).
Site Topography	Unable to reach Location Two. Location 2A had a steep grade with young trees. Location 2B was flat but had fully developed trees.
Site Characteristics	
Estimated Haul Distance	Approximately 6.5 km from the Sunshine Coast Highway

3.2.3 Location Three

Location Three is the southern-most potential location identified for analysis. It is located east of the Sunshine Coast Highway and southeast of Trout Lake. As presented on Figure 3-3, there were two potential development areas identified. Both areas of interest are located east of the utility corridor.

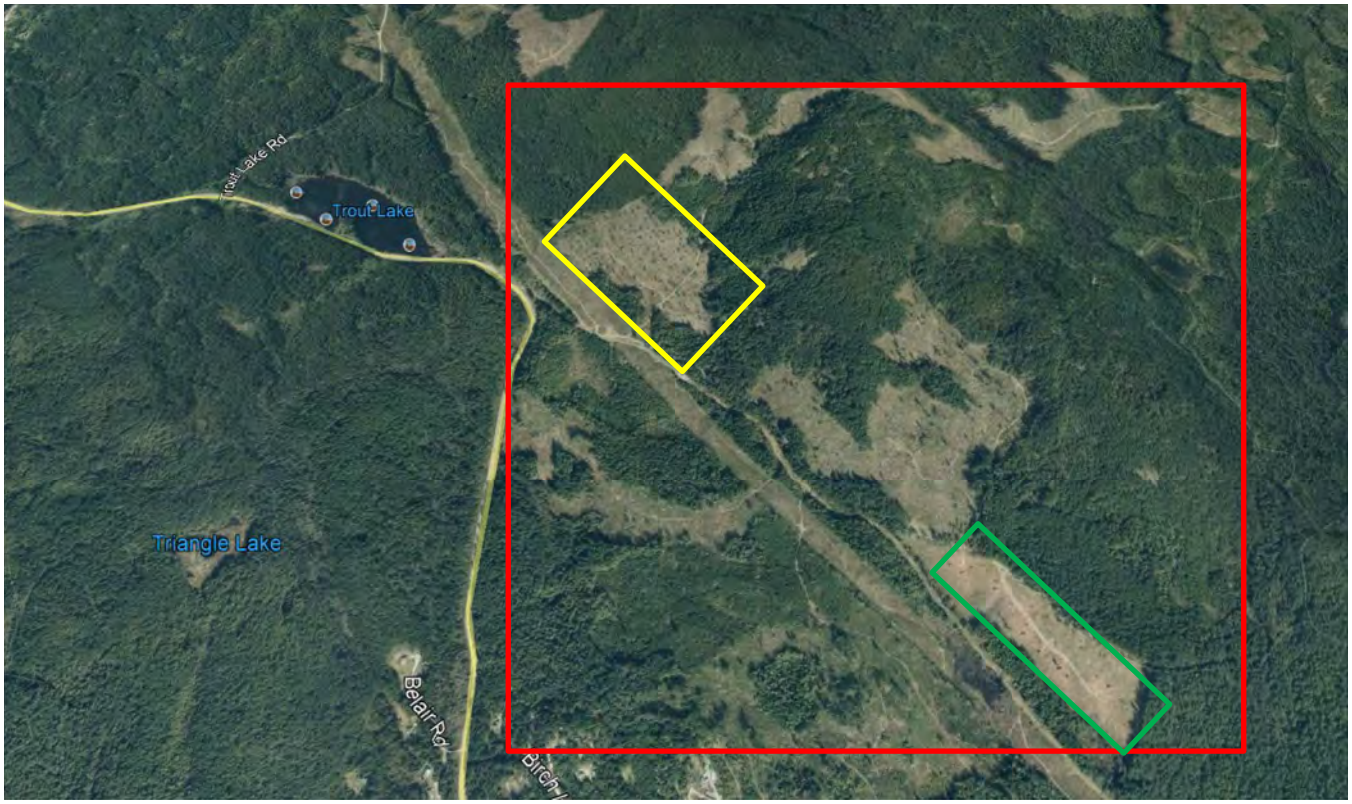


Figure 3-3: Potential Landfill Location Three

The southern area of interest, marked by the green box, is a narrow flat area of approximately 13.5 hectares. This area is located adjacent to the existing utility corridor. While this needs to be considered during landfill development due to potential crossing and proximity agreements required for development, the location could access this utility. The existing road access for the southern area of interest has a grade suitable for waste collection vehicles and appears to be maintained for all-season access. The location can be accessed within a two-minute drive from the Sunshine Coast Highway.

The northern area of interest, marked by the yellow box, was previously forested comprising approximately 16.5 hectares with a slight grade generally considered suitable for development. This location has easy road access on Carlson Forest Service Road, approximately 300 metres from the Sunshine Coast Highway. The area is located approximately 450 m east of Trout Lake which meets the BC Landfill Criteria guidelines requiring a minimum 300 m buffer from waterbodies.

Table 3-3 below presents an evaluation of Location Three based on the preliminary site reconnaissance activities. Site visit photos are presented in Appendix B.

Table 3-3: Location Three Evaluation

Evaluation Criteria	Description
Road Access	Carlson Forest Service Road provides ready access to site and is at a very low grade for both potential locations at Location Three.
Existing Utilities	Both locations of interest are located just adjacent to the utility corridor, offering easy connection to utilities if this location is pursued further.
Existing Land Uses and Potential for Expansion	Both areas of interest have previously been logged, though mature trees remain sparsely distributed in the logged areas. As the area has a relatively low grade, there is potential for expansion in the treed areas directly adjacent to both areas of interest.
Water Courses and Sensitive Habitat	Two minor watercourses have been observed in Location Three, as presented in Appendix B. Trout Lake is situated approximately 450 m to the west of the northern area of interest and over 1.6 km from the southern area of interest.
Site Topography	The northern area of interest is at a low grade, which is preferable for developing a new landfill.
Site Characteristics	
Estimated Haul Distance	Approximately 500 m from the Sunshine Coast Highway

3.2.4 Location Four

Location Four was not identified through the screening analysis but has been included for consideration due to the recent logging completed in the area and the low relief of the site that suits it to landfill development. This site is located approximately 750 m north of Location Two, as indicated on Figure 5. Location Four is located four km east of Halfmoon Bay, which is approximately a 12-minute drive along the well-maintained service road. Figure 3-4 identifies Location Four, indicated by the red border.

Figure 3-4: Potential Landfill Location Four

As depicted in site photos (Appendix B), Location Four is a largely flat area that has been recently cleared of trees. There is evidence of recent activity at this site; the entrance has been blocked and new vegetation has been recently planted. It is estimated that it would take a commercial vehicle roughly 12 minutes to drive to this location using the existing forestry road. Location Four can be reached by travelling up Trout Lake Rd. to Halfmoon-Carlson Forest Service Road. However, due to the remote location, there are no known human receptors in the surrounding area. There is a fish-bearing stream (Halfmoon Creek) that is located approximately 300 m northwest of Location Four.

Table 3-4 below presents an evaluation of Location Four based on the preliminary site reconnaissance activities. Photos of the site are included in Appendix B.

Table 3-4: Location Four Evaluation

Evaluation Criteria	Description
Road Access	Slight incline on dirt service road to reach this location. Location Two can be reached by travelling up Trout Lake Rd. to Halfmoon-Carlson Forest Service Road.
Existing Utilities	No utilities nearby.
Existing Land Uses and Potential for Expansion	Location Four has been recently cleared of all vegetation. Landfill development and expansion feasible, based on site reconnaissance
Water Courses and Sensitive Habitat	There was one minor water course noted at Location Four. There is a fish-bearing stream (Halfmoon Creek) approximately 300 m from the projected western edge of the potential waste footprint.
Site Topography	The site topography of Location Four is favourable for landfill development due to its low grade
Site Characteristics	
Estimated Haul Distance	Approximately 5.5 km from the Sunshine Coast Highway

3.3 Potential Landfill Footprint and Airspace

Tetra Tech was provided LiDAR data by the SCRD. A review of the data indicated that only Location Three was covered by the available data. Tetra Tech coordinated a topographic survey of the potential landfill locations by Coastal Resource Mapping Ltd. (CRM) to approximate contours of the ground surface and identify potential areas for landfill development. An Unmanned Aerial Vehicle (UAV) was used to complete the survey, providing an accuracy of approximately 5 cm (horizontal and vertical). This is regarded as suitable for this stage of the siting process, but more detailed survey would be required if the site was to be pursued further.

The available survey technology did not provide bare-earth contours (i.e., ground surface readings under forested areas), therefore the survey focused on previously logged areas. Using Google Earth to identify the limits of the cleared areas, as well as information acquired during the site reconnaissance, Tetra Tech provided CRM with shape files to plan surveys. Location One was excluded from further analysis due to the identified Karst topography in the area and the distance to population centres in the region.

The surveys by UAV were completed on April 15 and 16, 2021. Survey data was processed by CRM and transmitted to Tetra Tech for an assessment of the topography. The following includes a summary of each of the surveys and preliminary airspace estimates. It should be noted that modeling was not completed as part of this scope of work. The final waste contours shown in the figures described below and airspace estimates are based on a preliminary assessment. In all cases Tetra Tech has assumed no blasting would be required for landfill construction. It is also important to note that the airspace values presented below are limited by the survey area which only included deforested (i.e. logged) areas. The potential for expansion beyond the surveyed areas is not known.

3.3.1 Location Two

The surveyed area for Location Two is approximately 70 hectares and was the largest location surveyed. Figure 6A through Figure 6C show the overall site plan, the preliminary top of waste contours and landfill cross-sections. A 3D model is shown on Figure 6D. As can be seen on Figure 6A, the potential landfill is located on the western portion of the site and occupies a footprint of approximately 18.7 hectares. This provides an approximate airspace of 5.8 million cubic metres which is equivalent to approximately 200 years of lifespan. The eastern portion of the site is not suitable for landfill expansion given the steepness of the grade.

3.3.2 Location Three

The Location Three survey data is shown on Figures 7A through 7D. The surveyed area covers approximately 30 hectares. This location is constrained by the Sunshine Coast Highway, located approximately 1.0 km to the southwest of the site, and the slope to the northeast. The potential landfill occupies a footprint of approximately 12.5 hectares which provides an estimated airspace of 1.7 million cubic metres or roughly 60 years of airspace.

3.3.3 Location Four

The survey data for Location Four is presented on Figures 8A through 8D. The surveyed area is approximately 23 hectares. The centre of the potential landfill is in a low point with a total footprint of approximately 12.8 hectares. The estimated airspace is 2.2 million cubic metres which equates to approximately 80 years equivalent of airspace.

3.4 Conformance with Landfill Criteria

Table 3-5 presents an analysis of each potential location's ability to conform to the landfill siting requirements listed in the BC Landfill Criteria. There are several criteria that require further analysis to confirm location suitability. The majority of this work is related to completion of a detailed site investigation to determine geologic and hydrogeologic conditions, address environmental sensitivities, identify any heritage and archeological sites, and confirm sufficient buffer zones.

Table 3-5: Comparison to Landfill Criteria

Criteria for Siting a Landfill in British Columbia	Comment	Does the Location Conform to the Criteria? (✓ - Yes; ✗ - No; ? – To Be Determined)			
		1	2	3	4
>500 m from sensitive land use current or planned	A high-level assessment was completed based on publicly available information, but additional analysis is required to confirm sufficient buffer once the approximate landfill footprint is established.	✓	✓	✓	✓
>100 m from heritage/archeological site	Archeological study required for the identified sites.	?	?	?	?
>8 km from airport/float plane base or 3.2 km if bird control measures are accepted*	All identified sites are at least 8 km from the airport	✓	✓	✓	✓
Buffer zones 500 m	Each location appears to have sufficient space to establish the required buffer from any adjacent developments or land uses.	✓	✓	✓	✓
>500 m from municipal water supply wells	The locations identified are well over 500 m from existing municipal water supply wells.	✓	✓	✓	✓
Away from gullies and depressions	A high-level assessment was completed based on publicly available satellite images and limited location aerial survey. Based on the analysis to date all locations meet this criterion but additional site investigations and survey is required to confirm conformance.	✓	✓	✓	✓

Criteria for Siting a Landfill in British Columbia	Comment	Does the Location Conform to the Criteria? (✓ - Yes; ✗ - No; ? – To Be Determined)			
		1	2	3	4
Faults and unstable areas to be avoided	Location One was eliminated based in part on the proximity to potential Karst landscapes. Based on information reviewed to date the other locations do not appear overly faults or unstable areas. Further site investigation is required to confirm existing slope stability in the areas around each proposed landfill location.	✗	✓	✓	✓
>100 m from environmentally sensitive areas	All locations appear have some overlap with environmentally sensitive areas as shown in available provincial mapping. However, each location was selected based on ongoing industrial activity including recent active logging operations. Further site investigation work is required to confirm the presence of any sensitive areas within the proposal landfill locations and plan the exact boundaries of a potential landfill.	✗	✗	✗	✗
>100 m from surface water	All locations are located more than 100 m from known surface water however, there may be small watercourses, ephemeral streams, springs, or seasonal drainage pathways that would be identified through detailed site investigations.	✓	✓	✓	✓
Not in a flood plain	All locations are in sufficiently high ground and away from any major watercourses that may experience overland flooding. There are potential issues at some proposed locations with run-on surface water from adjacent slopes and properties, but these may be reasonably addressed through engineered controls and facility design.	✓	✓	✓	✓
Shoreline area to be avoided	All locations are away from the shoreline.	✓	✓	✓	✓
Depth to water table from base > 1.5 m	Intrusive site investigations are required to confirm depth to water table at each site. It is likely that each potential location would have areas where the water table is within 1.5 m of the potential landfill base. Any areas of non-conformance with this criterion would be addressed through the facility design and potentially seeking a limited exemption from ENV in areas where the landfill base cannot be raised sufficiently.	?	?	?	?

* Note – BC Landfill Criteria specifies 8 km as the required minimum separation from airports. Transport Canada requirements indicate that bird strikes may pose a hazard for landfills located within 11 km along the runway approach or descent paths for airports supporting commuter aircraft[4]. Figure 1 shows an 11 km airport offset radius. All locations are over 11 km away from the Sechelt Airport , but Locations 2, 3 and 4 are within 11 km of the Sechelt Porpoise Bay Water Aerodrome.

