INFRASTRUCTURE SERVICES COMMITTEE

Thursday, November 21, 2019
SCRD Boardroom, 1975 Field Road, Sechelt, B.C.

AGENDA

CALL TO ORDER 9:30 a.m.

AGENDA

1. Adoption of Agenda

PRESENTATIONS AND DELEGATIONS

2.	AJ MacDonald, Vice-President Operations, Integrated Sustainability Consultants Regarding Raw Water Reservoir Phase 3 Results	Presentation

REPORTS

3.	Manager, Capital Projects Results Raw Water Reservoir Feasibility Study Phase 3 **(Voting – A, B, D, E, F, Sechelt)**	Annex A pp 1 - 125
4.	General Manager, Infrastructure Services Groundwater Investigation Project Update **(Voting – A, B, D, E, F, Sechelt)**	Annex B pp 126-128
5.	Water and Energy Projects Coordinator Drought Management Plan 2019 Summary **(Voting – A, B, D, E, F, Sechelt)**	Annex C pp 129-136
6.	Water and Energy Projects Coordinator Water Conservation Public Participation Summary **(Voting – A, B, D, E, F, Sechelt)**	Annex D pp 137-158
7.	Water and Energy Projects Coordinator Water Conservation Rebate Program Options **(Voting – A, B, D, E, F, Sechelt)**	Annex E pp 159-164
8.	General Manager, Infrastructure Services Strategic Plan Initiatives – Infrastructure Department **(Voting – All)**	Annex F pp 165-168

9. Manager, Solid Waste Operations — Annex G
Pender Harbour Transfer Station Operations Contract Term Extension — pp 169-171
(Voting – All)

10. Senior Planner — Annex H
Zoning Amendment Bylaws for Short Term Rental Accommodation Regulations – Consideration of 3rd Reading — pp 172-221
Rural Planning (Voting – A, B, D, E, F)

11. Transportation Advisory Committee Meeting Minutes of October 17, 2019 — Annex I, pp 222-225
(Voting – All)

12. Solid Waste Plan Monitoring Advisory Committee Meeting Minutes of November 5, 2019 — Annex J, pp 226-227
(Voting – All)

COMMUNICATIONS

13. Association of Vancouver Island and Coastal Communities (AVICC) dated October 22, 2019 — Annex K, pp 228-231
Regarding Invitation from MFLROD to participate in BC's Old Growth Strategic Review
(Voting – A, B, D, E, F)

14. Honourable Minister Trevena, Ministry of Transportation and Infrastructure dated October 22, 2019 — Annex L, pp 232-233
Regarding UBCM 2019 discussions on ferry service levels, the Highway 101 Corridor and potential safety measures for Woodcreek Park area
(Voting – All)

15. Darwyn Kutney, Director of Engineering and Operations, District of Sechelt dated November 7, 2019 — Annex M, pp 234-235
Regarding District of Sechelt Liquid Waste Management Plan Stage 2 – Steering Committee and Technical Advisory Committee
(Voting – All)

NEW BUSINESS

IN CAMERA

That the public be excluded from attendance at the meeting in accordance with Section 90 (1) (e), (k) and 2(b) of the *Community Charter* – "the acquisition, disposition or expropriation of land or improvements, if the council considers that disclosure could reasonably be expected to harm the interests of the municipality", "negotiations and related discussions respecting the proposed provision of a municipal service that are at their preliminary stages and that, in the view of the council, could reasonably be expected to harm the interests of the municipality if they were held in public", "the consideration of information received and held in confidence relating to negotiation between the municipality and a provincial government or the federal government or both, or between a provincial government or the federal government or both and a third party".

ADJOURNMENT

SUNSHINE COAST REGIONAL DISTRICT STAFF REPORT

TO: Infrastructure Services Committee - November 21, 2019

AUTHOR: Remko Rosenboom, General Manager, Infrastructure Services
Stephen Misiurak, Manager, Capital Projects

SUBJECT: **RESULTS OF RAW WATER RESERVOIR FEASIBILITY STUDY PHASE 3**

RECOMMENDATION(S)

THAT the report titled Results of Raw Water Reservoir Feasibility Study Phase 3 be received;

AND THAT a budget proposal for $225,000 for a Feasibility Study Phase 4 with respect to the development of a Raw Water Reservoir on Site B be brought forward to the 2020 Round 2 Budget;

AND FURTHER THAT a budget proposal for Development Phase 1 with respect to the development of a Raw Water Reservoir on Site B to be brought forward to the 2020 Round 2 Budget.

BACKGROUND

At its February 21, 2019 meeting, the Infrastructure Services Committee considered the results of Phase 1 and 2 of the Raw Water Reservoir (RWR) Project. The Board subsequently approved the funding for a Feasibility Study, Phase 3 as part of its 2019 budget process.

The objective of the Feasibility Study Phase 3 was to provide more detailed insight of the four sites selected in Phase 2: Site A, Site B, Site C3 and Site C4. The assessments and resulting reports focused on the following aspects:

- Suitability of the ground conditions (type and landslide risk);
- Presence and mitigation options for ecological values;
- Hydrological impacts;
- First Nation interests;
- Confirmation of preliminary Dam Safety Classification;
- Detailed assessments of the operations benefits;
- Refinement of conceptual designs and cost estimates; and
- Updating the Phase 2 MCA based on the additional data and assessments collected and compiled in Phase 3 scope of work.

At the December 13, 2018 Planning and Community Development Committee meeting, the report titled 2018 Water Demand Analysis was received. This report presented an outlook of the annual shortfall in the amount of water to satisfy the water supply objective as outlined in the Water Sourcing Policy – Framework. This shortfall is called the Water Supply Deficit.

The table presented below is taken from that report and presents the Water Supply Deficit (in Million cubic meters) for three levels of effectiveness of water conservation initiatives and a 2% average annual population growth within the area supplied by the Chapman Creek System.

Effectiveness of water conservation initiatives (per capita, compared to 2010)	Water supply deficit (Million m^3)		
	2025	2035	2050
Service Area Population	26,000	32,000	43,000
10% reduction	2.01	2.83	4.35
20% reduction	1.65	2.39	3.76
33% reduction	1.22	1.82	2.98

The targeted volume of a RWR was set at approximately 1 million m^3 as that would likely address the Water Supply Deficit for 2025 in combination with the development of a deep aquifer well field at Church Road, which is currently considered for development, as well as intensive demand management.

Results from the Groundwater Investigation Phase 3 for the development of a well field at Church Road will be presented at the December 12, 2019 Planning and Community Development Committee meeting.

In addition to a RWR, the Church Road well field, and intensive demand management, one or more additional water supply sources are required to address the Water Supply Deficit for 2035.

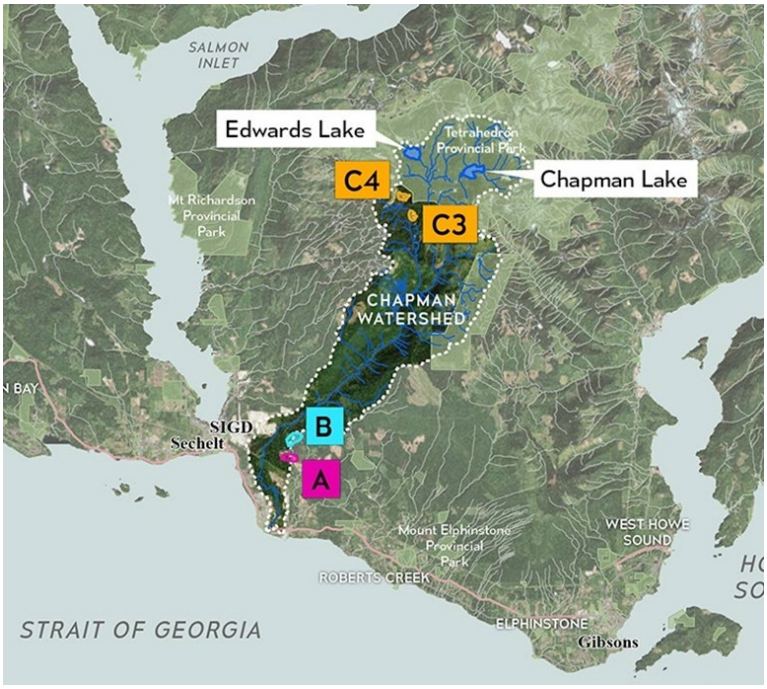
At the February 21, 2019 Board Meeting, the results of the Phase 2 RWR study were presented to the Board with the following information; the conceptual designs for each of the four sites; the preliminary cost estimates for each of the four sites; and the recommended next steps which formed the basis for the Phase 3 scope of work for the RWR.

The purpose of this report is to present the findings of the RWR Feasibility Study Phase 3 project and request direction on next steps on the development of a RWR.

DISCUSSION

Description of the four potential sites

The four sites selected based on the findings of the Feasibility Study Phase 2 are all located on Crown Land and are depicted in Figure 1. The conceptual design of a RWR on each of the sites is described in the paragraphs to follow.



Site A:

This site is located above the airport and below the Fortis BC gas line and east of the Sechelt Airport Forest Service Road. A reservoir on this site would use the current Chapman Creek intake location as its point of diversion and one pipe would connect the reservoir to the existing conveyance infrastructure to the Chapman Creek Water Treatment Plant. Site A would require pumping water to and from the reservoir site and therefore results in a higher lifecycle costs than all the other sites, as use of primary intake and outtake pumps are required to convey water to and from the reservoir site. Site A consists of previously harvested forest with a current low economic value.

Site B:

Site B is located just north of Site A on the other side of the Fortis BC gas line. A reservoir on this site would require a new Chapman Creek water intake to be constructed at a higher elevation than the current one. New conveyance piping from that intake to the reservoir and from the reservoir to the current intake location would be required. From that point, water would flow via the current conveyance infrastructure to the Chapman Creek Water Treatment Plant. Due to the elevation of Site B there will be more pressure in the piping to the treatment plant, eliminating the need for the booster pump that is located between the current intake and the treatment plant. There are only pumps required to pump the water over the reservoir embankment. Site B consists of previously harvested forest with a current low economic value.

Site C3 and C4

Both sites would enlarge small alpine lakes through the construction of a dam embankment on the downstream face only. The conveyance to the treatment plant would occur via Chapman Creek and the Chapman Creek water intake and conveyance infrastructure, similar to the current method with water released from Edwards Lake and Chapman Lake.

Technical analysis

For each site the following technical analyses were completed and compiled in the following reports. All reports are available on www.scrd.ca/reservoir.

- Design Summary Report, including updated Multi-Criteria Analysis;
- Regulatory Roadmap Report: Evaluation of the regulatory and permitting requirements for each of the Sites;
- Environmental Scoping Report: Environmental scoping assessment to describe the environmental scope of work remaining for the Sites;
- Point of Diversion Report: Evaluation of potential point of diversion (POD) locations on Chapman Creek to support development of a new intake to divert water to Site B;
- Aquatics Assessment Report: Preliminary aquatics evaluation at Sites C3 and C4, as well as at the potential Site B POD locations;
- Hydrological Assessment Report: Hydrological studies for Sites C3 and C4 to determine recharge of the lakes in a dry year;
- Terrain Assessment Report: Terrain assessment for the Sites to determine ground types and landslide risk;
- Refined conceptual engineering drawings for all sites;
- Dam consequence of failure analysis and classifications reports for all sites.

Table 1 presents a high level overview of the results from these assessments:

Assessed Criteria	**Site A**	**Site B**	**Site C3**	**Site C4**
Technical Feasibility				
Storage volume (m3)	1.07 M	1.27 M	1.06M	0.76 M
Total area (ha)	47	45	23	27
Scalability	Would require a dam >15 m	Would require a dam >15 m, and some horizontal expansion potential	Would require a dam >15 m	Would require a dam >15 m
Amount of earthwork required during construction	High	High	Low	Low
Amount of offsite construction material required	High	High	Moderate	Moderate
Site access	Existing FSR	Existing FSR	Reactivated FSR and helicopter	Reactivated FSR and helicopter
Water conveyance method	Current infrastructure, gravity fed to reservoir and pumped from reservoir to treatment plant	New intake, gravity fed to reservoir and a combination of pump and gravity fed from reservoir to treatment plant	No change to conveyance infrastructure	No change to conveyance infrastructure
Terrain stability	Some instability	Good	Good	Good
Dam Consequence of failure classification	Extreme	Extreme	Extreme	Extreme
Economics				
Capital Cost (Including contingency allowances)	$49.1 M	$53.1 M	$16.4 M	$12.8 M

Assessed Criteria	Site A	Site B	Site C3	Site C4
Operating cost	- Significant due to ongoing pumping requirement - reduction in treatment costs due to improved water quality - ongoing O&M of new infrastructure	- reduction in pumping costs compared to current situation - reduction in treatment costs due to improved water quality - ongoing O&M of new infrastructure	- ongoing O&M of new infrastructure	- ongoing O&M of new infrastructure
Lifecycle costs	High	Moderate	Low	Low
Potential of economic co-benefits (partnerships, hydropower)	- Construction	- Construction - Hydropower generation	None	None
Environmental Impacts				
Potential for important species and habitats (desktop study 10km radius)	High	High	Moderate	Moderate
Wildlife presence (desktop study 10km radius and limited field study)	Moderate	Moderate	Moderate	Moderate
Potential for impacts to wildlife	Low	Low	High (incl. elk, bear, and frogs)	High (incl. elk, bear, and frogs)
Potential for impacts to wetlands and surface water	Limited	Limited	Extreme	Extreme
Water quality of intake water compared to current	Improved	Improved	Similar to current	Similar to current
Regulatory and Community Sensitivity				
Regulatory Framework	Moderate, such as: - Environmental Assessment Certificate - Water Licence - Dam Safety approval - Land tenure - ALR approval - District of Sechelt Approval	Moderate, such as: - Environmental Assessment Certificate - Water Licence - Dam Safety approval - Land tenure (incl. current overlap with SCRGC tenure) - ALR approval	Complex, such as: - Environmental Assessment Certificate - Water Licence - Dam Safety approval - Land tenure - ALR approval - Fisheries and Oceans approval	Complex, such as: - Environmental Assessment Certificate - Water Licence - Dam Safety approval - Land tenure - ALR approval - Fisheries and Oceans approval
Potential regulatory challenges	Moderate	Moderate	High	High
General community favourability	Moderate, previously impacted area	Moderate, previously impacted area	Low, unimpacted alpine area	Low, unimpacted alpine area

The following points provide additional information on some of the items listed in the table.

- Capital Cost Estimates:
    - The Phase 3 cost estimates presented are based on the following assumptions:
        - An additional allowance of up to 15% for the majority of line items. The extent of the allowance depends on the certainty associated with the cost estimate for that particular line item at this point in time. The main reason for including this allowance is the lack of geotechnical data on the soil composition and the bedrock depth of all sites. More advanced geotechnical field investigations would need to be completed to fill in this information gap. Including such investigative work for all four sites in Phase 3 of the project would have been very expensive, and not possible within the current allocated budget and considered not cost effective to do at all four sites.
        - Inclusion of a 20% contingency allowance for the entire project for unforeseen expenses.
        - Due to the inclusion of the listed allowances, the listed capital costs can be considered to be the upper limit of the actual costs for the development of a RWR on each of the sites.
    - Phase 2 results estimated the following maximum storage volumes and cost estimates:

	Site A	**Site B**	**Site C3**	**Site C4**
Maximum Storage Volume (m^3)	1,180,300	1,291,600	781,900	856,000
Development costs estimate (excluding 50% contingency allowance)	$ 23,764,000	$ 23,575,000	$9,411,000	$8,698,000

    - Phase 2 cost estimates excluded several items that were included in those for Phase 3, such as the costs for:
        - Contingency allowance
        - Bedrock excavation and stockpiling
        - Concrete liner to reduce seepage
        - Water conveyance infrastructure
        - Reservoir access road construction and upgrades
        - Detailed engineering, permitting, procurement and construction management costs.
- Lifecycle Costs: The lifecycle costs associated with Site B are lower than for Site A as the construction of a new intake and piping infrastructure will reduce the lifecycle costs of the current water intake and piping infrastructure. Further analysis is required to quantify this.
- Dam Consequence of Failure: The Dam Consequence of Failure Classification is based on the dam height, storage volume as well as the potential risk for loss of life, environmental and cultural values, and infrastructure. Almost all lakes and reservoirs used for community water supply in BC have the Dam Consequence of Failure Classification of Extreme.

- Dam Height: All dams are designed to be a maximum of 15 meters high in order to be subject to provincial dam safety regulations. Higher dams would need to meet more stringent international standards.
- Seismic Risk: The risk associated with a seismic event is included in all assessments and design work and is considered a concern for Site A
- Hydrological Feasibility: Sites A and B would be filled from Chapman Creek. Sites C3 and C4 depend on the catchment area of their respective watersheds for recharge. The Hydrological Study looked at the confidence these sites would refill in a dry year. Based on historical information, the study concluded Site C3 would recharge even in the driest years. The smaller catchment area of Site C4 led to a risk of not completely recharging during an extremely dry winter.
- Hydropower: The hydropower generation potential at Site B is considerable. The power generated can be used on site and at the Chapman Creek Water Treatment Plant. It will have to be determined if any excess power can be sold to BC Hydro.

  For Site A and B, the costs associated with the installation of hydropower generating equipment are not included in the design or cost estimates and this equipment can be installed at a later date.
- Environmental Impacts: The potential for impacts to important species, habitat and wildlife are based on a desktop study of all the species that could be present in a 10 kilometer radius surrounding the different sites. It is expected that the actual presence of species and their likelihood to be impacted by the development of a RWR will be reduced once more detailed environmental field assessments are conducted.