[4] Transport Canada. (2007). Airport Wildlife Management Bulletin – TP 8240 – No. 38. Retrieved from https://tc.canada.ca/en/aviation/publications/airport-wildlife-management-bulletins-tp-8240/airport-wildlife-management-bulletin-tp-8240-no-38.

Due to the potential presence of Karst landscapes and proximity to a campground and day-use area, Location One was not carried forward for further analysis.

3.5 Landfill Economic Evaluation

Tetra Tech completed a high-level economic evaluation for siting a new landfill as part of the feasibility assessment completed during Part 2 of the project. The evaluation presented here considers the approximate costs previously presented with the addition of costs associated with haul roads and utilities (electricity), as well as the addition of capital costs related to detailed engineering and detailed site assessment (i.e. geotechnical, hydrogeotechnical or biophysical expenditures). The potential difference in the cost to construct the onsite infrastructure at each location has not been analyzed as this greater level of engineering would require additional data that is not currently available. The costs to develop a landfill at each location may vary greatly based on topography and local environmental conditions. The costs presented do not account for the complexity of the permitting and approval process required, level of stakeholder consultation necessary, nor any costs related to crown land tenure. It should also be noted that the economic evaluation does not account for setbacks that may be encountered while working towards siting a particular landfill site.

A basic cost for junction treatment at the highway has been included. However, the requirements for safe access to and from the highway for all vehicles and especially trucks could be considerable. Presently the cost estimates include a treatment to allow basic right turn access and egress. The junction at Location 3 would be especially demanding.

A range of costs is presented in Table 3-6 to account for the potential variation in costs at each location. The capital costs are presented as present-day values. The operating costs are presented as Net Present Value (NPV), assuming an inflation rate of 1.47% and a rate of return requirement of 2.0%. The per tonne cost of each component assumes an approximate annual disposal of 18,000 tonnes.

Table 3-6: Landfill Economic Evaluation

Location	Cost Category	Cost Sub-Category	New Landfill Costs	
			Low-End	High-End
Location Two	**Capital Costs**	Capital Costs	$32.9 Million	$41.2 Million
		$/tonne	**$10**	**$11**
	NPV Operating Costs (2026-2225)	Annual Operating Costs	$2.5 Million	$3.6 Million
		$/tonne	**$140**	**$195**
Location Three	**Capital Costs**	Capital Costs	$20.1 Million	$26.0 Million
		$/tonne	**$18**	**$24**
	NPV Operating Costs (2026-2085)	Annual Operating Costs	$2.5 Million	$3.6 Million
		$/tonne	**$140**	**$195**
Location Four	**Capital Costs**	Capital Costs	$25.9 Million	$33.9 Million
		$/tonne	**$18**	**$23**
	NPV Operating Costs (2026-2110)	Annual Operating Costs	$2.5 Million	$3.6 Million
		$/tonne	**$140**	**$195**

3.6 Landfill Siting Summary

As detailed in Section 3.2 through Section 3.5, there are three locations that are considered feasible for landfill siting and development based on the BC Landfill Criteria. The relevant information along with opportunities and challenges associated with each of the potential locations is summarized in Table 3.7.

Table 3-7: Landfill Location Summary

Landfill Characteristic	Location One	Location Two	Location Three	Location Four	Details Provided in Report Section
Estimated Landfill Footprint	Not Applicably – Location Not Surveyed	18.7 ha	12.5 ha	12.8 ha	3.3
Estimated Airspace	Not Applicably – Location Not Surveyed	5.8 M m^3	1.7 M m^3	2.2 M m^3	3.3
Potential for Landfill Lifespan	Not Applicably – Location Not Surveyed	200 years	60 years	80 years	3.3
Estimated Road Length to Highway	1.3 km	6.5 km	0.5 km	5.5 km	3.2
Non-Conformance Considerations with the BC Landfill Criteria ✘ - No; ? – Unknown	✘ - Faults and unstable areas to be avoided ✘ - >100m from environmentally sensitive areas ? - >100m from heritage/archeological site ? – Depth to water table from base > 1.5 m	✘ - >100m from environmentally sensitive areas ? - >100m from heritage/archeological site ? – Depth to water table from base > 1.5 m	✘ - >100m from environmentally sensitive areas ? - >100m from heritage/archeological site ? – Depth to water table from base > 1.5 m	✘ - >100m from environmentally sensitive areas ? - >100m from heritage/archeological site ? – Depth to water table from base > 1.5 m	3.4
Estimated Development Capital Cost (Lifespan)	Not Applicable – Location Not Surveyed	$32.9 - $41.2 Million $10/tonne - $11/tonne	$20.1 - $26.0 Million $18/tonne - $24/tonne	$25.9 - $33.9 Million $18/tonne - $23/tonne	3.5
Challenges	▪ Karst landscape presents a potential geohazard ▪ Adjacent land uses present risk to public support ▪ Location is far from major populations	▪ Requires longest haul road development, increasing cost to maintain access in all seasons ▪ No nearby power connections ▪ Potential development area is narrow construction of the landfill liner and berms may be more challenging in this location due to the underlying topography.	▪ Location meets the buffer criteria for water bodies but is within 450 m of Trout Lake which may present a risk to public support.	▪ Location is remote, requiring long-haul road development and utility connection.	Not Applicable

Landfill Characteristic	Location One	Location Two	Location Three	Location Four	Details Provided in Report Section
Opportunities	▪ Existing access road can be easily upgraded to accommodate landfill traffic	▪ Available area appears to exceed required airspace requirements	▪ Adjacent to existing utility corridor ▪ Closest location to the highway ▪ Existing access road is suitable for all-seasons so anticipated capital upgrades are minimal	▪ Remote location appears to neighbour existing Crown land and industrial (forestry) operations.	Not Applicable
Location is feasible for Landfill Development based on BC Landfill Criteria	Recommended not to proceed.	**Yes**	**Yes**	**Yes**	Not Applicable

4.0 CLOSURE

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech Canada Inc.

Prepared by:
Zachary Lirenman, B.Sc.
Project Scientist
Solid Waste Management Practice
Direct Line: 778.945.5930
Zach.Lirenman@tetratech.com

2021-06-29
PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
L. A. Y. QUAN
46301

Transfer Station Feasibility Prepared by:
Lauren Quan, P.Eng.
Project Engineer
Solid Waste Management Practice
Direct Line: 204.954.6850
Lauren.Quan@tetratech.com

Prepared by:
Nancy Nikolakakis, P.Eng. (AB)
Project Engineer
Solid Waste Management Practice
Direct Line: 403.723.1536
Nancy.Nikolakakis@tetratech.com

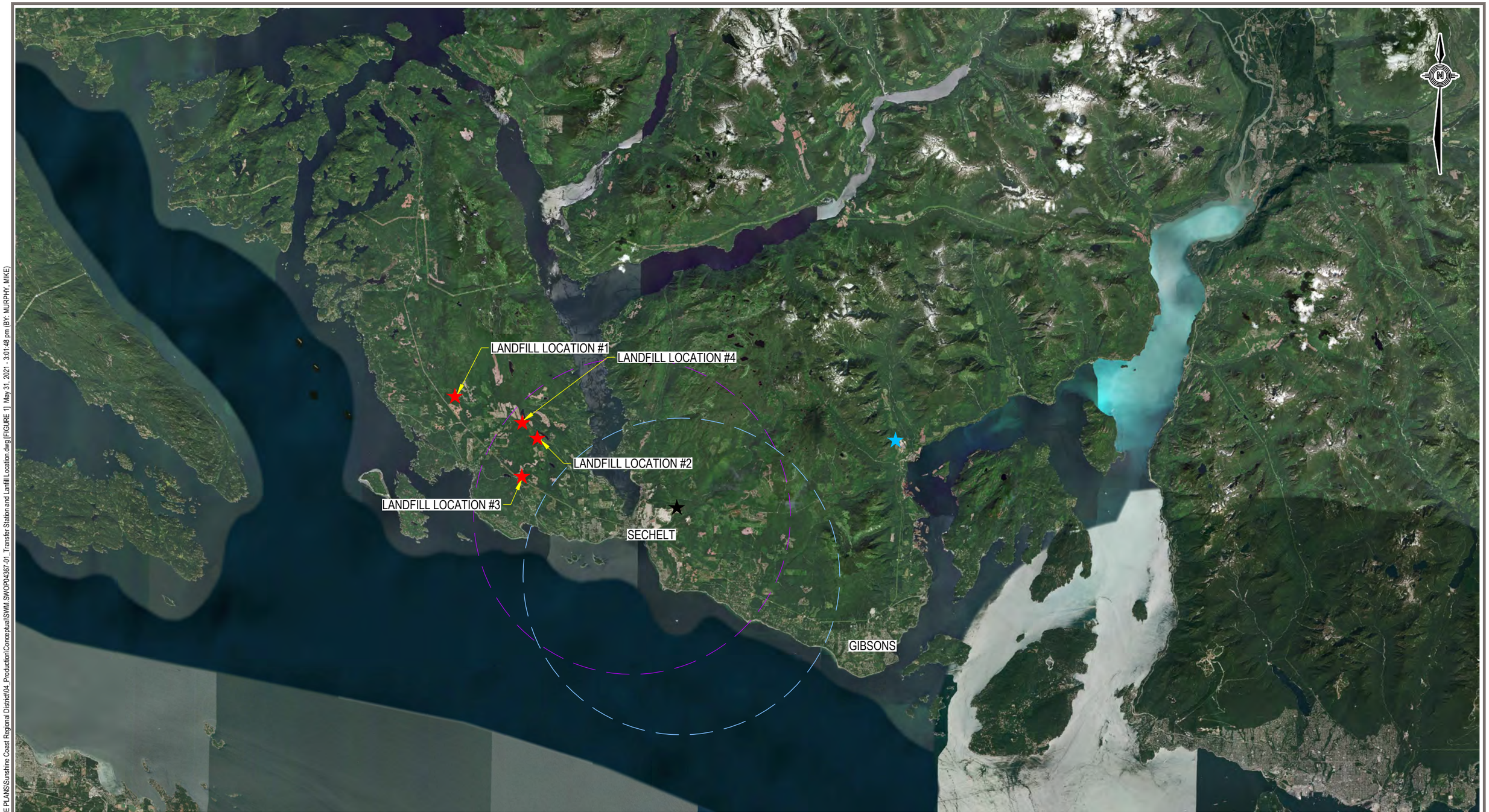
Reviewed by:
Wilbert Yang, P.Eng.
Senior Planning Engineer
Solid Waste Management Practice
Direct Line: 604.608.8648
Wilbert.Yang@tetratech.com

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
P. A. EVANS
43152

Reviewed by:
Paul Evans, P.Eng., MBA
Project Engineer / Senior Consultant
Solid Waste Management Practice
Direct Line: 403.899.1477
Paul.Evans@tetratech.com

/sy

FIGURES



LEGEND:

- POTENTIAL LANDFILL LOCATION
- POTENTIAL TRANSFER STATION LOCATION
- CURRENT SECHELT LANDFILL
- SECHELT GIBSONS AIRPORT TRANSPORT CANADA PRIMARY AND SECONDARY BIRD HAZARD ZONE FOR (FAR 23) COMMUTER AIRCRAFT (11km RADIUS)
- SECHELT PORPOISE BAY WATER AERODOME TRANSPORT CANADA PRIMARY AND SECONDARY BIRD HAZARD ZONE FOR (FAR 23) COMMUTER AIRCRAFT (11km RADIUS)

0 12 500 m

Scale: 1: 250 000

CLIENT: SUNSHINE COAST REGIONAL DISTRICT

TETRA TECH

SCRD BC FUTURE WASTE DISPOSAL OPTIONS ANALYSIS STUDY

AREAS OF INTEREST

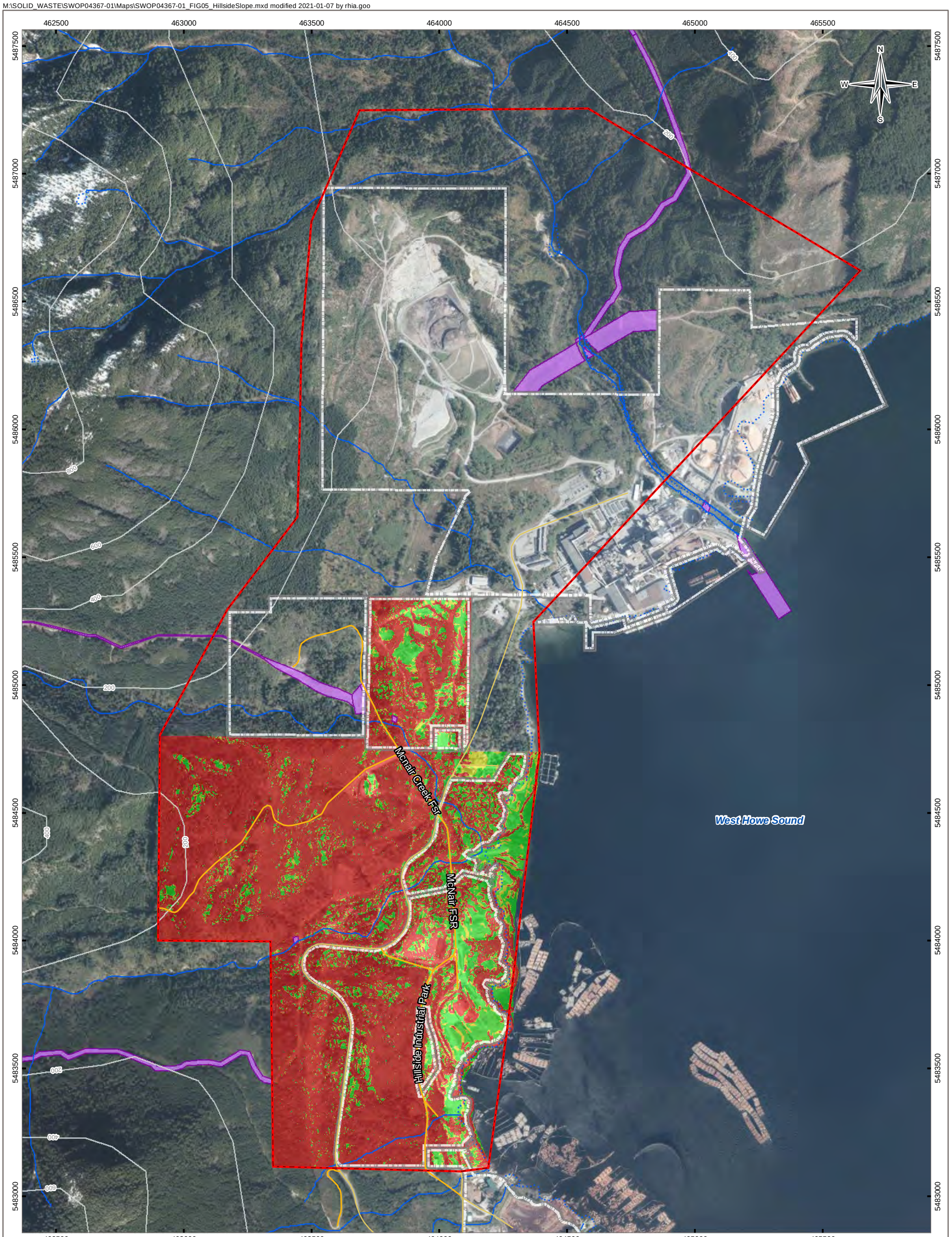
PROJECT NO.	DWN	CKD	REV
SWM.SWOP04367-01	MM	NN	0