Multi-Criteria Analyses

Based on the results of the analyses, an updated Multi-Criteria Analyses (MCA) was conducted to allow for a thorough comparison of the four sites (see Attachment A). To increase the robustness of this analyses, several sub-MCAs were completed, each with a very specific focus. Sub-MCAs were completed for the following cases:

- Base case: holistic weighing of factors
- Technically focussed case: extra weight on technical feasibility
- Economics focussed case: extra weight on economic feasibility
- Environmental focussed case: extra weight on environmental feasibility
- Regulatory and community focussed case: extra weight on Regulatory and community sensitivity

The scores of the sub-cases as well as the overall average score are presented in Table 2:

Focus sub-MCA	**Site A**	**Site B**	**Site C3**	**Site C4**
Base case	54%	61%	57%	55%
Technically focussed case	52%	60%	59%	57%
Economics focussed case	49%	57%	61%	64%
Environmental focussed case	55%	61%	54%	54%
Regulatory and community focussed case	57%	61%	44%	44%
Average of all cases	**53%**	**60%**	**55%**	**55%**

Note: 100% is the maximum score possible if all assessed criteria would score as Excellent.

Based on all the technical analyses and the MCA, Site B is overall the most favourable site to develop a RWR in support of the Water Supply Deficit as predicted for 2025. The site is the best option from an environmental, technical and regulatory point and only ranks lower from an economical point of view.

Based on these results staff recommend to only proceed with confirming the feasibility of Site B and explore possibilities to improve its economic viability.

Additional details on Site B

A breakdown of the cost estimate for the development of a RWR on Site B can be found in Table 3:

Cost Category	**Estimated costs ($)**
Reservoir site and access road preparation	$ 925,000
Excavation, hauling and RWR construction	$ 26,210,500
Water conveyance infrastructure	$ 6,326,400
Auxiliary infrastructure (fencing, roads etc.)	$ 856,300
Engineering, procurement and construction management	$ 9,949,000
Contingency allowance	$ 8,853,000
Total development costs	**$ 53,120,200**

As previously indicated, this cost-estimate is very conservative and includes several allowances. If these conservative allowances turn out favourably, then the total development costs of Site B could be approximately $40 million.

As mentioned earlier in this report, more in-depth geotechnical field investigations would be required to increase insight into the soil composition and bedrock depth. This would allow for a subsequent refinement of the design and cost estimates. In-depth geotechnical field investigations would consist of a drilling program and field and lab analysis of the soil composition.

Based on the limited geotechnical data currently available it is anticipated that approximately 600,000 m^3 of excavated materials might not be required to construct the RWR and might have a market value. The geotechnical drilling program would inform the exact amount of material and composition of the materials that could be marketed. This would allow for an estimate to be prepared on the revenue that could be regenerated by marketing those materials.

A RWR on Site B would require a new water intake on Chapman Creek and piping infrastructure. Keeping the current infrastructure in place would result in very desirable redundancy in our water intake ability from Chapman Creek.

The new water intake would be constructed upstream of the reservoir location, allowing for a gravity fed system to the reservoir and subsequently from the reservoir to the treatment plant. Such a system could be used year round, limiting the amount of pumping required.

A RWR on Site B (or Site A) will result in a stand-alone reservoir that could meet the community water demand and Environmental Flow Needs of Chapman Creek for about one month under Stage 2 demand. This is especially valuable when the creek water is sediment laden during and

after storm events or in an emergency that would compromise the water intake such as a landslide or structural damage.

Timeline for next steps

As outlined above, there are several opportunities to refine the cost estimates and revenue potential for the development of a reservoir on Site B. Staff recommend that a budget proposal for $225,000 for a Feasibility Study Phase 4 with respect to the development of a RWR on Site B be brought forward to the 2019 Round 2 Budget. This Feasibility Study Phase 4 project would only include:

- Limited geotechnical field investigation;
- Refined design and cost estimates; and
- Confirm revenue potential.

The results of the Phase 4 project would be presented to the Board for consideration at a Committee meeting in Q3 2020.

Based on any subsequent direction provided by the Board, the next phase of the development of a RWR would be the Development Phase 1. This phase would include the process to obtain all required regulatory and other authorizations, and the development of the final design and all supporting technical assessments. This phase could take three to four years to complete and could allow for the completion of a RWR in five-six years.

Staff recommend that a budget proposal for Development Phase 1 with respect to the development of a RWR on Site B be brought forward to the 2020 Round 2 Budget. The inclusion for this project in the 2020 budget would allow this phase to be initiated in Q3 2020, pending the Board's direction to do so after their consideration of the results of the Feasibility Study Phase 4 project.

Financial Implications

The objective of the Feasibility Study Phase 4 would be to refine the financial implications associated with the development of a RWR on Site B.

As the Development Phase 1 could take up to four years to complete, the SCRD would have several years to seek sufficient funds for the actual construction of a RWR on Site B.

Staff are assessing, on an ongoing basis, grant opportunities to fund projects like these. One common eligibility criteria for grants that support the financing of the development of a RWR is that the final design be prepared and all required regulatory and other authorizations be obtained or are forthcoming. The SCRD would therefore not be able to apply for any grants until the proposed Development Phase 1 project is complete or about to be completed.

Communication Strategy

Information on this project will be shared broadly through paid advertising, corporate newsletters, social media and the SCRD website.

Staff will continue to engage with the *shíshálh* Nation to share the findings of this project phase.

STRATEGIC PLAN AND RELATED POLICIES

The Raw Water Reservoir project is identified as a supply project in the Comprehensive Regional Water Plan.

The project also supports many aspects of the 2019-2023 Strategic Plan. It supports strategy 2.1 to plan for and ensure year round water availability now and in the future and specifically the tactic to "investigate and/or develop water supply plans/sources for North and South Pender, Langdale, Soames, Grantham's, Eastbourne, Cove Cay, Egmont and Chapman Creek water systems". Since climate change is straining the water system, the raw water reservoir will contribute to the development and implementation of adaptation strategies and measure for priority risk areas.

CONCLUSION

RWR Feasibility Study Phase 3 studied four sites identified in Phase 2. Site A is located above the airport and below the Fortis BC gas line. Site B is located just north of Site A on the other side of the Fortis BC gas line. Sites C3 and C4 would enlarge small alpine lakes in the upper Chapman Creek watershed.

Based on all the technical analyses and the Multi-Criteria Analysis, Site B is overall the most favourable site to develop a RWR. A RWR on Site B would require a new water intake on Chapman Creek and piping infrastructure. Keeping the current infrastructure in place would result in very desirable redundancy in our water intake ability from Chapman Creek.

There are several opportunities to refine the cost estimates and revenue potential for the development of a reservoir on Site B. Staff recommend that a budget proposal for $225,000 for a Feasibility Study Phase 4 be brought forward to the 2019 Round 2 Budget and include:

- Limited geotechnical field investigation;
- Refined design and cost estimates; and
- Confirm revenue potential.

The results of the Phase 4 project would be presented to the Board for consideration at a Committee meeting in Q3 2020.

Based on any subsequent direction provided by the Board, the next phase of the development of a RWR would be the Development Phase 1. This phase would include the process to obtain all required regulatory and other authorizations, and the development of the final design and all supporting technical assessments. This phase could take three to four years to complete and could allow for the completion of a RWR in five-six years.

Staff recommend that a budget proposal for Development Phase 1 with respect to the development of a RWR on Site B be brought forward to the 2020 Round 2 Budget. The inclusion for this project in the 2020 budget would allow this phase to be initiated in Q3 2020, pending the Board's direction to do so after their consideration of the results of the Feasibility Study Phase 4 project.

Attachments:

Attachment A – Design Summary Report
Attachment B – Preliminary design for Site A
Attachment C – Preliminary design for Site B
Attachment D – Preliminary design for Site C3
Attachment E – Preliminary design for Site C4

Reviewed by:			
Manager		CFO/Finance	X-T.Perreault
GM		Legislative	
Interim CAO	X – M. Brown	Other	

Raw Water Reservoir Feasibility Study

Phase 3

Design Summary Report

Prepared for

Sunshine Coast Regional District

Integrated Sustainability

15 November 2019

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WATER | WASTE | ENERGY

Disclaimer

The information presented in this document was compiled and interpreted exclusively for the purposes stated in Section 1 of the document. Integrated Sustainability provided this document for Sunshine Coast Regional District solely for the purpose noted above.

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Any questions concerning the information or its interpretation should be directed to AJ MacDonald.

Document Revision History

Rev No.	Rev Description	Author	Reviewer	Approver	Rev Date
1	Re-Issued as Final	Haley Massong	Alexa Sperske	AJ MacDonald	15-Nov-2019
0	Issued as Final	Haley Massong	Alexa Sperske	AJ MacDonald	31 Oct 2019

INTEGRATED SUSTAINABILITY

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1 INTRODUCTION

1.1 Project Overview

The Sunshine Coast Regional District (SCRD) has identified a need for additional water supply within the Chapman Water System to meet current and future potable water consumption demands. The SCRD intends to develop these means such that there is sufficient year-round water supply for communities dependant on the Chapman Water System under both typical and high demand circumstances.

The SCRD supplies water to three water service areas, the Regional Water Service Area, North Pender Harbour Water Service Area, and South Pender Harbour Water Service Area, which together extend approximately 85 km along the Sunshine Coast between Egmont, British Columbia (BC) to the north and Langdale, BC to the south. The Chapman Water System is the primary water system in the Regional Water Service Area.