OFFICE: CGY

DATE: May 2021

Figure 1

M:\SOLID_WASTE\SWOP04367-01\Maps\SWOP04367-01_FIG05_HillsideSlope.mxd modified 2021-01-07 by rhia.goo



LEGEND

- Area of Interest

Percent Slope

- <5%
- 5-7.5%
- >7.5%

Base Data

- Major Road
- Local Road
- Elevation Contour (200 m)
- Stream
- Shoreline
- Land Use - Industrial Zoning
- Crown Land
- Preferred Transfer Station Location

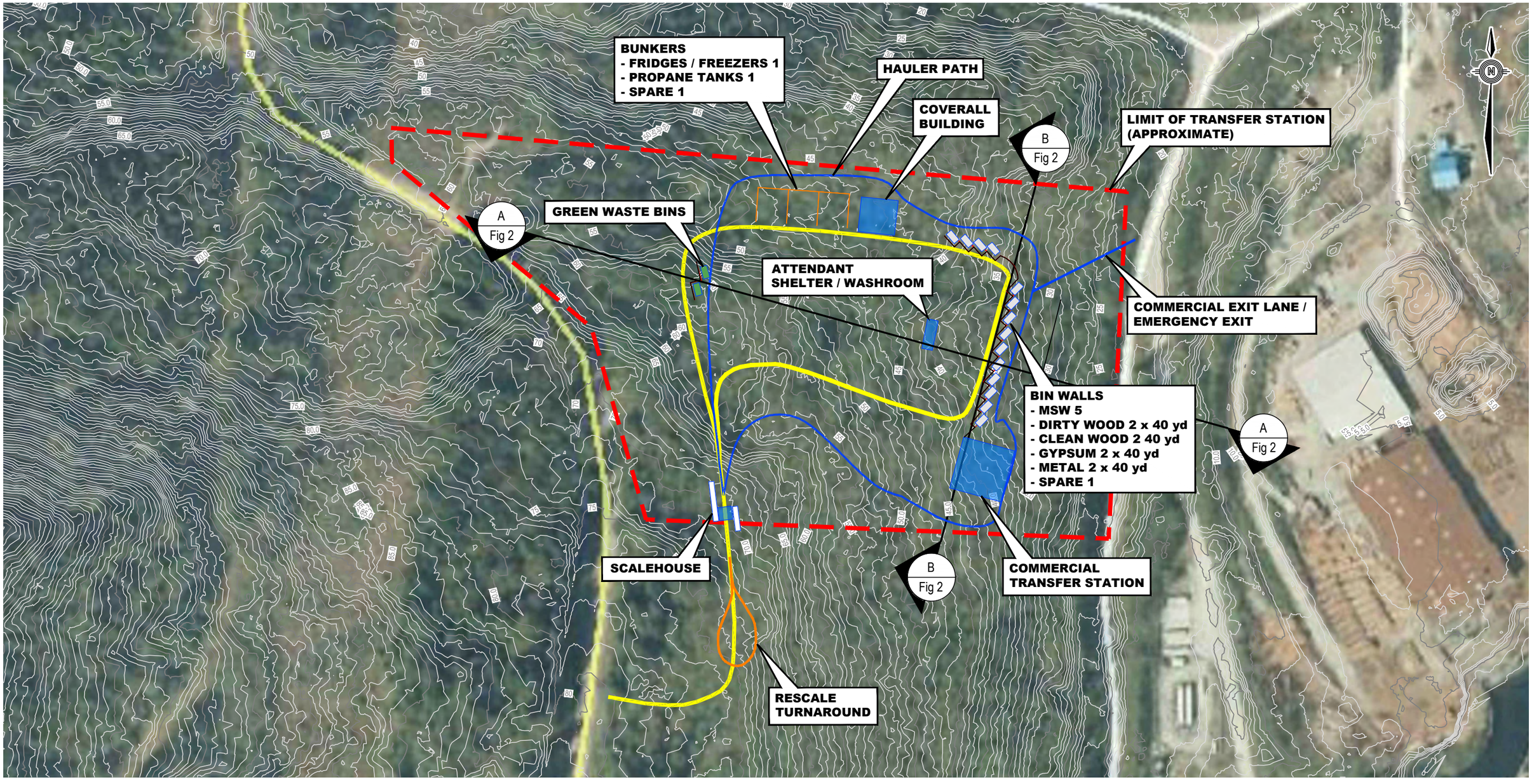
NOTES
Base data source:
Canvec (2019), DataBC (2019)
SCRD (downloaded 2020)
Base imagery source:
ESRI-Maxar (various 2013-2019)

STATUS
ISSUED FOR USE

FUTURE WASTE DISPOSAL OPTIONS ANALYSIS STUDY
SUNSHINE COAST REGIONAL DISTRICT, BC

Topography at Hillside North of Langdale

PROJECTION: UTM Zone 10			DATUM: NAD83	CLIENT
Scale: 1:14,000 (200 100 0 200 Metres)				
FILE NO.: SWOP04367-01_FIG05_HillsideSlope.mxd				TETRA TECH
OFFICE: Tt-CAL	DWN: RG	CKD: SL	APVD: NN	REV: 0
DATE: January 7, 2021	PROJECT NO.: SWM.SWOP04367-01			Figure 2



0 100 m

Scale: 1: 2 000

CLIENT

SUNSHINE COAST REGIONAL DISTRICT

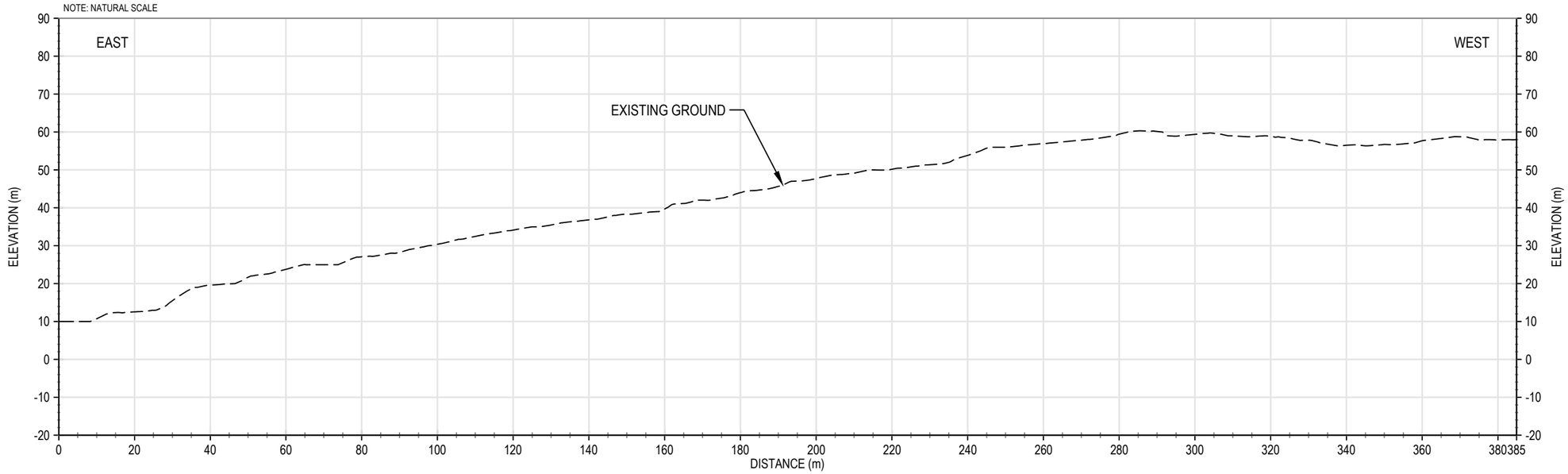
TETRA TECH

SCRD BC FUTURE WASTE DISPOSAL OPTIONS ANALYSIS STUDY

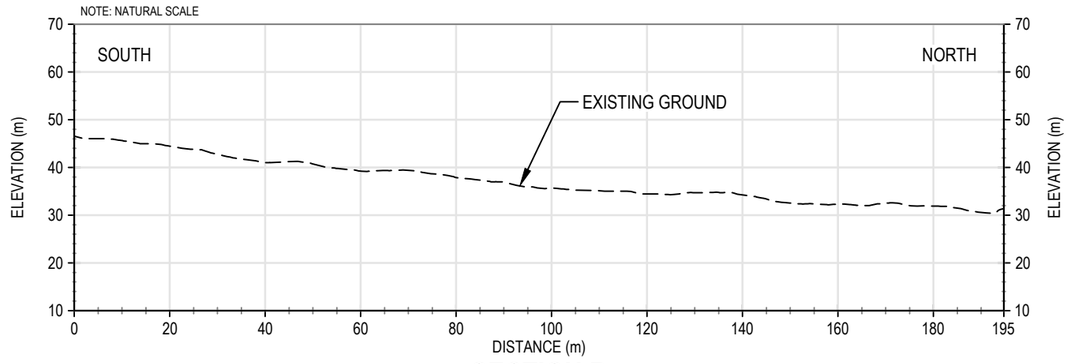
SITE PLAN SHOWING SCHEMATIC TRANSFER STATION LOCATION

PROJECT No.	OFFICE	DES	CKD	REV	DRAWING
SWM.SWOP04367-01	EDM	LQ/DBD	LQ	0	Figure 3
DATE: May 2021	SHEET No. 1 of 2	DWN DBD	APP LQ	STATUS A	

C:\Debashis\Office Projects\00_MASTER PROJECT BASE PLANS\Sunshine Coast Regional District\06_Figures\SWM.SWOP04367-01 Figures 3-4_TS.dwg [FIGURE 3] May 14, 2021 - 7:17:30 am (BY: DAS, DEBASHIS)



SECTION A



SECTION B

0 50 m

Scale: 1: 1 250

lx

CLIENT

SUNSHINE COAST REGIONAL DISTRICT

TETRA TECH

SCRD BC FUTURE WASTE DISPOSAL OPTIONS ANALYSIS STUDY

TRANSFER STATION CROSS-SECTIONS

PROJECT No.	OFFICE	DES	CKD	REV	DRAWING
SWM.SWOP04367-01	EDM	LQ/DBD	LQ	0	Figure 4
DATE: May 2021	SHEET No. 2 of 2	DWN DBD	APP LQ	STATUS A	

CLIENT

SUNSHINE COAST REGIONAL DISTRICT

TETRA TECH

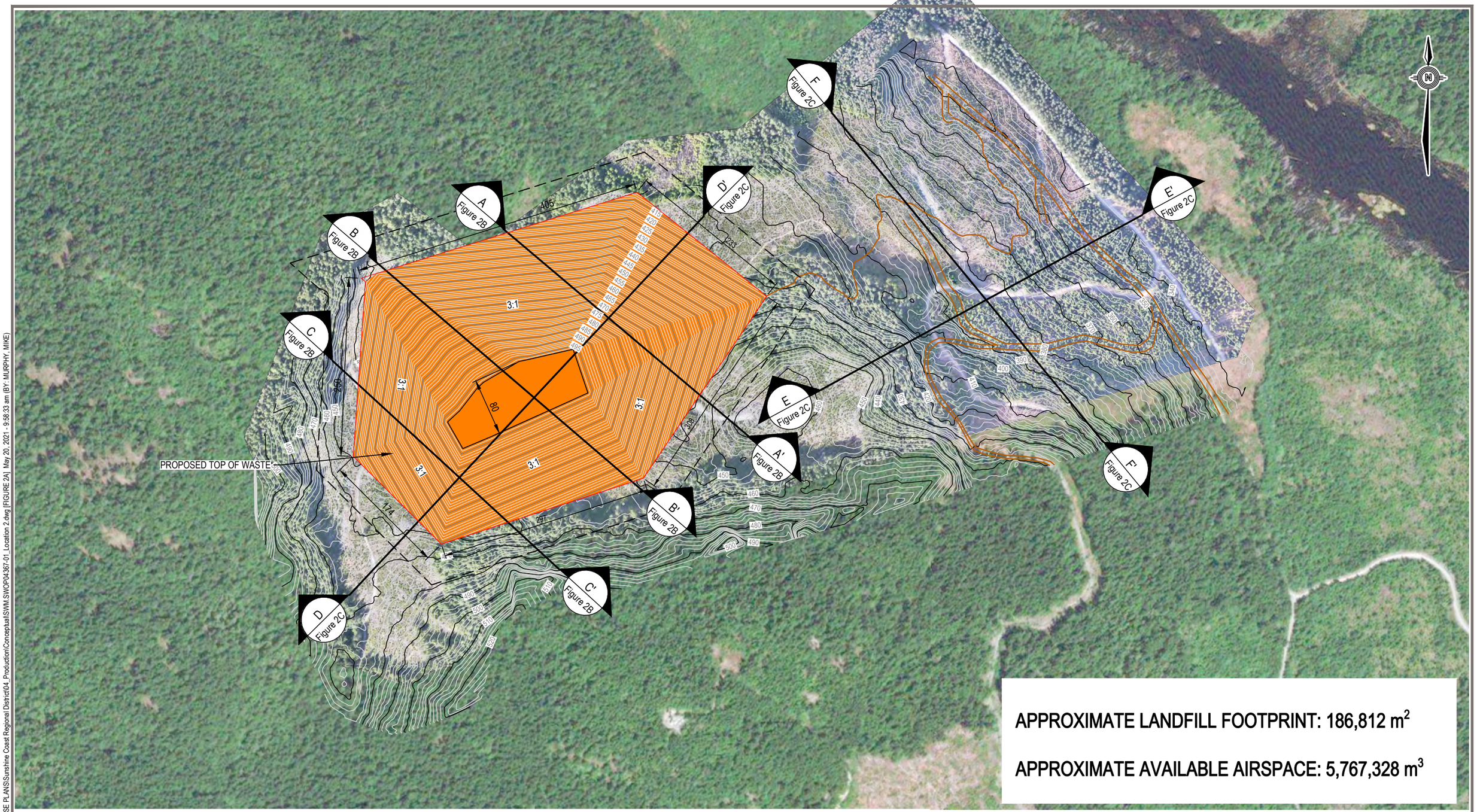
SCRD BC FUTURE WASTE DISPOSAL OPTIONS ANALYSIS STUDY

OVERVIEW OF POTENTIAL LANDFILL LOCATIONS

PROJECT NO.	DWN	CKD	REV
SWM.SWOP04367-01	MC	NN	0
OFFICE: CGY	DATE: April 2021		

Figure 5

Q:\Edmonton\Drafting\00_MASTER PROJECT BASE PLANS\Sunshine Coast Regional District\04_Production\Conceptual\SWM.SWOP04367-01_Figure 1-3.dwg [FIGURE 1] April 12, 2021 - 12:47:20 pm (BY: CONLEY, MIKE)