The Chapman Creek watershed is the primary water source for the Chapman Water System and conveys water from Chapman Lake and Edwards Lake to the Chapman Creek Water Treatment Plant (WTP) via an existing intake on Chapman Creek. The SCRD is advancing several projects to address the growing water demands, one of which is the development of a raw water reservoir. The concept of the raw water reservoir is to store water during periods of high precipitation and supply water to the Chapman Water System during periods of low precipitation and low creek flow periods.

The SCRD is progressing a raw water reservoir feasibility study (the Project) to evaluate the feasibility of developing a raw water reservoir to increase water supply to the existing Chapman Water System. The overall objective of the Project is to identify and evaluate potential locations for development of a raw water reservoir and to develop designs and cost estimates for sites deemed feasible. To reach these objectives, a water demand analysis was conducted to evaluate the current and projected water demands for the Chapman Water System, existing water supply sources, and determine the resultant water supply deficit (Integrated Sustainability 2018a). Based on the results of the water demand analysis, a target storage volume for the reservoir was selected. Potential reservoir sites have been identified and reviewed at a desktop and preliminary field level. A multi-criteria analysis (MCA) has been completed to compare and rank the sites and conceptual designs have been completed for the four top-ranked sites (Sites A, B, C3, and C4, the Sites) and Class C cost estimates were developed based on these designs.

1.2 Overall Project Scope

Integrated Sustainability previously completed Phases 1 and 2 of the Project between September 2018 and March 2019. A detailed description of the work completed during Phases 1 and 2 of the Project is included in the Phase 2 Feasibility Study Report (Integrated Sustainability 2019c). Phase 3 of the Project was commenced in May 2019. The overall scope of work for Phases 1 through 3 is summarized below.

1) Phase 1 consisted of the following:
   - Water demand analysis to evaluate current and projected water demands for the Chapman Water System, existing water supply sources, and determine the resultant water supply deficit (Integrated Sustainability 2018a)
   - Development of siting and conceptual design criteria for the raw water reservoir, to support reservoir siting and design development, including a target storage volume of approximately 1,300,000 m^3 (Integrated Sustainability 2018b)
   - Identification of 11 potential raw water reservoir sites with approximate volumes ranging from 900,000 m^3 to 2,300,000 m^3, and preliminary desktop review of these sites, including preliminary environmental and regulatory review and engagement (Integrated Sustainability 2018b)
   - Preliminary Multi-Criteria Analysis (MCA) of the 11 identified sites to evaluate them from a technical, economic, environmental, and regulatory perspective (Integrated Sustainability 2018b)
   - Selection of five preferred sites, Sites A, B, C1, C3, and C4, to progress to Phase 2 (Integrated Sustainability 2018b)
2) Phase 2, Integrated Sustainability completed the following:
   - Detailed technical and regulatory and permitting requirements review of the five preferred sites from Phase 1 and elimination of Site C1 based on technical review criteria, leaving four Sites, Sites A, B, C3, and C4, remaining (Integrated Sustainability 2019a)
   - Conceptual designs and Class D cost estimates for the Sites (Integrated Sustainability 2019a, 2019b)
   - Detailed MCA evaluation to determine conceptual feasibility of the Sites (Integrated Sustainability 2019c)
   - Recommendations by Integrated Sustainability to advance the Sites for further Study in Phase 3 of the Project (Integrated Sustainability 2019c), followed by SCRD Board of Directors decision to authorize this recommendation
3) Phase 3 included:
   - Evaluation of the regulatory and permitting requirements for each of the Sites (Integrated Sustainability 2019d)
   - Environmental scoping assessment to describe the environmental scope of work remaining for the Sites (Integrated Sustainability 2019e)
   - Evaluation of potential point of diversion (POD) locations on Chapman Creek to support development of a new intake to divert water to Site B (Integrated Sustainability 2019f)
   - Preliminary aquatics evaluation at Sites C3 and C4, as well as at the potential Site B POD locations (Integrated Sustainability 2019g)

- Hydrological studies for Sites C3 and C4 (Integrated Sustainability 2019h)
- Terrain assessment for the Sites (Integrated Sustainability 2019i)
- Conceptual engineering, including infrastructure assessment, design development (Integrated Sustainability 2019j, 2019k, 2019l, and 2019m), dam consequence of failure classifications (Integrated Sustainability 2019n, 2019o, 2019p, and 2019q), and cost estimates for the Sites (Integrated Sustainability 2019r)
- Updating of the Phase 2 MCA based on additional information collected during Phase 3
- First Nations and stakeholder engagement and consultation support

1.3 Design Summary Purpose and Scope

The purpose of this Design Summary Report is to summarize the key design criteria and assumptions for Integrated Sustainability's Phase 3 engineering design scope and present the updated MCA matrix.

Overall, the Phase 3 design development scope includes developing designs for the Sites to a conceptual design level further advanced than the design work completed during Phase 2. Dam site characterization completed to date falls within the guidelines for scoping-level design, as per the BC professional practice guidelines for Site Characterization for Dam Foundations in BC (APEGBC 2016).

The Phase 3 design development will encompass the Sites, as well as supporting infrastructure (e.g. water conveyance/pipelines, roads, intake) required to connect the Sites to the existing Chapman Water System infrastructure. During Phase 3, designs of the Sites will be advanced further than the designs for the supporting infrastructure, given that there is more information available to support designs of the Sites at this stage. For the purpose of Phase 3, design breaks have been delineated to clearly illustrate the different levels of design development for the Sites versus their supporting infrastructure, and are summarized as follows:

- The Sites (approximately 30% design), in support of developing Class C cost estimates
- Supporting infrastructure required to connect the Sites to the existing Chapman Water System infrastructure (15% to 20% design), in support of developing Class D cost estimates

Parameters defined in this Design Summary Report will be used to meet project objectives and to align the design criteria with the SCRD's operational requirements and regulatory requirements. It is recommended that this Design Summary Report is further updated during future design stages to support approvals under the Water Sustainability Act (BC Government 2014) in accordance with BC Dam Safety Regulation (DSR) (BC Government 2016a, 2016b) requirements.

1.4 Conceptual Site Development

The conceptual model for the raw water reservoir is based on the following approach:

- Diversion of water to a raw water reservoir for storage during periods of high precipitation
- Diversion of water from the raw water reservoir to the Chapman Creek WTP for supply augmentation during periods of low precipitation and to meet water demands as well as downstream flow requirements during peak summer demands

Sites A and B are located near the existing Chapman Water System infrastructure and the Sunshine Coast communities (2 km to 3 km). Conceptual reservoir designs at Sites A and B comprise reservoirs that include both excavation into existing ground and constructed embankment dams to obtain the design storage volume. Sites C3 and C4 are located further from and northeast of the Sunshine Coast communities (10 km to 15 km) and are situated within existing subalpine lake basins. Conceptual reservoir designs at Sites C3 and C4 utilize the steep basin valley slopes and a dam at the downstream end of the basin valley to obtain the design storage volume. The Sites are located as follows:

- Site A - National Topographic System (NTS) Location J/92-G-5
- Site B - NTS Location J/92-G-5
- Site C3 – NTS Location B/92-G-12
- Site C4 – NTS Location B/92-G-12

Locations of the Sites are shown in Figure 1.

2 SITING

A detailed desktop study was conducted in Phase 2 of the Project (Integrated Sustainability 2019a) and included a review of publicly available data such as topography, geology, hydrogeology, environmental data, and regulatory permitting requirements. The following information and criteria were used as part of this desktop study:

- Land use and ownership data, to position the reservoir within land owned by the SCRD, Crown land, or Agricultural Land Reserve (ALR) land, and not within Tetrahedron Provincial Park, the Gravel Lands (as per shíshálh Nation Foundation Agreement) (BC Government 2018a), or utility rights-of-ways (ROWs)
- Proximity to existing infrastructure, including access roads
- Conceptual methods for conveying water to and from the sites, and approximate conveyance distances
- Topographical and disposition data to evaluate site suitability, constraints, and logistics
- Regional bedrock and surficial geology to evaluate subsurface conditions

- Local terrain data to avoid siting within areas typically susceptible to geohazard activity, including ravines, coulees, and gullies
- Landslide hazard data to maintain adequate setback from potential slope failures
- Proximity to mapped fault locations
- Water features data to maintain required setbacks from wetlands and watercourses
- Available environmental data to evaluate the presence of vegetation, fish, and wildlife
- Historical data and previous uses to evaluate historical and archaeological significance, and previous contamination
- Available current and historical wetland data to evaluate the presence and impact to wetlands within the area
- Existing and abandoned water wells to understand the groundwater users within the area
- Regulatory permitting requirements

To date, review of historical and archeological significance of lands that may be impacted by development at each of the Sites has been limited to desktop review of publicly available data. A detailed archeological assessment should be completed in future design stages.

3 SITE AND CONCEPTUAL DESIGN DESCRIPTIONS

3.1 Site A

The Site A conceptual design footprint is approximately 47.4 hectares (ha). Site A is located at an elevation of approximately Elevation (El.) 190 m. The elevation across Site A ranges from El. 163 m in the south to El. 200 m in the north, resulting in a total elevation change of up to 38 m. Site A is located approximately 1,300 m to 2,000 m east, northeast, and north of communities along the Sunshine Coast, and approximately 600 m north of the Sechelt-Gibsons Airport. The east portion of Site A is located within the SCRD's electoral area defined as Area D: Roberts Creek and the west portion of Site A is located within the District of Sechelt (SCRD electoral area defined as Area S). Site A is situated on Crown land, and the majority of it is situated within Agricultural Land Reserve (ALR). A portion of the Site A footprint was previously cleared. Site A is bound to the west by the Sechelt-Airport Forestry Service Road (FSR) and the Gravel Lands (BC Government 2018a), and to the north by a Fortis BC right-of-way (ROW) (2403806). Undeveloped land borders Site A to the south and east. A BC Hydro ROW (0207803) is located approximately 500 m to the south, and Field Road is located approximately 400 m to the east. Site A is located approximately 600 m east of Chapman Creek and 400 m west of Hudson Creek.

Site A is situated such that water would be conveyed from Chapman Creek to the reservoir via pipeline, with potential contributions from surface water inflow and

groundwater. Water would then be conveyed from the reservoir to the Chapman Creek WTP via an additional pipeline. The Site A conceptual design footprint includes a single reservoir, operations area, and areas for topsoil, subsoil, and excess subsurface material stockpiles. The reservoir is irregular to rectangular in shape and oriented lengthwise from east to west. The site is steeply sloped from north to south with localized areas of topographic relief, the north portion of the reservoir would require a cut and the south portion of the reservoir would require an embankment dam. Site A is assumed to be accessed from the west via the Sechelt-Airport FSR.

3.2 Site B

Site B is located immediately north of Site A. The Site B conceptual design footprint is approximately 45.2 ha in area. Site B is located at an elevation of approximately El. 220 m. Site B slopes from northeast (El. 213 m to El. 217 m) to southwest (El. 195 m to El. 200 m), for a total elevation change across Site B of 13 m to 22 m. Site B is located approximately 1,900 m to 2,600 m east, northeast, and north of communities along the Sunshine Coast, and approximately 1,200 m north of the Sechelt-Gibsons Airport. Site B is located within the SCRD's electoral area defined as Area D: Roberts Creek. Site B is situated on Crown land, and most of it is situated within ALR. The northwest portion of Site B is located within an area where the Sunshine Coast Rod and Gun Club (SCRGC) currently holds a provincial land tenure and a Land Use Agreement with the SCRD. A portion of Site B was previously cleared. Site B is bound to the west and northwest by the Sechelt-Airport FSR, to the north and northeast by the SCRGC access road and facility, and to the south by the Fortis BC ROW (2403806). Undeveloped land borders Site B to the east. An inactive gravel quarry is located immediately southwest of the Site B footprint. Site B is located approximately 400 m to 600 m east of Chapman Creek and immediately west of Hudson Creek.

Similar to Site A, Site B is situated such that water would be conveyed from Chapman Creek to the reservoir via pipeline, with potential contributions from surface water inflow and groundwater. Water would then be conveyed from the reservoir to the Chapman Creek WTP via an additional pipeline. The Site B conceptual design footprint includes a single reservoir, operations area, and areas for topsoil, subsoil, and excess subsurface material stockpiles. The reservoir is irregular to rectangular in shape and oriented lengthwise from northeast to southwest. The site is moderately sloped from northeast to southwest with localized areas of topographic relief. Given the existing topography, an embankment dam would be required on all sides of the reservoir, with an embankment dam on the south side being greater in height than those on the north side. Site B is assumed to be accessed from the west via the Sechelt-Airport FSR.

3.3 Site C3

The Site C3 conceptual design footprint is approximately 23.3 ha in area and is located approximately 12 km northeast of Sechelt on the west side of the Chapman Creek valley. Site C3 is located within the SCRD's electoral area defined as Area D: Roberts Creek, is

situated on Crown land, and is located approximately 200 m south of the Tetrahedron Provincial Park boundary.

Site C3 is situated within an existing subalpine lake basin at approximately El. 1,000 m. An unnamed creek inlet enters the lake from the northwest and the Tsawcome Creek outlet exits to the south-southwest. The confluence of Tsawcome Creek and Chapman Creek is located approximately 650 m southwest of Site C3. Tsawcome Creek is a tributary of Chapman Creek and the confluence of the two is located approximately 650 m southwest of the Site. The northern extent of Site C3 is located approximately 500 m southeast of the southern extent of Site C4.

Site C3 is situated such that the reservoir would capture surface water from the local watershed, including the unnamed creek that drains to the lake basin from the northwest. Water would be released from the reservoir into Chapman Creek via Tsawcome Creek. The conceptual layout for Site C3 includes a constructed dam positioned at the south end of the lake basin, used to capture water within the lake basin to create a reservoir constrained by the dam and valley slopes surrounding the lake basin. Areas for topsoil, subsoil, and excess subsurface material stockpiles and operations area have also been included in the site layout. Site C3 is assumed to be accessed from the northwest via an existing, decommissioned forestry road, from which new road infrastructure would be constructed to gain direct access to Site C3. However, Site C3 could also be accessed from another existing, decommissioned forestry road from the southeast.

3.4 Site C4

The Site C4 conceptual design footprint is approximately 26.6 ha in area and is located approximately 14 km northeast of Sechelt on the west side of the Chapman Creek valley. Site C4 is located within the SCRD's electoral area defined as Area D Roberts Creek, is situated on Crown land, and is located approximately 100 m west and 300 m south of the Tetrahedron Provincial Park boundary.

Site C4 is situated within an existing subalpine lake basin at approximately El. 1,050 m. The outlet to Tsawcome Creek is located at the south end of the lake basin. Tsawcome Creek is a tributary of Chapman Creek and the confluence of the two is located approximately 800 m southwest of the Site. The southern extent of Site C4 is located approximately 500 m northwest of the northern extent of Site C3.

Similar to Site C3, Site C4 is situated such that the reservoir would capture surface water from the local watershed. Water would be released from the reservoir directly into Chapman Creek via the unnamed creek between Sites C3 and C4 and then via Tsawcome Creek between Site C3 and the confluence of Tsawcome Creek and Chapman Creek. Given this, water conveyed from Site C4 would travel through the Site C3 lake basin on its path to Chapman Creek. Water conveyance to and from the reservoir is via overland surface water flow, with potential contribution from groundwater. The conceptual layout for Site C4 includes a constructed dam positioned at the south end of the lake basin, used to capture water within the lake basin to create a reservoir

constrained by the dam and valley slopes surrounding the lake basin. Areas for topsoil, subsoil, and excess subsurface material stockpiles and operations area have also been included in the site layout. Site C4 is assumed to be accessed from the northwest via an existing, decommissioned forestry road, from which new road infrastructure would be constructed to gain direct access to Site C4. However, Site C4 could also be accessed from another existing, decommissioned forestry road from the southeast.

4 SITE CHARACTERIZATION

The site characterization included desktop review and site (field) reconnaissance to evaluate the general project area and locations in which the Sites are situated, in terms of terrain characteristics, dam foundation characteristics, and general engineering construction considerations.

Dam site characterization completed prior to and during Phase 3 falls within the guidelines for scoping level design, as per the BC Professional Practice Guidelines for Site Characterization for Dam Foundations in BC, the purposes of which was to identify major features that have potential to impact siting, design configuration, and operations (APEGBC 2016). Site characterization completed to date is limited to desktop review and general site reconnaissance to map terrain at each of the Sites based on visual observations. Recommendations provided in the following sections should be used to support Phase 3 design criteria only. Additional site characterization work will be required during future design stages, and should include detailed terrain and bedrock mapping, intrusive investigations, in-situ testing, laboratory testing, and geophysics.

Integrated Sustainability completed a review of available, relevant materials to characterize the Sites at a desktop level, which included review and consideration of the following key attributes:

- Regional surficial geology and geomorphology
- Regional bedrock geology
- Regional hydrogeology
- Regional terrain stability and drainage conditions
- Potential geohazards
- Potential design and construction criteria, including available construction materials

Integrated Sustainability completed a general site reconnaissance, using the data reviewed during the desktop study as a planning tool. The site reconnaissance was limited to visual surficial observations and visual observations made of near surface conditions based on shallow hand auger holes). Observations made during the site reconnaissance will need to be confirmed during detailed site investigations in future design stages. The site reconnaissance included the following:

- Assessment of terrain conditions, including near-surface soils, bedrock and groundwater, surface water, and topography and terrain characteristics

- Identification and interpretation of potential geohazards, and assessment of activity and potential impacts of geohazards on the proposed development at each of the Sites
- Evaluation of potential engineering and construction considerations, including potential available construction materials

Following completion of Phase 3 of the Project, the following scope items have been identified as minimum requirements to support future design stages and will be based on the additional site characterization data:

- Evaluation of suitability of onsite soils and bedrock for use as construction materials
- Slope stability analysis for the reservoir side slopes and embankment dam side slopes and recommendations on design slope angles and setback distances
- Seepage analysis and recommended control measures for the embankment dams and embankment dam foundations
- Evaluation of potential for liquefiable soils at the Sites during a seismic event and recommended control measures
- Settlement analysis for the embankment dams and recommended control measures
- Soil loading analysis to determine setback distances between site infrastructure and buried utilities
- Site specific seismic hazard assessment

The site characterization and supporting design recommendations provided within this report should be verified and additional, detailed recommendations provided during future design stages.