APPROXIMATE LANDFILL FOOTPRINT: 186,812 m^2

APPROXIMATE AVAILABLE AIRSPACE: 5,767,328 m^3

LEGEND:

- MAJOR CONTOUR (10m)
- MINOR CONTOUR (2m)
- LANDFILL CELL FOOTPRINT (APPROXIMATELY 100 YEAR TOTAL CAPACITY)
- 50m BUFFER
- ROAD

0 200 m

Scale: 1: 4 000

CLIENT

SUNSHINE COAST REGIONAL DISTRICT

TETRA TECH

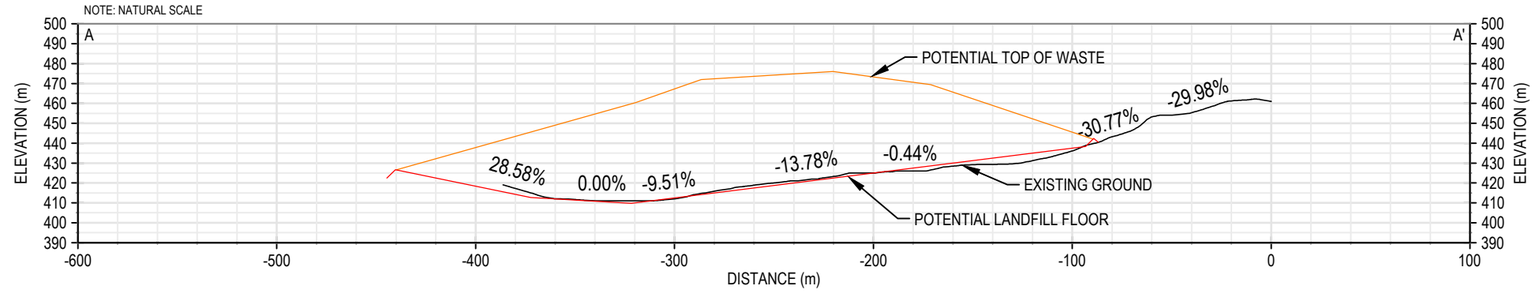
SCRD BC FUTURE WASTE DISPOSAL OPTIONS ANALYSIS STUDY

LANDFILL LOCATION 2
CONCEPTUAL FINAL CONTOURS - PLAN VIEW

PROJECT NO.	DWN	CKD	REV
SWM.SWOP04367-01	MC	NN	0
OFFICE: CGY	DATE: May 2021		

Figure 6A

Q:\Edmonton\Drafting\00_MASTER PROJECT BASE PLANS\Sunshine Coast Regional District\04_Production\Conceptual\SWM.SWOP04367-01_Location 2.dwg [FIGURE 2A] May 20, 2021 - 9:58:33 am (BY: MURPHY, MIKE)



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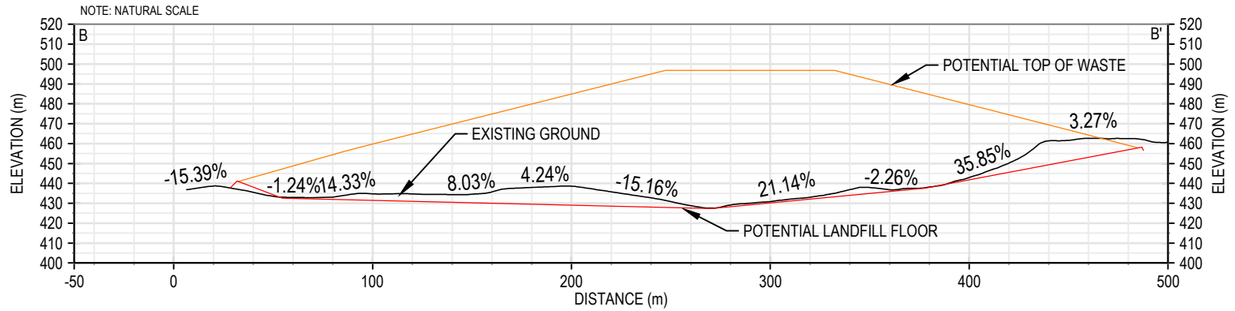

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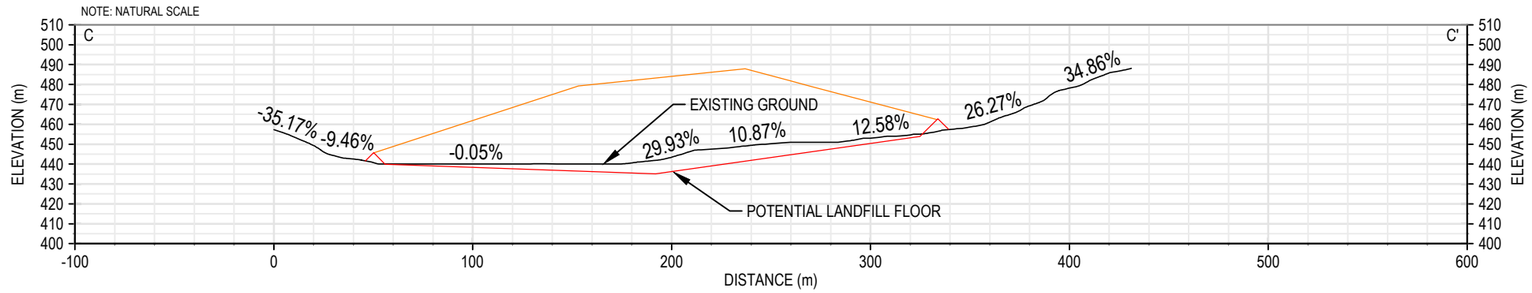


SECTION C

0 100 m

Scale: 1: 3 000

CLIENT

SUNSHINE COAST REGIONAL DISTRICT

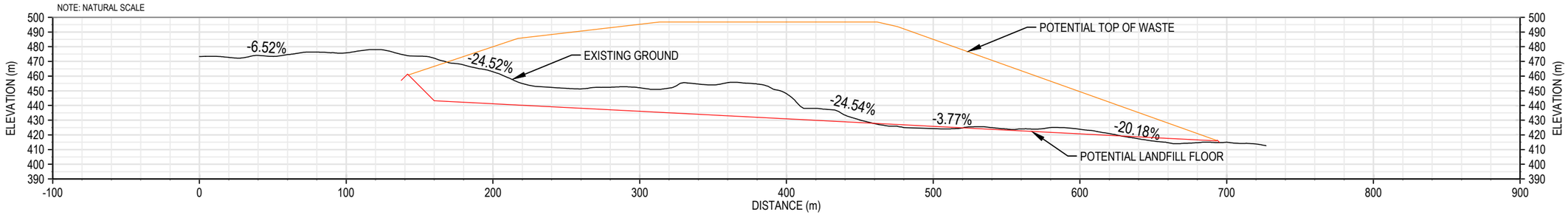
TETRA TECH

SCRD BC FUTURE WASTE DISPOSAL OPTIONS ANALYSIS STUDY

LANDFILL LOCATION 2 CROSS SECTIONS

PROJECT NO.	DWN	CKD	REV
SWM.SWOP04367-01	MC	NN	0
OFFICE: CGY	DATE: May 2021		

Figure 6B



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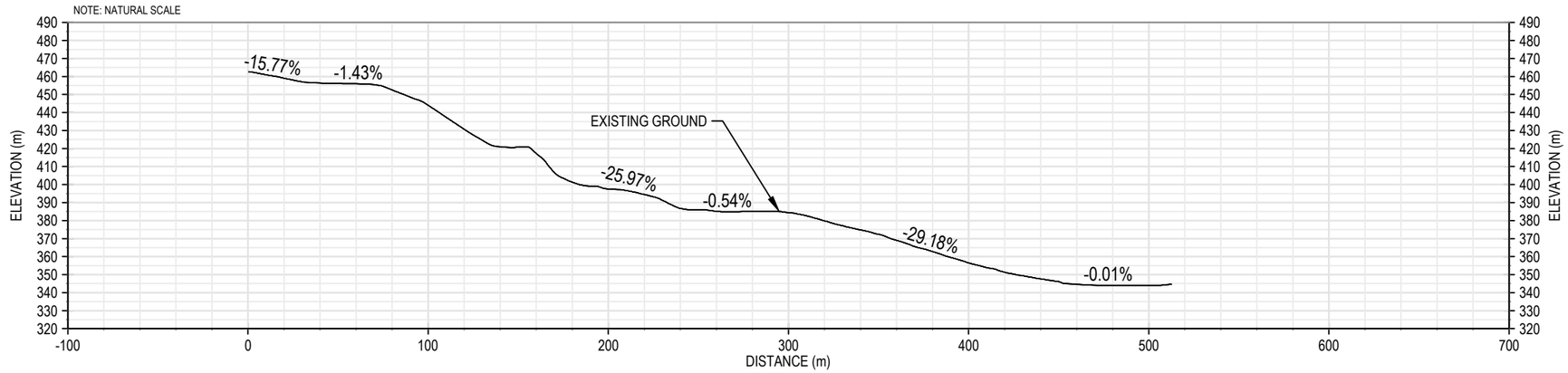
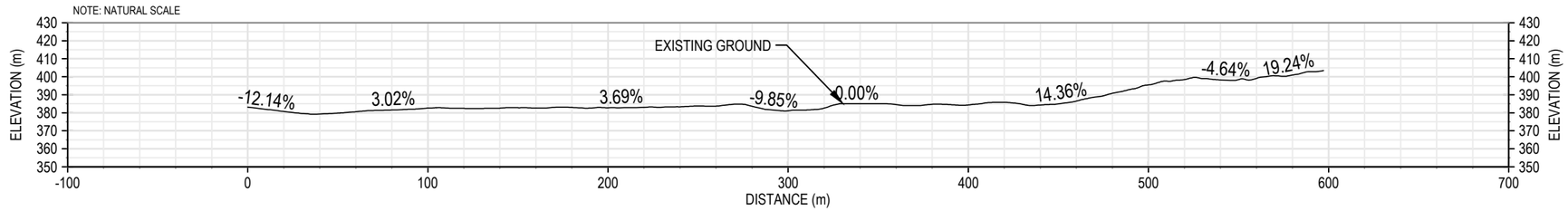