A summary of the site characterization findings, including general information on the geology and physiography of the area in which the Project is situated, as well as site-specific characteristics and recommendations pertaining to each of the Sites, is provided in the following sections.

Review of the Sites from an environmental and regulatory perspective can be found in the Regulatory Roadmap (Integrated Sustainability 2019d), Environmental Scoping Assessment (Integrated Sustainability 2019e), and Preliminary Aquatics Assessment (Integrated Sustainability 2019g).

4.1 General

4.1.1 Regional Geology and Physiography

The Project area lies within the Georgia Lowland and the lower slopes of the coast mountains. The topography and surficial geology in the region are products of Fraser Glaciation (late Wisconsonian) when continental ice sheets moved south down the Straight of Georgia and bordering lowlands and mountainous terrain approximately 14,500 years ago (Clague 1984). During glaciation, glacial till and other related sediments,

collectively known as Vashon Drift were deposited across the region. Climatic warming followed glaciation, during which Capilano Sediments, including glaciofluvial, glaciomarine, raised delta, intertidal, and beach sediments, were deposited over the Vashon Drift (Armstrong 1981).

Within the Project area previous mapping shows that above approximately El. 300 m, glacial processes left terrain comprising exposed bedrock or with thin deposits of unconsolidated, disintegrated till overlying bedrock. The bedrock within the Project area is interpreted to be shallow, and topography is heavily influenced by the underlying bedrock (McCammon 1977).

Below approximately El. 300 m and near the coast, a coarsening upwards sequence of Capilano glaciomarine, marine, and glaciofluvial sediments were deposited over coarse grained Vashon Drift (Clague et. al. 1982, BC MoECCS 2019). Glacial outwash flowed down the Chapman Creek valley during deglaciation and formed a raised delta and alluvial fan, which was later cut through by Chapman Creek. Remaining granular, glaciofluvial deposits remain on both sides of the Chapman Creek valley.

4.1.2 Regional Seismotectonic Conditions

The Sites are in a high seismic hazard region (NRC 2017). Accordingly, all structures included in the designs for the Sites will need to be designed to accommodate a 1:10,000 year return period earthquake (CDA 2007). During an earthquake, the intensity of shaking at the site is dependent on the magnitude of the event, the distance to its epicenter, and local geologic conditions.

The Government of BC database of mapped faults (Ministry of Energy, Mines and Petroleum Resources - BC Geological Survey 2018) was reviewed to evaluate the proximity of each of the Sites to previously identified tectonic and seismic faults in the region. Faults can either be described as tectonic faults, which are faults with two very different aged rocks on each side of the fault trace, or seismic faults, which are faults that are seismically active. Seismic faults usually have clusters of seismic epicenters near or on the fault trace and are classed a geohazard. Tectonic faults are more benign and typically do not have epicenters associated with them and therefore are not considered a geohazard. One tectonic fault was mapped within the general area of the Sites, with several additional tectonic faults mapped to the west of Sechelt inlet and to the east on Gambier Island. Sites A and B are located within 8 km to 20 km of mapped tectonic faults to the northeast and northwest. Sites C3 and C4 are located within 4 km to 15 km to mapped tectonic faults located to the southeast, east, and southwest.

The effects of strong ground shaking originating well off the coast of Vancouver Island and the associated ground deformation (liquefaction, lateral spreading, and landslides) are potential hazards on the west coast of BC and are always considered in the design of structures in Britch Columbia.

Based on results from the desktop study and site reconnaissance, the area in which Sites A and B are situated is interpreted, at this stage, to have a relatively low risk of liquefaction

during a seismic event. The area in which Sites C3 and C4 are situated is interpreted to have a relatively low risk of liquefaction during a seismic event. While silty sands may be present near Sites C3 and C4, surficial deposits overlying bedrock near Sites C3 and C4 are interpreted to be very thin, limiting their potential hazard during a seismic event.

Subsurface geotechnical investigations in future and more detailed design stages, as part of typical site investigations for greenfield development, will be required to help confirm the susceptibility of the soils to liquefaction.

4.2 Site A

Integrated Sustainability completed a desktop review of relevant information pertaining to Site A and completed a site reconnaissance at Site A and surrounding area on 25 July 2019. The site reconnaissance comprised on-foot traversing and advancement of shallow hand auger holes to verify characteristics of near-surface conditions. The Terrain Assessment Report provides a summary of results from the desktop review and site reconnaissance (Integrated Sustainability 2019i). A summary of key findings and recommendations for Site A are as follows, and are based on the terrain assessment desktop review and visual observations made during the terrain assessment site reconnaissance:

- Approximately 100 mm of topsoil and 100 mm of subsoil stripping over the footprint of Site A is recommended.
- Surficial soils across Site A are interpreted to comprise a thin layer of coarse-grained marine sediment deposits (sand, gravel, and cobbles, with variable amounts of silt) overlying discontinuous coarse grained Morainal deposits (sand with variable amounts of gravel and silt), overlying bedrock.
- It is recommended that soils within the footprint of the embankment dam at Site A are excavated to bedrock prior to embankment construction, and the embankments are constructed directly on a bedrock foundation.
- It is assumed that bedrock at Site A comprises massive to slightly fractured (1 m to 2 m fracture spacing) intrusive granodioritic rocks, based on visual observations of outcrops made during the site reconnaissance. The bedrock is interpreted to be of relatively low permeability and of high strength. The bedrock contact is interpreted to range from 2 metres below ground surface (mbgs) to 10 mbgs. It is recommended for design purposes to assume a bedrock contact ranging from 2 mbgs at the north end of Site A to 5 mbgs at the south end of Site A.
- The surficial soils and bedrock at Site A are expected to be suitable for reuse as construction materials for the embankment dam, operations pads, roads, and site access point, provided that the required processing is conducted to provide granular material suitable for construction of the site infrastructure.
- Groundwater at Site A is assumed to be encountered at approximately 1 mbgs.

- It is assumed that fine grained soils suitable for construction of impervious zones or membranes within the embankment dam are not available within or surrounding Site A, and are not readily available within the surrounding area. Given this, it is recommended that use of fine-grained materials is not included in the design criteria for construction of site infrastructure.
- To maintain a sufficient setback from the steeply sloping terrain south of Site A (below El. 163 and west of the Sechelt-Airport FSR), a minimum setback of 50 m should be maintained between El. 161 m and the Sechelt-Airport FSR and the toes of the embankment dam and stockpiles on Site A.
- The embankment dam is to maintain upstream side slopes of 3 horizontal to 1 vertical (3H:1V) and downstream side slopes of 4H:1V.

4.3 Site B

Integrated Sustainability completed a desktop review of relevant information pertaining to Site B and completed a site reconnaissance at Site B and surrounding area on 26 July 2019. The site reconnaissance comprised on-foot traversing and advancement of shallow auger holes to verify characteristics of near-surface conditions. The Terrain Assessment Report provides a summary of results from the desktop review and site reconnaissance (Integrated Sustainability 2019i). A summary of key findings and recommendations for Site B are as follows, and are based on the terrain assessment desktop review and visual observations made during the terrain assessment site reconnaissance:

- Approximately 100 mm of topsoil and 100 mm of subsoil stripping over the footprint of Site B is recommended.
- Surficial soils across Site B are interpreted to comprise a thin layer of coarse-grained marine sediment deposits (sand, gravel, and cobbles, with variable amounts of silt) overlying discontinuous coarse grained Morainal deposits (sand with variable amounts of gravel and silt), overlying bedrock.
- It is recommended that soils within the footprint of the embankment dam at Site B are over excavated to bedrock prior to embankment dam construction, and the embankments are constructed directly on a bedrock foundation.
- It is assumed that bedrock at Site B comprises massive to slightly fractured (1 m to 2 m fracture spacing) intrusive granodioritic rocks, based on visual observations of outcrops made during the site reconnaissance. The bedrock is interpreted to be of relatively low permeability and of high strength. The bedrock contact is interpreted to range from 1 mbgs to 5 mbgs. It is recommended for design purposes to assume a bedrock contact at 3 mbgs at Site B.
- The surficial soils and bedrock at Site B are expected to be suitable for reuse as construction materials for the embankment dam, operations pads, roads, and site

access point, provided that the required processing is conducted to provide granular material suitable for construction of the site infrastructure.

- Groundwater is interpreted to be shallow at Site B and is interpreted to be perched on the underlying, low permeability bedrock. A groundwater depth of 1 mbgs should be assumed for design purposes.
- It is assumed that fine grained soils suitable for construction of impervious zones or membranes within the embankment dam are not available within or surrounding Site B and are not readily available within the surrounding area. Given this, it is recommended that use of fine-grained materials is not included in the design criteria for construction of site infrastructure.
- The embankment dam is to maintain upstream side slopes of 3H:1V and downstream side slopes of 4H:1V.

4.4 Site C3

Integrated Sustainability completed a desktop review of relevant information pertaining to Site C3 and completed a site reconnaissance at Site C3 and surrounding area on 22 July 2019. The site reconnaissance comprised on-foot traversing and advancement of shallow auger holes to verify characteristics of near-surface conditions. The Terrain Assessment Report provides a summary of results from the desktop review and site reconnaissance (Integrated Sustainability 2019i). A summary of key findings and recommendations for Site C3 are as follows:

- Approximately 400 mm of topsoil and 200 mm of subsoil stripping within the footprint of the gravity dam at Site C3 is recommended.
- Surficial soils across Site C3 are interpreted to comprise a veneer (0 m to 1 m thick) of colluvium (sands and gravels with variable amounts of silt) overlying bedrock on steep bedrock-controlled slopes, and veneers to blankets (1 m to 3 m thick) of coarse grained till overlying undulating bedrock within the lake basin.
- It is recommended that soils within the footprint of the gravity dam at Site C3 are excavated to bedrock, and the dam is constructed directly on bedrock.
- It is recommended that soils within the footprint of the operations pad at Site C3 are excavated to bedrock prior to placement of fill material.
- It is assumed that bedrock at Site C3 comprises massive to slightly fractured (1 m to 2 m fracture spacing) intrusive granodioritic rocks. The bedrock contact is interpreted to range from surface to approximately 4 mbgs. It is recommended for design purposes to assume a bedrock contact underlying the gravity dam footprint at Site C3 at 2 mbgs.
- The surficial soils and bedrock at Site C3 are not expected to be suitable for reuse as construction materials for the dam, operations pads, roads, and site access point.
- Groundwater at Site C3 is expected to be encountered at surface within the lake basin, and 1 mbgs on the valley slopes.

4.5 Site C4

Integrated Sustainability completed a desktop review of relevant information pertaining to Site C4 and completed a site reconnaissance at Site C4 and surrounding area on 23 July 2019. The site reconnaissance comprised on-foot traversing and advancement of shallow auger holes to verify characteristics of near-surface conditions. The Terrain Assessment Report provides a summary of results from the desktop review and site reconnaissance (Integrated Sustainability 2019i). A summary of key findings and recommendations for Site C4 are as follows:

- Approximately 400 mm of topsoil and 200 mm of subsoil stripping within the footprint of the gravity dam at Site C4 is recommended.
- Surficial soils across Site C4 are interpreted to comprise a veneer (0 m to 1 m thick) of colluvium (sands and gravels with variable amounts of silt) overlying bedrock on steep bedrock-controlled slopes, and veneers to blankets (1 m to 3 m thick) of coarse grained till overlying undulating bedrock within the lake basin.
- It is recommended that soils within the footprint of the operations pad at Site C4 are excavated to bedrock prior to placement of fill material.
- It is recommended that soils within the footprint of the gravity dam at Site C4 are excavated to bedrock, and the dam is constructed directly on bedrock.
- It is assumed that bedrock at Site C4 comprises massive to slightly fractured (1 m to 2 m fracture spacing) intrusive granodioritic rocks. The bedrock contact is interpreted to range from surface to approximately 4 mbgs. It is recommended for design purposes to assume a bedrock contact underlying the gravity dam footprint at Site C4 at 2 mbgs.
- The surficial soils and bedrock at Site C4 are not expected to be suitable for reuse as construction materials for the dam, operations pads, roads, and site access point.
- Groundwater at Site C4 is expected to be encountered at surface with the lake basin, and 1 mbgs on the valley slopes.

4.6 Site C3 and C4 Access Roads

Site access to Sites C3 and C4 will be achieved utilizing a combination of recommissioning (i.e. upgrading) existing, decommissioned roads and construction of new access roads. Two site access options for Sites C3 and C4 have been identified, both of which would be accessed from the Grey Creek FSR and then utilize existing, decommissioned roads to locations close to Sites C3 and C4, from which points new access roads would be constructed to gain direct site access. The existing, decommissioned roads proposed to be utilized in Access Road Option 1 would provide access to Sites C3 and C4 from the northwest and the existing, decommissioned roads proposed to be utilized in Access Road Option 2 would provide access to Sites C3 and C4 from the southwest. Access Road Option 1 and Access Road Option 2 consist of the following components:

- Access Road Option 1

  - Approximately 9 km of existing, decommissioned road, accessed via Grey Creek Road
  - Approximately 1 km of new access road
- Access Road Option 2
  - Approximately 14 km of existing, decommissioned road, accessed via Grey Creek Road
  - Approximately 5 km of new access road

Integrated Sustainability completed a site reconnaissance of existing, decommissioned roads for Access Road Option 1 and Access Road Option 2 on 24 July 2019. The site reconnaissance comprised truck-access and on-foot access along the existing, decommissioned roads to assess their condition and evaluate upgrades required for recommissioning. A summary of key findings and recommendations for the existing, decommissioned roads are as follows:

- Culverts and bridges have been removed and road maintenance has not been completed since decommissioning, including clearing of vegetation, and maintenance of cut/fill slopes, ditches, and road surface grading.
- Many swales (up to 2 m deep and 4 m wide along Access Road Option 1, and up to 4 m deep and 8 m wide along Access Road Option 2) intersected the roads, some of which are resultant from removed culverts and bridges, and others developed due to surface water erosion. Surface water was observed flowing through many of the swales along Access Road Option 2.
- Vegetation on the road varied from little vegetation to the road being mostly vegetated. Vegetation was limited to grasses and shrubs up to 2 m high. No tree growth was observed on the road.
- Bedrock outcrops were observed on the road surface and along the road cut slopes, indicating near-surface bedrock. Surficial soils observed comprised sand and gravel, with cobbles and boulders.
- Some occurrences of tension cracks and slumping along the downslope side of the road was observed, primarily along Access Road Option 2.
- The roads were consistently approximately 4 m wide with some sections up to 6 m wide.
- Cut and fill slopes up to 35 degrees.
- Road centerline grades generally ranged from 5% to 20%.
- It is assumed that reactivation of Access Road Option 1 would require two new bridges. Reactivation of Access Road Option 2 would require one new bridge.
- It is assumed that reactivation of the roads along both access routes would require installation of culverts at a spacing of approximately 25 m, based on the inferred spacing of culverts previously removed during deactivation.

5 DESIGN CRITERIA

Key design parameters for the Sites are summarized in Table A. Further description on design criteria and assumptions for the Sites is included in Sections 5.1 through 5.6.

Table A. Summary of Key Design Parameters

Design Parameter	Site A	Site B	Site C3	Site C4
Site area (ha)	47.4	45.2	23.3	26.6
Dam type	Rockfill embankment dam with an upstream facing concrete membrane	Rockfill embankment dam with an upstream facing concrete membrane	Concrete gravity dam	Concrete gravity dam
Total operational storage volume (m^3)[1]	1,066,400	1,270,000	1,056,700[3]	764,000[3]
Dam crest elevation (m)	177.5	215.5	1,003.0	1,056.5
Maximum water level (MWL) elevation (m)[1]	175.5	213.5	1,001.0	1,054.5
Water conveyance to site	Use existing Chapman Creek intake Water conveyed via pipeline Pumping required to convey water along pipeline	Use new intake Water conveyed from via pipeline No pumping required	Water conveyed via overland surface water capture	Water conveyed via overland surface water capture

Design Parameter	Site A	Site B	Site C3	Site C4
Water conveyance from site to Chapman Creek WTP	Water conveyed via pipeline Pumping required to convey water out of reservoir and to convey water along pipeline	Water conveyed via pipeline Pumping required to convey water out of reservoir, no pumping required to convey water along pipeline	Water conveyed via overland drainage and pipeline, via existing Chapman Creek intake	Water conveyed via overland drainage and pipeline, via existing Chapman Creek intake
Maximum dam height, H (m)[2]	13.5	12.0	13.5	14.7
Topsoil stripping volume (m^3)	43,300	36,780	3,231	3,087
Subsoil stripping volume (m^3)	39,900	39,970	1,615	1,543
Overburden excavation volume (m^3)	883,200	725,293	15,174	9,322
Bedrock excavation volume (m^3)	271,300	267,418	0	0
Overburden to stockpile (m^3)	0	0	12,140	6,288
Bedrock to stockpile (m^3)	188,500	256,468	0	0

Design Parameter	Site A	Site B	Site C3	Site C4
Embankment, access, and pad fill (m^3)	966,000	736,243	3,034	3,034

Notes:

1. Assumes a freeboard of 2 m between the dam crest and maximum water level elevations.
2. Maximum dam height, H, and maximum reservoir volume, V, have been maintained such that $H^2 \times \sqrt{V} < 200$, so as not to trigger the dam height thresholds for 'large dams' as defined by ICOLD (ICOLD 2011, 2016). At Sites A and B, H is measured as the difference in elevation between the minimum water level elevation (reservoir base) and the maximum dam crest elevation. At Sites C3 and C4, H is measured as the difference in elevation between the outlet creek bed elevation and the maximum dam crest elevation.
3. Storage volume excludes any existing water not captured by LiDAR. Volume will need to be refined once additional information is available.