SECTION E



SECTION F

0 100 m

Scale: 1: 3 000

CLIENT

SUNSHINE COAST REGIONAL DISTRICT

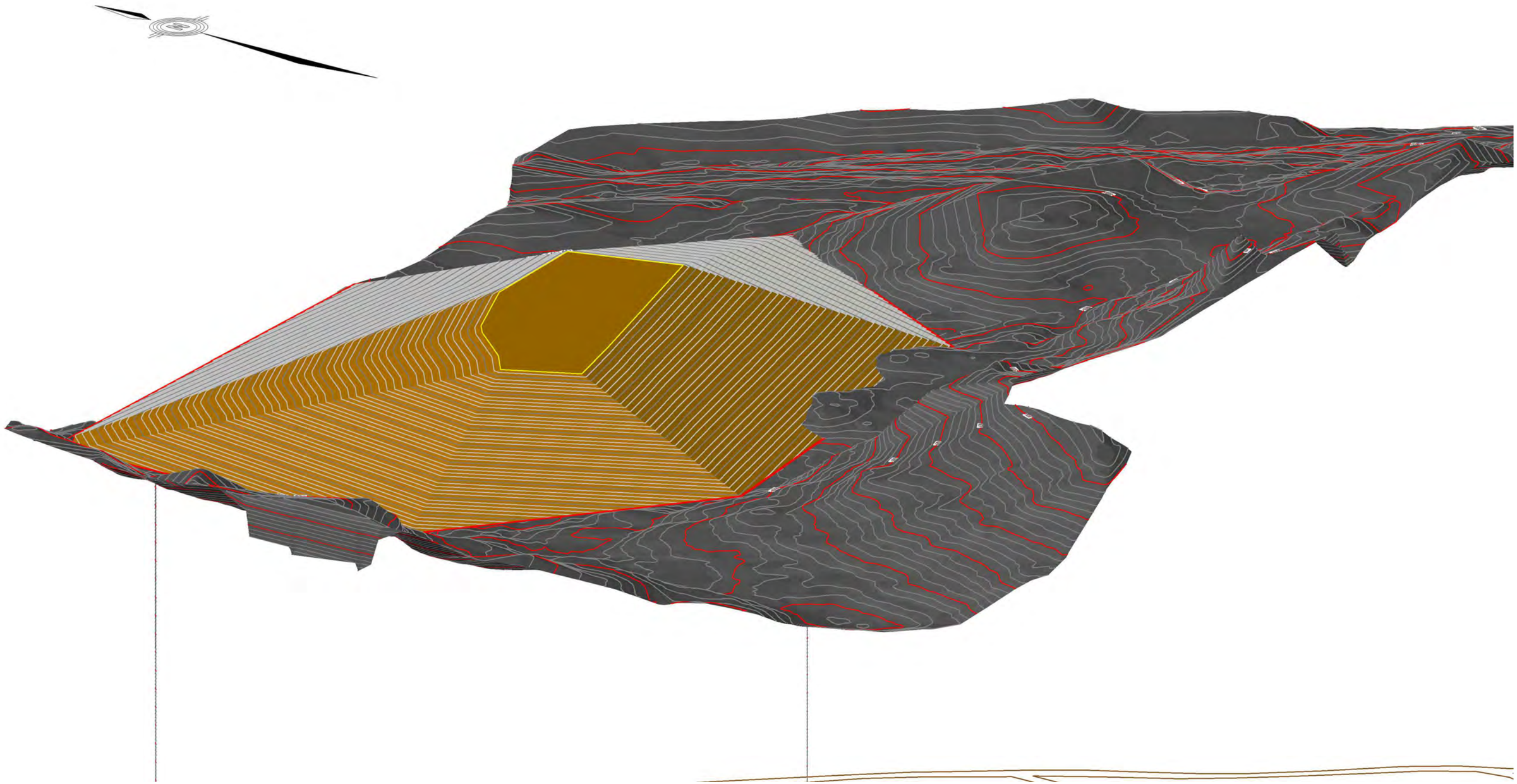
TETRA TECH

SCRD BC FUTURE WASTE DISPOSAL OPTIONS ANALYSIS STUDY

LANDFILL LOCATION 2 CROSS SECTIONS

PROJECT NO.	DWN	CKD	REV
SWM.SWOP04367-01	MC	NN	0
OFFICE: CGY	DATE: May 2021		

Figure 6C



0 200 m

Scale: 1: 4 000

CLIENT

SUNSHINE COAST REGIONAL DISTRICT

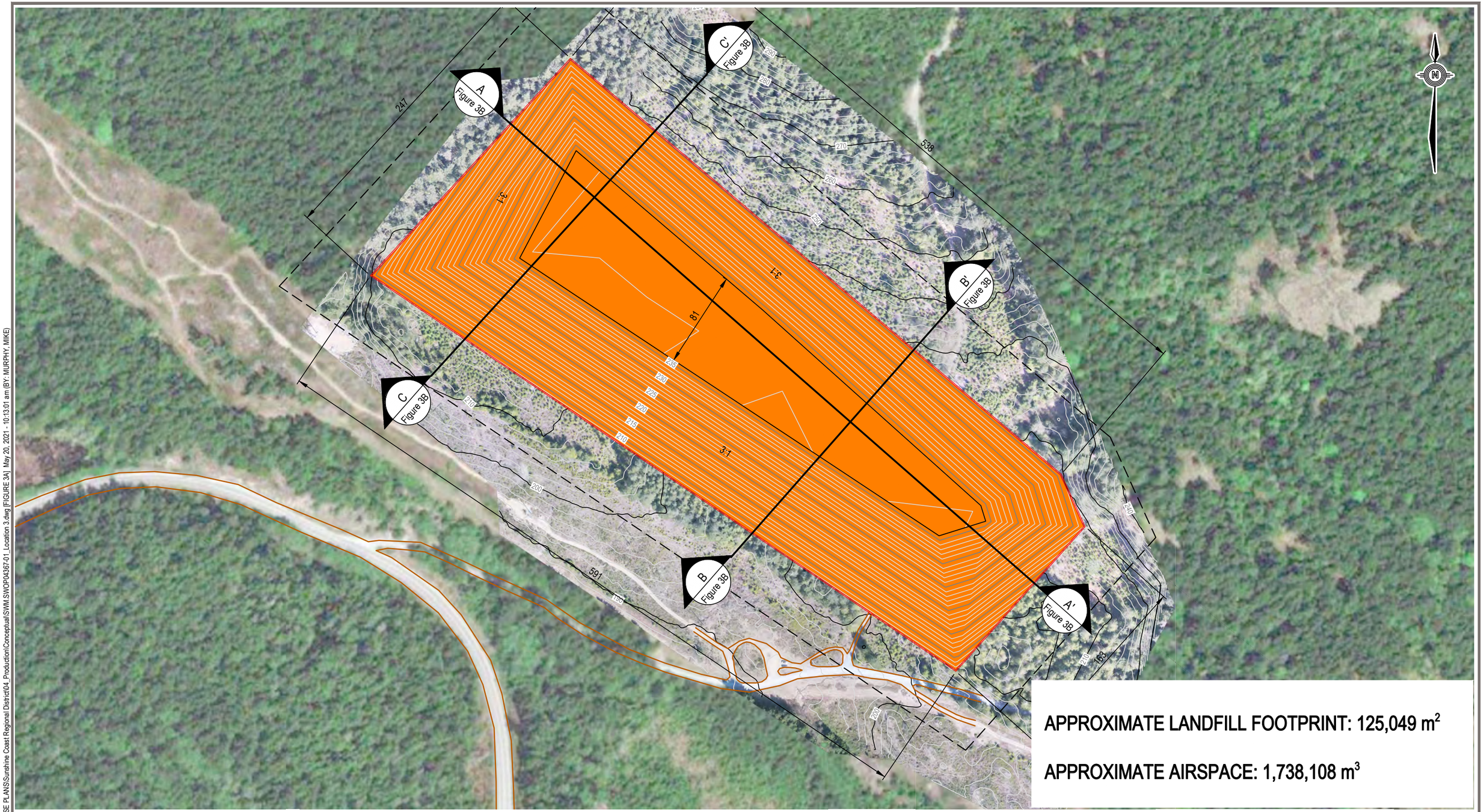
TETRA TECH

SCRD BC FUTURE WASTE DISPOSAL OPTIONS ANALYSIS STUDY

LANDFILL LOCATION 2
3D VIEW

PROJECT NO.	DWN	CKD	REV
SWM.SWOP04367-01	MC	NN	0
OFFICE: CGY	DATE: May 2021		

Figure 6D



APPROXIMATE LANDFILL FOOTPRINT: 125,049 m^2

APPROXIMATE AIRSPACE: 1,738,108 m^3

LEGEND:

- MAJOR CONTOUR (10m)
- MINOR CONTOUR (2m)
- LANDFILL FOOTPRINT (APPROXIMATELY 100 YEAR TOTAL CAPACITY)
- 50m BUFFER
- ROAD

0 100 m

Scale: 1: 3 000

CLIENT

SUNSHINE COAST REGIONAL DISTRICT

TETRA TECH

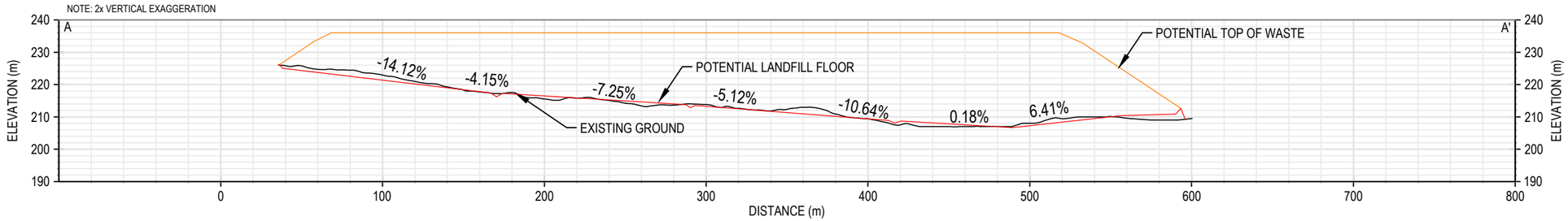
SCRD BC FUTURE WASTE DISPOSAL OPTIONS ANALYSIS STUDY

LANDFILL LOCATION 3
CONCEPTUAL FINAL CONTOURS - PLAN VIEW

PROJECT NO.	DWN	CKD	REV
SWM.SWOP04367-01	MC	NN	0
OFFICE: CGY	DATE: May 2021		

Figure 7A

Q:\Edmonton\Drafting\00_MASTER PROJECT BASE PLANS\Sunshine Coast Regional District\04_Production\Conceptual\SWM.SWOP04367-01_Location 3.dwg, [FIGURE 3A], May 20, 2021 - 10:13:01 am (BY: MURPHY, MIKE)



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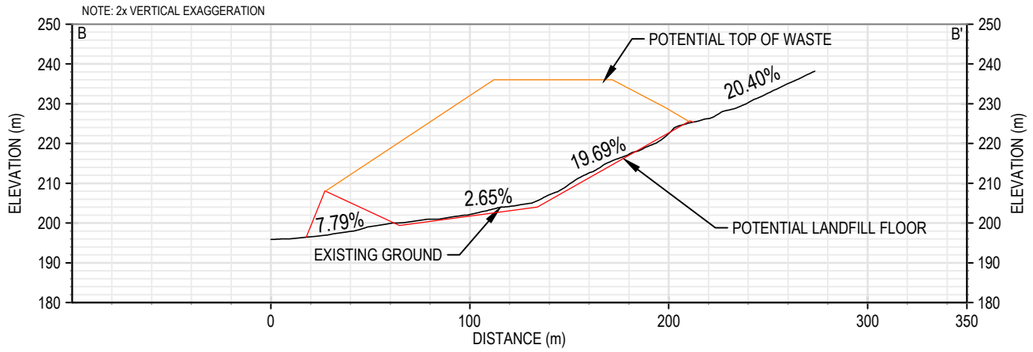

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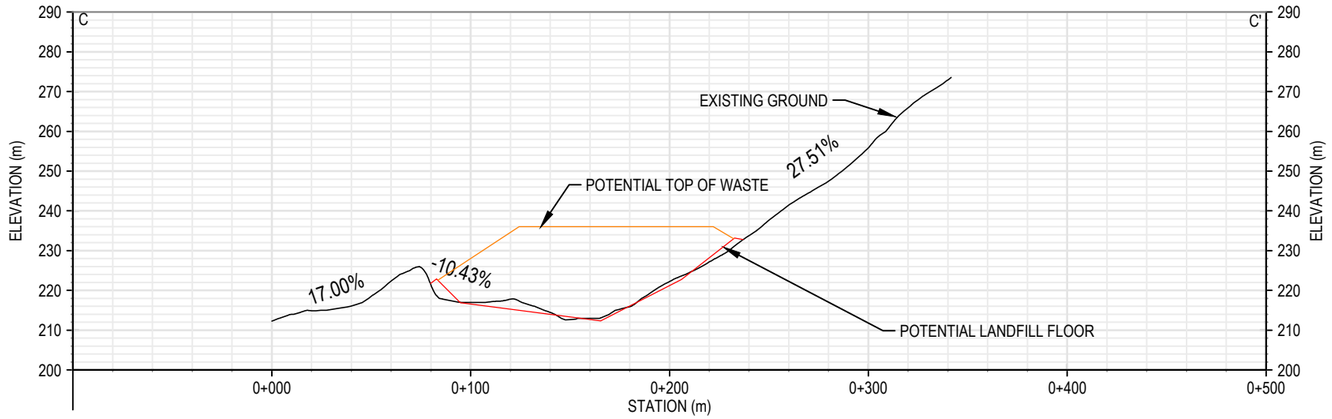


SECTION C

0 100 m

Scale: 1: 3 000

CLIENT

SUNSHINE COAST REGIONAL DISTRICT

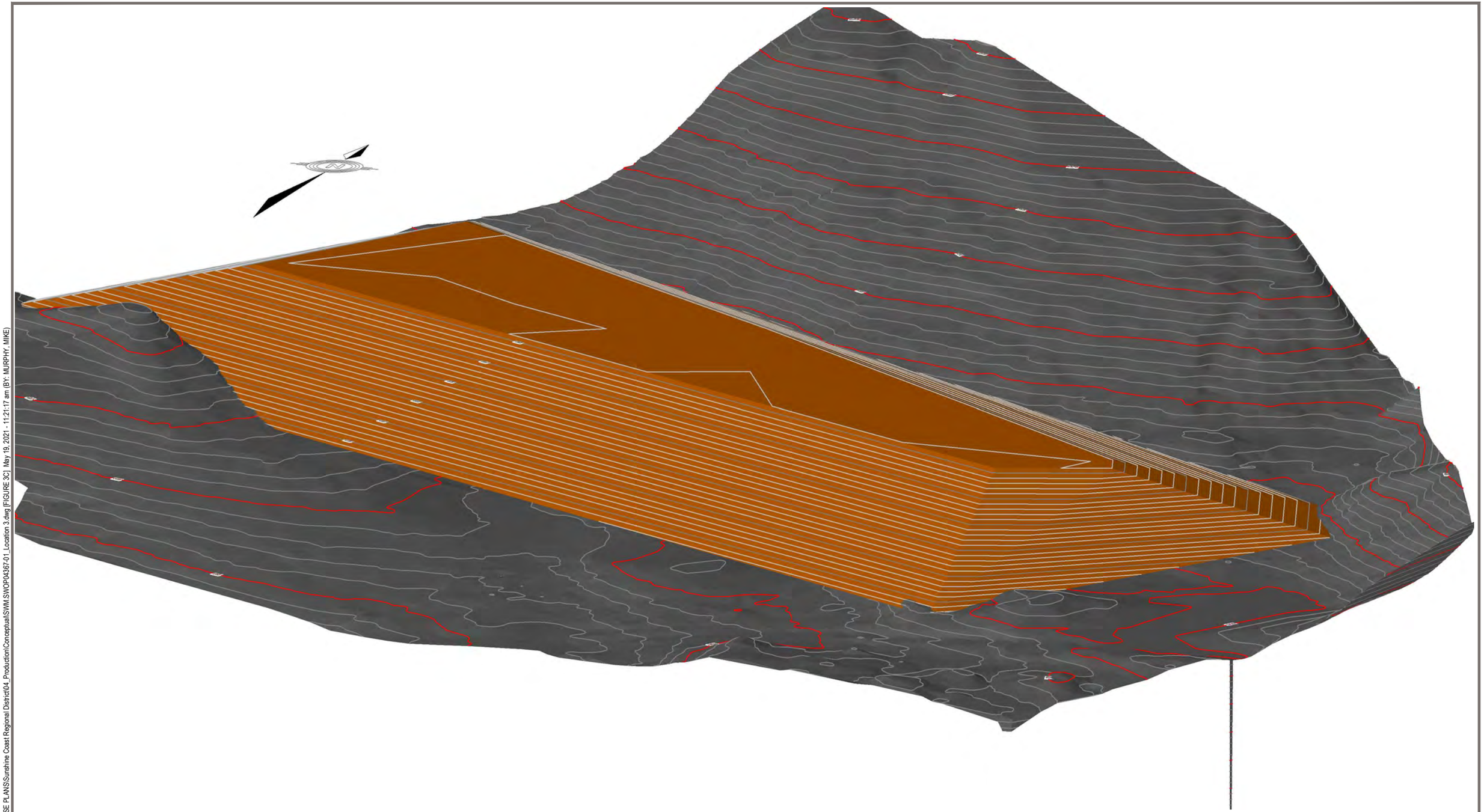
TETRA TECH

SCRD BC FUTURE WASTE DISPOSAL OPTIONS ANALYSIS STUDY

LANDFILL LOCATION 3 CROSS SECTIONS

PROJECT NO.	DWN	CKD	REV
SWM.SWOP04367-01	MM	NN	0
OFFICE: CGY	DATE: May 2021		

Figure 7B



0 50 m

Scale: 1: 1 250

CLIENT

SUNSHINE COAST REGIONAL DISTRICT

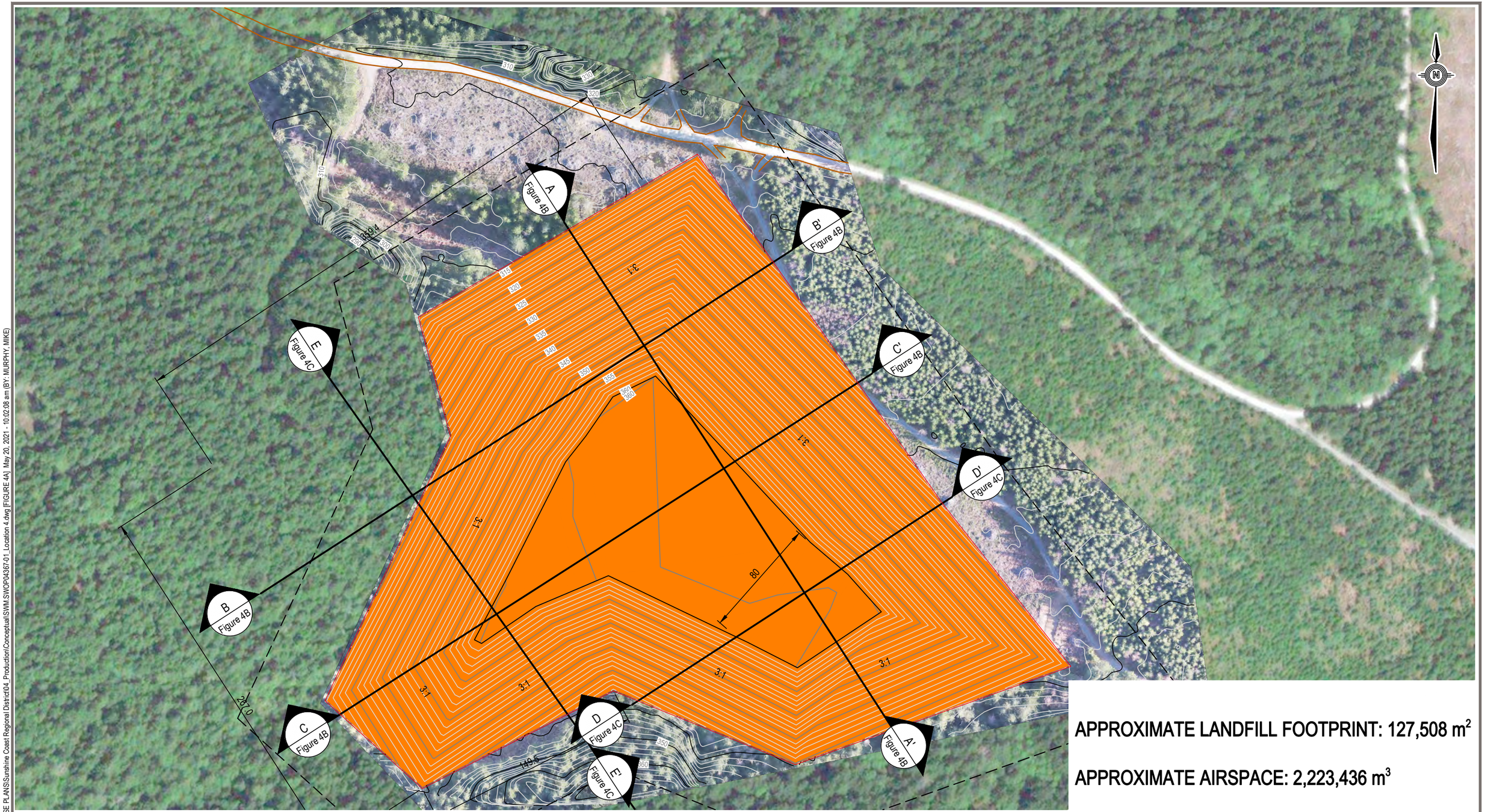
TETRA TECH

SCRD BC FUTURE WASTE DISPOSAL OPTIONS ANALYSIS STUDY

LANDFILL LOCATION 3
3D VIEW

PROJECT NO.	DWN	CKD	REV
SWM.SWOP04367-01	MM	NN	0
OFFICE: CGY	DATE: May 2021		

Figure 7C



APPROXIMATE LANDFILL FOOTPRINT: 127,508 m^2

APPROXIMATE AIRSPACE: 2,223,436 m^3

LEGEND:

- MAJOR CONTOUR (10m)
- MINOR CONTOUR (2m)
- LANDFILL FOOTPRINT (APPROXIMATELY 100 YEAR TOTAL CAPACITY)
- 50m BUFFER
- ROAD

0 100 m

Scale: 1: 2 500

CLIENT

SUNSHINE COAST REGIONAL DISTRICT

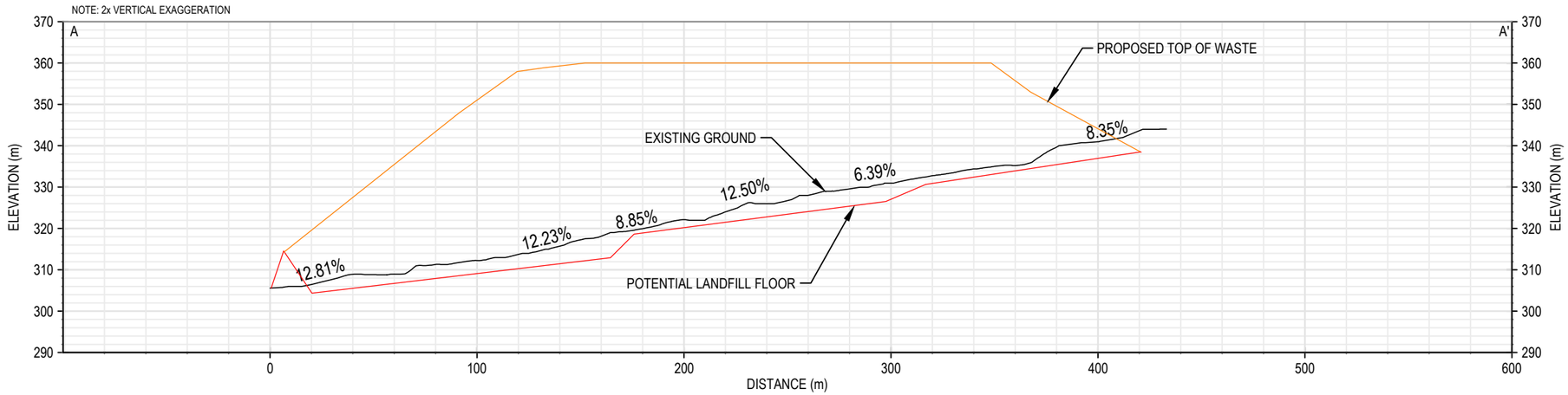
TETRA TECH

SCRD BC FUTURE WASTE DISPOSAL OPTIONS ANALYSIS STUDY

LANDFILL LOCATION 4
CONCEPTUAL FINAL CONTOURS - PLAN VIEW

PROJECT NO.	DWN	CKD	REV
SWM.SWOP04367-01	MM	NN	0
OFFICE: CGY	DATE: May 2021		

Figure 8A



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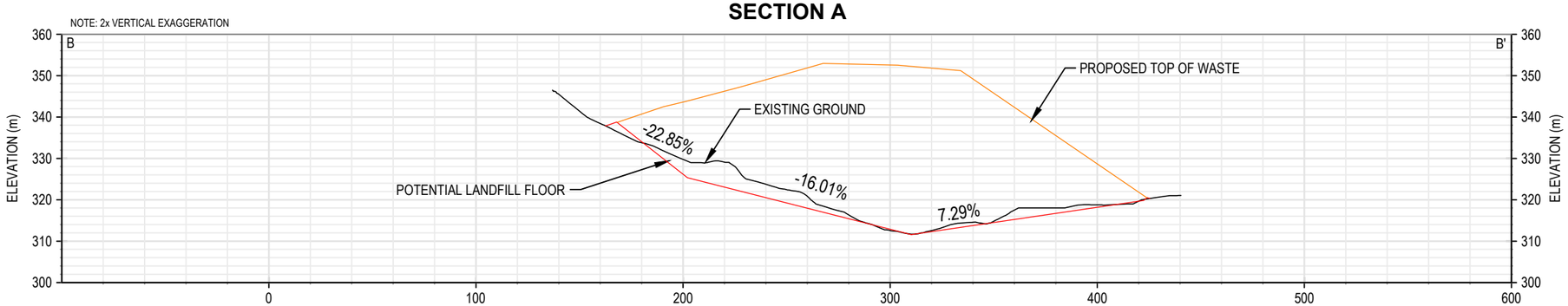

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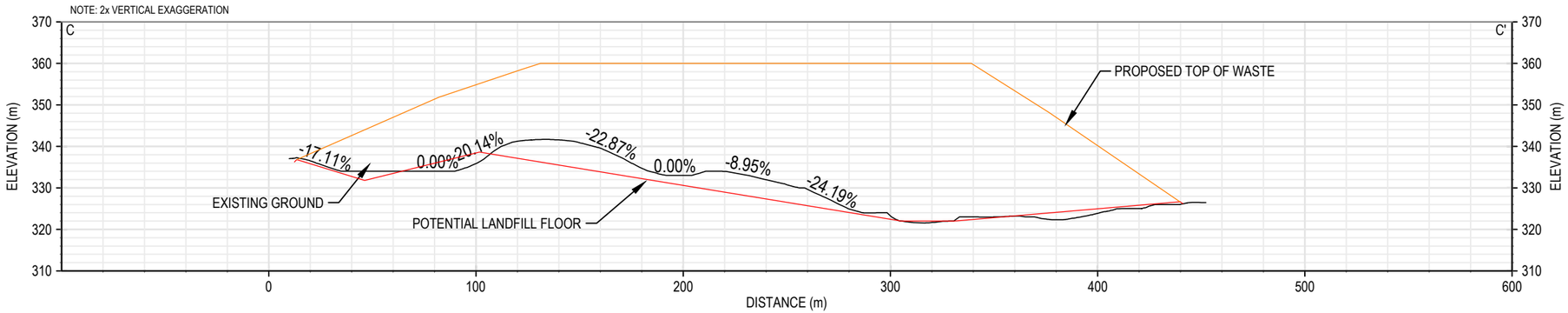

SECTION C

0 100 m

Scale: 1: 2 500

CLIENT

SUNSHINE COAST REGIONAL DISTRICT

TETRA TECH

SCRD BC FUTURE WASTE DISPOSAL OPTIONS ANALYSIS STUDY

LANDFILL LOCATION 4 CROSS SECTIONS

PROJECT NO.	DWN	CKD	REV
SWM.SWOP04367-01	MC	NN	0
OFFICE: CGY	DATE: May 2021		

Figure 8B

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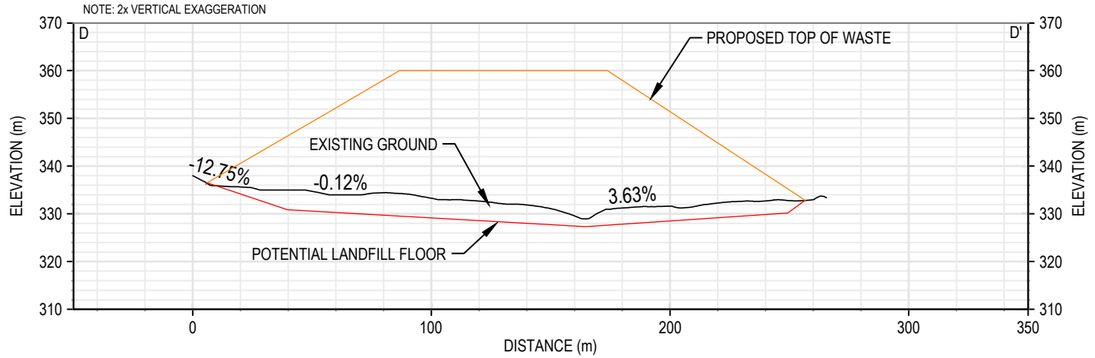
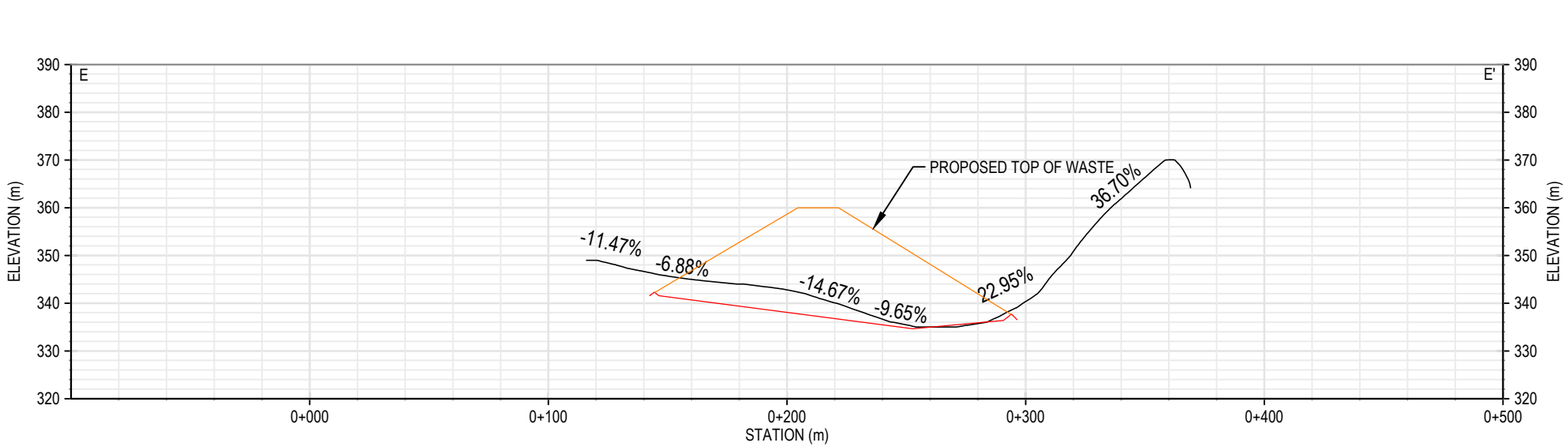
Q:\Edmonton\Drafting\00_MASTER PROJECT BASE PLANS\Sunshine Coast Regional District\04_Production\Conceptual\SWM.SWOP04367-01_Location 4.dwg [FIGURE 4B] May 20, 2021 - 10:04:30 am (BY: MURPHY, MIKE)



SECTION D



SECTION E

0 100 m

Scale: 1: 2 500

CLIENT

SUNSHINE COAST REGIONAL DISTRICT

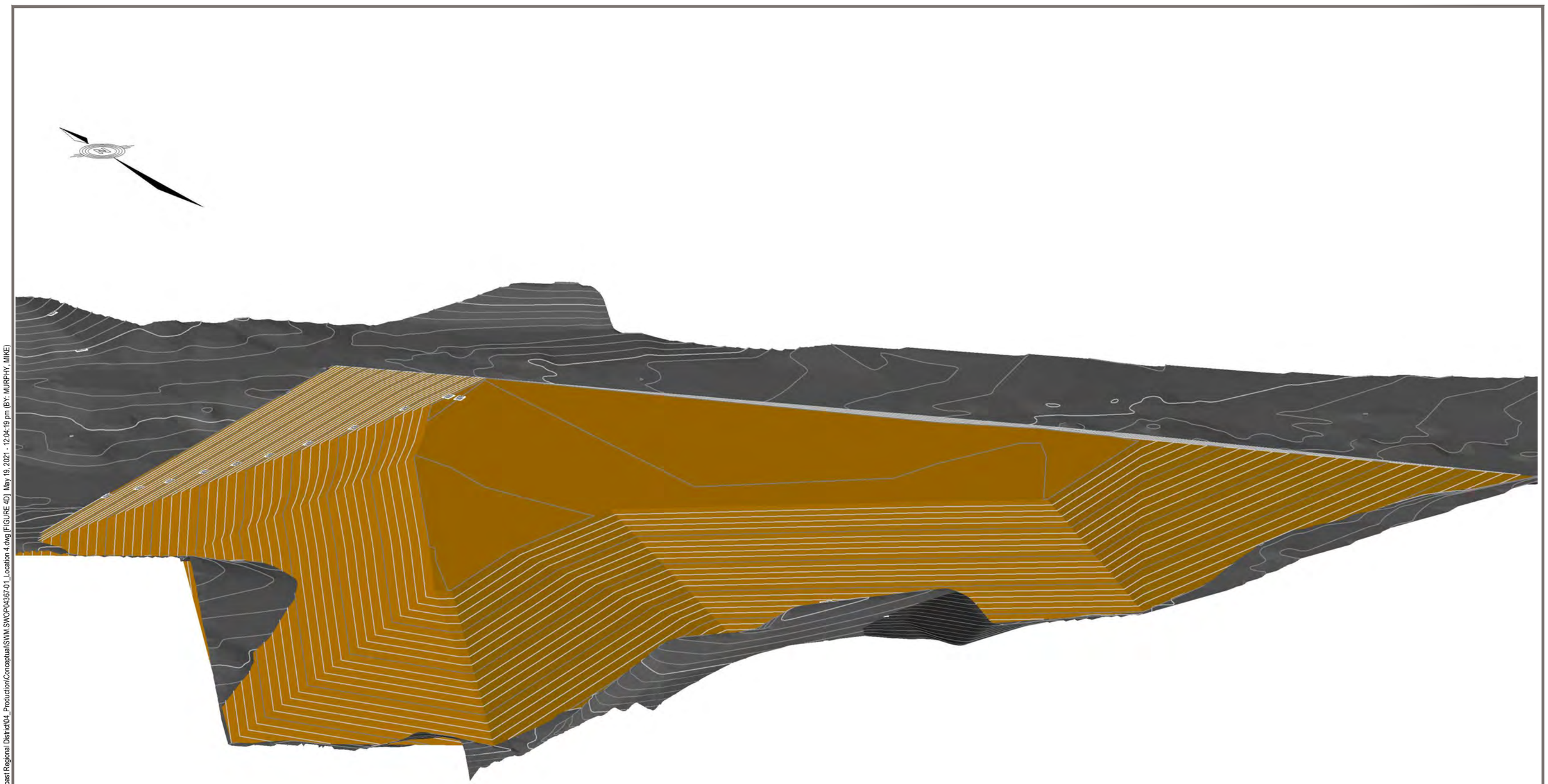
TETRA TECH

SCRD BC FUTURE WASTE DISPOSAL OPTIONS ANALYSIS STUDY

LANDFILL LOCATION 4 CROSS SECTIONS

PROJECT NO.	DWN	CKD	REV
SWM.SWOP04367-01	MM	NN	0
OFFICE: CGY	DATE: May 2021		

Figure 8C



0 50 m

Scale: 1: 1 250

CLIENT

SUNSHINE COAST REGIONAL DISTRICT

TETRA TECH

SCRD BC FUTURE WASTE DISPOSAL OPTIONS ANALYSIS STUDY

LANDFILL LOCATION 4
3D VIEW

PROJECT NO.	DWN	CKD	REV
SWM.SWOP04367-01	MM	NN	0
OFFICE: CGY	DATE: May 2021		

Figure 8D

Q:\Edmonton\Drafting\00_MASTER PROJECT BASE PLANS\Sunshine Coast Regional District\04_Production\Conceptual\SWM.SWOP04367-01_Location 4.dwg [FIGURE 4D] May 19, 2021 - 12:04:19 pm (BY: MURPHY, MIKE)

APPENDIX A

TETRA TECH'S LIMITATIONS ON THE USE OF THIS DOCUMENT

LIMITATIONS ON USE OF THIS DOCUMENT

GEOENVIRONMENTAL

1.1 USE OF DOCUMENT AND OWNERSHIP

This document pertains to a specific site, a specific development, and a specific scope of work. The document may include plans, drawings, profiles and other supporting documents that collectively constitute the document (the "Professional Document").

The Professional Document is intended for the sole use of TETRA TECH's Client (the "Client") as specifically identified in the TETRA TECH Services Agreement or other Contractual Agreement entered into with the Client (either of which is termed the "Contract" herein). TETRA TECH does not accept any responsibility for the accuracy of any of the data, analyses, recommendations or other contents of the Professional Document when it is used or relied upon by any party other than the Client, unless authorized in writing by TETRA TECH.

Any unauthorized use of the Professional Document is at the sole risk of the user. TETRA TECH accepts no responsibility whatsoever for any loss or damage where such loss or damage is alleged to be or, is in fact, caused by the unauthorized use of the Professional Document.

Where TETRA TECH has expressly authorized the use of the Professional Document by a third party (an "Authorized Party"), consideration for such authorization is the Authorized Party's acceptance of these Limitations on Use of this Document as well as any limitations on liability contained in the Contract with the Client (all of which is collectively termed the "Limitations on Liability"). The Authorized Party should carefully review both these Limitations on Use of this Document and the Contract prior to making any use of the Professional Document. Any use made of the Professional Document by an Authorized Party constitutes the Authorized Party's express acceptance of, and agreement to, the Limitations on Liability.

The Professional Document and any other form or type of data or documents generated by TETRA TECH during the performance of the work are TETRA TECH's professional work product and shall remain the copyright property of TETRA TECH.

The Professional Document is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of TETRA TECH. Additional copies of the Document, if required, may be obtained upon request.

1.2 ALTERNATIVE DOCUMENT FORMAT

Where TETRA TECH submits electronic file and/or hard copy versions of the Professional Document or any drawings or other project-related documents and deliverables (collectively termed TETRA TECH's "Instruments of Professional Service"), only the signed and/or sealed versions shall be considered final. The original signed and/or sealed electronic file and/or hard copy version archived by TETRA TECH shall be deemed to be the original. TETRA TECH will archive a protected digital copy of the original signed and/or sealed version for a period of 10 years.

Both electronic file and/or hard copy versions of TETRA TECH's Instruments of Professional Service shall not, under any circumstances, be altered by any party except TETRA TECH. TETRA TECH's Instruments of Professional Service will be used only and exactly as submitted by TETRA TECH.

Electronic files submitted by TETRA TECH have been prepared and submitted using specific software and hardware systems. TETRA TECH makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

1.3 STANDARD OF CARE

Services performed by TETRA TECH for the Professional Document have been conducted in accordance with the Contract, in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Professional judgment has been applied in developing the conclusions and/or recommendations provided in this Professional Document. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of the Professional Document.

If any error or omission is detected by the Client or an Authorized Party, the error or omission must be immediately brought to the attention of TETRA TECH.

1.4 DISCLOSURE OF INFORMATION BY CLIENT

The Client acknowledges that it has fully cooperated with TETRA TECH with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The Client further acknowledges that in order for TETRA TECH to properly provide the services contracted for in the Contract, TETRA TECH has relied upon the Client with respect to both the full disclosure and accuracy of any such information.

1.5 INFORMATION PROVIDED TO TETRA TECH BY OTHERS

During the performance of the work and the preparation of this Professional Document, TETRA TECH may have relied on information provided by persons other than the Client.

While TETRA TECH endeavours to verify the accuracy of such information, TETRA TECH accepts no responsibility for the accuracy or the reliability of such information even where inaccurate or unreliable information impacts any recommendations, design or other deliverables and causes the Client or an Authorized Party loss or damage.

1.6 GENERAL LIMITATIONS OF DOCUMENT

This Professional Document is based solely on the conditions presented and the data available to TETRA TECH at the time the data were collected in the field or gathered from available databases.

The Client, and any Authorized Party, acknowledges that the Professional Document is based on limited data and that the conclusions, opinions, and recommendations contained in the Professional Document are the result of the application of professional judgment to such limited data.

The Professional Document is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present, or variation in assumed conditions which might form the basis of design or recommendations as outlined in this report, at or on the development proposed as of the date of the Professional Document requires a supplementary investigation and assessment.

TETRA TECH is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the Client.

1.7 NOTIFICATION OF AUTHORITIES

In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by TETRA TECH in its reasonably exercised discretion.

APPENDIX B

LANDFILL SITING RECONNAISSANCE PHOTOS

Photo 1: Landfill Location 1 – Full Site (Looking South)

Photo 2: Landfill Location 1 – Utility Corridor (Looking South)

Photo 3: Landfill Location 1 – Water Course (Looking North)

Photo 4: Landfill Location 1 – Steep Grade (Looking East)

Photo 5: Location 2A – Steep Grade (Looking North)

Photo 6: Location 2B – Dense Vegetation (Looking North)

Photo 7: Location 3 – Northern Area (Looking South)

Photo 8: Location 3 – Southern Area (Looking South)

Photo 9: Location 3 – Water Course (Near Northern Area)

Photo 10: Location 3 – Water Course (Near Southern Area)

Photo 11: Location 4 – Looking East

Photo 12: Location 4 – Looking South

Photo 13: Location Four – Looking West

Photo 14: Location Four – Site Blockade (Looking West)

SUNSHINE COAST REGIONAL DISTRICT STAFF REPORT

TO: Infrastructure Services Committee Name – July 8, 2021

AUTHOR: Remko Rosenboom, General Manager, Infrastructure Services
Robyn Cooper, Manager, Solid Waste Services

SUBJECT: **POWER SYSTEM REPLACEMENT FOR SECHELT LANDFILL UPDATE**

RECOMMENDATION(S)

THAT the report titled Power System Replacement for Sechelt Landfill be received;

AND THAT the Sechelt Landfill pursue a direct connection to the BC Hydro grid;

AND THAT the Sechelt Landfill power supply system replacement budget be increased from $115,000 to $194,000 funded through MFA 5-Year Equipment Finance Loan;

AND THAT a loan of up to $194,000 for a term of 5 years be requested through the Municipal Finance Authority Equipment Financing Program under section 403(1)(a) of the *Local Government Act* (Liabilities Under Agreement) to fund the repair of the Power Supply System at the Sechelt Landfill.

AND THAT the Sechelt Landfill [352] base budget be increased by $1,200 for Annual Maintenance and Operating costs starting in 2022 funded from tipping fees;

AND THAT the 2021-2025 Financial Plan be amended accordingly;

AND FURTHER THAT these recommendations be forwarded to the July 8, 2021 Board meeting.

BACKGROUND

The Sechelt Landfill utilizes a photovoltaic (PV) power system supplemented with a propane generator as demand requires at approximately 80% PV and 20% generator.

In early 2021, the entire power system, including generator, at the Sechelt Landfill failed and the site has been utilizing a diesel generator on loan from SCRD Utility Services. None of the system components can be repaired or reused.

As part of the 2021 Budget process, $115,000 was approved to fund the replacement of the power system at the Sechelt Landfill and $10,000 was approved to fund the rental generator.

The purpose of this report is to provide an update on the power system replacement for the Sechelt Landfill and to seek Board direction regarding next steps.

DISCUSSION

XCG Consulting Ltd. (XCG), the SCRD's contracted solid waste engineers, were retained to conduct a power assessment and system replacement study (Study) for the Sechelt Landfill. The power assessment included assessing all current and future power needs of the site. The replacement portion of the study took those power needs and prepared cost estimates for an off-grid system and for connecting to BC Hydro. The results of the Study are included as Attachment A.

Options and Analysis

From the XCG Study, there are four options for consideration, three of which are based on a photovoltaic (PV) system. For all options, a backup generator is required. Staff propose a propane backup generator based on capital and operating costs and GHG considerations when compared to a diesel or gasoline generator. Prior to asset failure, a propane backup generator was utilized at the site.

As well, all photovoltaic system options presented below would be built to include a minimum of 15% additional capacity.

A summary of the options is provided in the table below.

<table>
<tr><th></th><th>Option 1
Direct connect to BC Hydro
(recommended option)</th><th>Option 2a
New PV system 99%</th><th>Option 2b
New PV system 80%</th><th>Option 2c
New PV system 50%</th></tr>
<tr><td>Photovoltaic system</td><td>n/a</td><td>99%</td><td>80%</td><td>50%</td></tr>
<tr><td>Generator use</td><td>Backup only</td><td>Backup only</td><td>20%</td><td>50%</td></tr>
<tr><td>Capital Cost for power system, incl. generator (estimate)</td><td>$177,000</td><td>$140,000-$160,000</td><td>$55,000-$65,000</td><td>$40,000-$50,000</td></tr>
<tr><td rowspan="2">Annual operating & maintenance costs (estimate)</td><td>$1,200</td><td>$2,500-$3,500</td><td>$2,000-$2,500</td><td>$2,500-$3,500</td></tr>
<tr><td>Electricity costs</td><td colspan="3">Fuel + electrician costs</td></tr>
<tr><td rowspan="3">Asset Replacement - power system (estimate)</td><td rowspan="3">n/a</td><td colspan="3">PV Array – 25 yrs, $6,000</td></tr>
<tr><td colspan="3">Batteries – 10 yrs, $20,000</td></tr>
<tr><td colspan="3">Inverter – 12 to 15 yrs, $6,000</td></tr>
<tr><td rowspan="2">Asset Replacement - generator (estimate)</td><td>7-8 yrs</td><td>7-8 yrs,</td><td>4-6 yrs</td><td>3-5 yrs</td></tr>
<tr><td colspan="4">$7,500</td></tr>
<tr><td>GHG considerations</td><td>0.085 t/yr</td><td>0.05 t/yr</td><td>7.25 t/yr</td><td>11.5 t/yr</td></tr>
</table>

Carbon Tax implications ($170/tonne by 2030)	$14.45	$8.50	$1,233	$1,955

As a Climate Action Charter signatory and included in the SCRD's Strategic Plan is the goal of being carbon neutral. Although landfill emissions are part of a separate federal reporting framework, these emissions are within the decision making realm of the SCRD. 99% renewable or connecting to the BC Hydro grid are the two options that meet this requirement.

Based on the capital costs, annual maintenance, asset management and GHG considerations, staff recommend that the Sechelt Landfill pursue a direct connection to the BC Hydro grid.

Organizational and Intergovernmental Implications

Options 2a, 2b and 2c will require ongoing oversight by IT and site staff whereas Option 1, does not.

For Option 1, there would need to be consultation with the Sechelt Nation. If required, a report following that consultation would be brought forward.

Additionally, the generator on loan to Solid Waste Services from Utilities Services is currently malfunctioning and may require additional maintenance or replacement. A report regarding those costs is forthcoming.

Financial Implications

The initial 2021 approved project budget for capital and installation costs is $115,000 funded through Municipal Finance Authority (MFA) 5-year Equipment Finance Loan. An additional $10,000 from taxation Regional Solid Waste [350] was approved to fund costs associated with utilizing an interim generator.

The power assessment and system replacement study had a budget of $17,000.

Thus, the remaining project budget is approximately $98,000.

Option 1 would require an additional $79,000, for a total project budget of $195,000. This option would be completed one year from initiation. Therefore, borrowing would not begin until July 2022 at the earliest. Based on a funding date of July 2022, the SCRD would incur $20,023 in debt servicing costs in 2022, $40,045 from 2023-2026 and $20,023 in 2027. The resulting taxation impact per $100,000 would be $0.13 in 2022, $0.26 in 2023-2026 and $0.13 in 2027. In addition to the increase in debt servicing costs, this option would also result in a $1,200 base budget increase due to annual operating and maintenance costs for electricity costs. The base budget increase would start in 2022 and be funded from tipping fees.

Option 2a would require an additional $62,000 for a total project budget of $177,000. This option can be completed within the next several months. Therefore, based on a funding date of November 2021, the SCRD would incur $6,089 in debt servicing costs in 2021, $36,536 from 2022-2025 and $30,447 in 2026. The resulting taxation impact per $100,000 would be $0.04 in 2021, $0.23 in 2022-2025 and $0.19 in 2026. In addition to the increase to debt servicing costs,

this option would require a $3,500 increase to the base budget for annual maintenance and operating costs for fuel and electrician.

Options 2b and 2c could be completed within approved budget, however would require a $2,500 and $3,500 increase to the base budget respectively for annual maintenance and operating costs for fuel and electrician.

For Options 1 and 2a, the additional budget could be funded from the MFA Equipment Finance Loan.

An amendment to the 2021-2025 Financial Plan is required.

Timeline for next steps

For Option 1, indications are that it is a minimum of one year from initiation to completion of a direct connection into the BC Hydro grid. As well, additional permitting related to the road would be required.

For Options 2a, 2b and 2c, each of these options can be initiated and completed within the next several months, pending procurement and availability of the various components.

Communications Strategy

n/a

STRATEGIC PLAN AND RELATED POLICIES

This report is in support of the SCRD's Strategic Plan strategy to achieve corporate carbon neutrality.

CONCLUSION

In early 2021, the entire power system failed at the Sechelt Landfill.

SCRD contracted XCG Consulting Ltd. to provide an analysis of power system replacement options including a comparison of off-grid photovoltaic systems and a direct connection to the BC Hydro grid.

Based on the capital costs, annual maintenance, asset management and GHG considerations, staff recommend that the Sechelt Landfill pursue a direct connection to the BC Hydro grid.

To do so, requires an additional $79,000 budget, for a total project budget of $194,000 which can be funded through Municipal Finance Authority (MFA) 5-year Equipment Finance Loan. An amendment to the Financial Plan is required.

Attachment A – XCG Consulting Ltd. Power Assessment and System Replacement Study Results

Reviewed by:			
Manager		CFO/Finance	X-T.Perreault
GM		Legislative	
CAO	X-D.McKinley	Other	X-C.Suveges X - R.Shay

July 7, 2021 - Updated Table for Sechelt Landfill Power System Replacement Options

	Option 1 Direct connect to BC Hydro (recommended option)	**Option 2a New PV system 99%**	**Option 2b New PV system 80%**	**Option 2c New PV system 50%**
Photovoltaic system	n/a	99%	80%	50%
Generator use	Backup only	Backup only	20%	50%
Capital Cost for power system, incl. generator (estimate, incl 10% contingency)	$195,000	$140,000-$160,000	$55,000-$65,000	$40,000-$50,000
Annual operating & maintenance costs (estimate)	$1,200	$2,500-$3,500	$2,000-$2,500	$2,500-$3,500
	Electricity costs	Fuel + electrician costs		
Asset Replacement - power system (estimate)	n/a (BC Hydro owns & maintains)	PV Array – 25 yrs, $6,000 to $18,000		
		Batteries – 10 yrs, $20,000 to $60,000		
		Inverter – 12 to 15 yrs, $6,000 to $18,000		
Asset Replacement - generator (estimate)	7-8 yrs	7-8 yrs,	4-6 yrs	3-5 yrs
	$7,500			
GHG considerations	0.085 t/yr	0.05 t/yr	7.25 t/yr	11.5 t/yr
Carbon Tax implications ($170/tonne by 2030)	$14.45	$8.50	$1,233	$1,955

XCG
Environmental Engineers & Scientists

XCG CONSULTING LIMITED
T 780 432 5770 | edmonton@xcg.com
#200, 6768 75th Street, Edmonton, Alberta, Canada T6E 6T9

June 30, 2021 **XCG File No. 4-2111-01-81**

Mrs. Robyn Cooper
Manager, Solid Waste Services
Infrastructure Services
Sunshine Coast Regional District
1975 Field Road
Sechelt, British Columbia V0N 3A1

Re: Review of Sechelt Landfill Power System Upgrade Study

Dear Mrs. Cooper:

XCG Consulting Limited (XCG) is pleased to provide the following letter to the Sunshine Coast Regional District (SCRD) to review the power system upgrade study for the Sechelt Landfill (Site).

XCG subcontracted Sacre-Davey Engineering (Sacre-Davey) to provide an assessment of the existing power system, existing loads, future loads and then compare the costs to replace the power system with either a new photovoltaic system or direct connection into BC Hydro service. The following summarized Sacre-Davey's findings.

EXISTING POWER SYSTEM

The existing off-grid system is a photovoltaic array (PV) with battery storage as the primary power source, with a propane generator backup. These systems are designed so that the PV array inputs power to a direct current (DC) bus which either feeds the inverter or charges the battery bank. The inverter converts the DC power to alternating current (AC) power to feed the site loads. When the DC bus voltage (indicator of the battery bank state of charge) drops below a certain point, the generator is turned on to support the site load and recharge the battery bank.

The existing system consists of the following:

- 2.205 Kilowatt (kW) Photovoltaic Array.
- 4 kW Hybrid Inverter (DC bus and AC generator inputs).
- 825 ampere hour Battery Bank.
- 12 kW Generator (Propane).

The existing off-grid hybrid PV system is currently out of commission as the current load on the system exceed its capacity. According to SCRD staff, the propane generator on site has failed and is not repairable and the battery bank has failed and has been disconnected.

During the site visit conducted by Sacre-Davey it was noted that the site is currently powered by a rental diesel generator, which requires refueling every day.

SYSTEM LOADS

Sacre-Davey undertook the task of estimating the existing load on the system as well as the future load on the system upon the completion of the Public Drop-Off Construction project currently underway at the Site. Under the current operating conditions, the peak load on the system is estimated at 3.2kW (exceeding the 2.2kW capacity of the system).

The estimated future load was estimated by Sacre-Davey at 6.6 kW inclusive of all of the proposed additions to the electrical infrastructure.

NEW PHOTOVOLTAIC SYSTEM SPECIFICATIONS AND COST ESTIMATE

Based on the future needs of the Site the following design criteria were used by Sacre-Davey for the new PV system:

- 10.5 kW Photovoltaic Array.
- 5 x 2.8kW/h Batteries.
- 7.5 kW Inverter.
- 15kW Generator (Propane).

Sacre-Davey prepared a cost and annual operating cost estimate based on the following renewable energy percentages:

- 80%.
- 99%.
- 50%.

A new PV system generating 80% renewable energy would cost between $55,000 and $65,000, including the propane generator, and the annual operating costs would range between $1,500 and $2,000.

A new PV system generating 99% renewable energy would cost between $140,000 and $160,000, including the propane generator, and the annual operating costs would range between $500 and $750.

A new PV system generating 50% renewable energy would cost between $40,000 and $50,000, including the propane generator, and the annual operating costs would range between $2,000 and $3,000.

A standard PV system has the following replacement schedules:

- Photovoltaic Array Panels – 25 Years ($6,000 replacement cost);
- Batteries – 10 Years ($20,000 replacement cost);
- Inverter – 12-15 Years ($6,000 replacement cost)
- Generator ($7,500 replacement cost):
  - 80% - 4 to 6 years;
  - 99% - 7 to 8 years;
  - 50% - 3 to 5 years.

DIRECT CONNECTION INTO BC HYDRO SERVICE

Based on the future electrical needs of the Site, the following design criteria were used by Sacre-Davey in sizing and costing a new direct connection into BC Hydro service:

- The nearest BC Hydro pole is 1.7 km from the Sechelt landfill.
- 200A – 120/240V, 1Phase service capacity.
- BC Hydro maintains the new line once built.
- BC Hydro supplies the transformer.

The total estimated net present cost for the direct connection into BC Hydro service is estimated by Sacre-Davey at $169,000. Average annual costs for the direct connection into BC hydro is $1,200. The SCRD would also like to have a backup propane generator on site in the event of a power failure. The additional cost for a backup generator would be $7,500.

Direct connection systems do not have replacement schedules; however, the additional propane generator would require replacing every 7 to 8 years depending on usage.

GREENHOUSE GAS EMISSIONS

In the 2020 Greenhouse Gas Emissions Assessment for the Sechelt Landfill (XCG), the current PV system and propane generator produced 9.5 tonnes of greenhouse gas equivalents (CO_2e) for the year. The new propane generators specified above would all be newer and more energy efficient, as such, the annual CO_2e emissions from the future PV system are estimated as follows:

80% renewable energy – 7.25 tonnes of CO_2e per year;

99% renewable energy – 0.05 tonnes of CO_2e per year;

50% renewable energy – 11.5 tonnes of CO_2e per year.

A direct connection into BC Hydro Service would have a negligible impact on the CO_2e emissions for the Site. BC Hydro publishes an annual CO_2e estimate of 10.67 tonnes per gigawatt hour of electrical use. Based on the estimated Site electrical usage, the total CO_2e emissions would total 0.0850 tonnes of CO_2e per year.

It should be noted that the CO_2e emissions from the current propane generator account for less that 0.5% of the Site's total CO_2e emissions. The choice between a PV system or a direct connection into BC Hydro services would not have a significant impact on the annual greenhouse gas generation assessment for the site that is required by the federal government.

It should also be noted that the CO_2e emissions estimate was limited to the operation of both the PV system and the direct connection into BC Hydro services. The CO_2e emission resulting in the manufacturing and eventual disposal of the various components of each system were not considered.

SUMMARY

Based on the design criteria above and the budgetary pricing estimates, the NPC over 20 years for the two power supply options are:

- New PV / Battery / Generator system = $40,000 to $140,000.

- Direct Connection into BC Hydro Service = $169,000 plus an additional $7,500 for the backup generator.

LIMITATIONS

The scope of this letter is limited to the matters expressly covered. This letter presenting the review of the Sechelt Landfill Power System Upgrade Study was produced for the sole use of the Sunshine Coast Regional District and may not be relied upon by any other person or entity without written authorization of XCG Consulting Limited. The scope of this letter may not be appropriate to satisfy the needs of other users, and any use or reuse of this document or the findings, conclusions, and recommendations represented herein, is at the sole risk of said users.

CLOSURE

Should you have any questions or require additional information, please do not hesitate to contact us.

Yours very truly,

XCG CONSULTING LIMITED

Trevor Mahoney, B.S.E.
Project Manager