5.1 Regulations, Codes, Standards, and Guidelines

The Sites will, at a minimum, be licenced under the *Water Sustainability Act* in accordance with BC DSR requirements. The design criteria described in this Design Summary Report for the Sites will conform to conditions set forth by the following regulatory bodies and the most recent editions of the following regulations, codes, standards, and guidelines:

- *Water Sustainability Act* (BC Government 2014)
- BC DSR (BC Government 2016a, 2016b)
- Canadian Dam Association Dam Safety Guidelines (CDA 2007)
- International Commission on Large Dams (ICOLD) (ICOLD 2011, 2016)
- BC Occupational Health and Safety Regulation (WorkSafe BC 2019)
- *BC Safety Standards Act* (BC Government 2003a)
- *BC Land Act* (BC Government 2019)
- *BC Environmental Assessment Act* (BC Government 2002a)
- BC Agricultural Land Reserve General Regulation (BC Government 2002b)
- *BC Drinking Water Protection Act* (BC Government 2003b)
- Fisheries and Oceans Canada (DFO) (DFO 2019)
- *Canadian Environmental Assessment Act* (CEAA) (Government of Canada 2012)
- Canadian Geotechnical Society Canadian Foundation Engineering Manual (CGS 2006)
- National Building Code of Canada (2015)
- BC Building Code (2018b)

During future design stages, as the design criteria included in this Design Summary Report is expanded upon and added to, the above list will be updated to include specific regulations, codes, standards, and guidelines conformed to within various aspects of the design.

5.2 Consequence of Failure Classification

Early stage consequence of failure classifications for each of the Sites were completed during Phase 3 of the Project. Results are summarized in reports for each of the Sites (Integrated Sustainability 2019n, 2019o, 2019p, and 2019q). Detailed consequence of failure classifications will be completed during future design stages.

5.3 Site A

The following criteria and assumptions were used as basis for the conceptual design:

- Development area of approximately 47.4 hectares (ha).
- One storage reservoir, comprising below-grade excavation and an embankment dam above grade to achieve the design storage volume.
- Excavated materials to be used as fill, with excess materials stockpiled onsite.
- Surface water management infrastructure.
- Two operations pads.
- Site access.
- Wildlife mitigation and security fencing.
- Water conveyance piping (details to be determined during future design stages).
- Outtake structure and pumps to convey water into and out of the reservoir (details to be determined during detailed design).
- Instrumentation and controls systems.
- Access and operations are planned for 365 days a year.
- Infrastructure is considered to be permanent (minimum of 50-year lifespan).
- Routine sediment removal will be required and is assumed to include dredging of the reservoir (details to be determined during future design stages).
- It is assumed that the storage capacity of the reservoir may be expanded in the future (by increasing dam height or by expanding reservoir footprint).

5.3.1 Site Preparation and Earthworks

The site preparation and earthworks at Site A will be designed based on the following parameters and assumptions:

- Tree clearing, and grubbing will be dictated by requirements for site access, construction and laydown areas, and regulatory requirements.

- The existing organic layers (i.e. topsoil and subsoil) will be stripped completely within the confines of areas designed for development and stockpiled separately onsite. Topsoil and subsoil depths of 100 mm have been assumed based on the Terrain Assessment site reconnaissance (Section 4.2) and have been used to estimate topsoil and subsoil stripping and stockpiling requirements (to be confirmed based on recommendations provided following a geotechnical and environmental assessment and incorporated during future design stages). The post-stripping surface will be the basis of the earthworks design.
- Topsoil and subsoil stockpiles will be sloped at 4H:1V. A 30% bulking factor will be applied for topsoil and subsoil stockpile sizing. Topsoil and subsoil stockpile slope angles should be confirmed based on geotechnical recommendations during future design stages.
- An overburden thickness ranging from 2 mbgs at the north end of Site A to 5 mbgs at the south end of Site A has been assumed based on the Terrain Assessment site reconnaissance (Section 4.2) and has been used to estimate approximate excavation volumes of soil and bedrock and stockpiling requirements (to be confirmed based on geotechnical recommendations and incorporated during future design stages).
- Soil and bedrock will be excavated to achieve the target storage volume. It is assumed that excavated soil will be used for construction of embankments first. Processed, excavated rock will be used for construction of the operations pads and site access road.
- The footprint of the embankment dam will be over excavated to bedrock to create a foundation for the dam.
- The diaphragm rockfill embankment dam will be constructed using suitable native material, including soil and bedrock. It is assumed that excavated bedrock will be processed to produce rockfill suitable for embankment construction. Gradation requirements and processing methods should be determined based on geotechnical recommendations during future design stages.
- Excess excavated bedrock will be stockpiled in an excavation stockpile, which will be sloped at 3H:1V. A bulking factor of 80% will be applied to the excavated bedrock for stockpile sizing. Excavation stockpile slope angles and bulking factors should be confirmed based on geotechnical recommendations during future design stages.
- Stockpiles will be positioned onsite with offset distances from the reservoir crests and nearby buried utilities to avoid excessive loading, and to avoid interference with construction activities and access points (offset distances will be determined based on geotechnical recommendations and incorporated during future design stages).
- The reservoir and stockpiles at Site A should be positioned such that a minimum setback of 50 m is maintained between the toes of the embankment dam and stockpiles and the steep area to the south and southwest. This setback distance is

measured from approximately El. 163 m to the south and the Sechelt-Airport FSR to the west.

- The operations pads, tops of the embankment dam, and access road will be graveled to maintain a workable surface, as detailed in Section 5.3.6.

5.3.2 Storage Reservoir

The reservoir will generally be designed based on the following parameters and assumptions:

- Embankment dam crest elevation at El. 177.5 m.
- Maximum water level (MWL) at El. 175.5 m.
- Maximum dam height of less than 15 m, measured as the difference in elevation between the minimum water level elevation (reservoir base) and the maximum dam crest elevation, so as not to trigger the dam height thresholds for 'large dams' as defined by ICOLD (ICOLD 2011, 2016).
- Maximum dam height, H, and maximum reservoir volume, V, such that $H^2 \times \sqrt{V} < 200$, where H is measured as the difference in elevation between the minimum water level elevation (reservoir base) and the maximum dam crest elevation, so as not to trigger the dam height thresholds for 'large dams' as defined by ICOLD (ICOLD 2011, 2016).
- Minimum reservoir operating volume of approximately 1,066,400 m^3.
- Upstream embankment dam slopes of 3H:1V and downstream embankment dam slopes of 4H:1V. Slope angles should be verified based on geotechnical recommendations during future design stages to maintain a design minimum factor of safety.
- Assumed normal freeboard allowance of 2.0 m at MWL (details to be determined during future design stages).
- Emergency spillway with an assumed depth of 1.0 m and assumed minimum width of 6.0 m (details to be determined during future design stages).
- Perimeter access will provide light vehicle and personnel access around the reservoir for inspection and maintenance only (no public access).
- Embankment dam crest widths of 10 m, to allow space for perimeter access and barriers on either side of the embankment crest (to be confirmed during future design stages).
- Guard rails along the inner and outer edges of the embankment dam crest to provide a safety barrier.
- Recommendations on acceptable embankment settlement should be provided following a geotechnical study and incorporated in future design stages.
- It is assumed that the embankment dam will be founded directly on bedrock.

- The foundation will be treated to minimize seepage through the foundation and provide sufficient friction between the foundation and dam base. Foundation treatment may include rock shaping/scraping and grouting and will be determined during future design stages.
- An upstream facing concrete diaphragm on the upstream slopes of the embankment dam will be used to create an impervious barrier on the upstream face of the embankment dam and will comprise reinforced concrete. The concrete membrane shall have physical properties (i.e. density, strength, flexibility, permeability, weather resistance) that are fit for the purpose intended.
- A concrete diaphragm thickness of 500 mm has been assumed (to be determined during future design stages).
- Drains and filters will be used to manage groundwater flow from the upstream reservoir side slopes and base, as well as seepage (details to be determined during future design stages).
- It is assumed that seepage management will be required within the dam foundation to reduce and manage system below the embankment dam and to achieve a seal between the dam membrane and foundation. A concrete cut-off wall or other similar structure may be used (details to be determined during future design stages).
- It is assumed that the entire base of the reservoir will comprise bedrock. The base of the reservoir and side slopes will be grouted as needed to prevent seepage into the substrate. Grouting requirements will be based on geotechnical recommendations and determined during future design stages.

5.3.3 Site Access

Site access design and considerations will generally be based on the following parameters and assumptions:

- One site access point, located on the west side of Site A.
- Site A will be accessed via the Sechelt-Airport FSR located directly west of Site A. The site access road will be used to gain direct access to Site A. The site access road is assumed to be approximately 120 m long and have a minimum width of 6 m.
- Configuration of site infrastructure to allow for future access to excavation stockpile for the purposes of hauling excavated rock offsite.

5.3.4 Operations Pads

The operations pad design will generally be based on the following parameters and assumptions:

- Two operations pads, one on the east end and one on the west end of the reservoir, each with a minimum width of 30 m wide to provide space for intake/outtake structures, equipment laydown, rockfill material processing, staging area, and/or space for other operations requirements.

- A minimum cross slope of 1% across the operations pads away from the embankment dam for drainage.
- The operations pads will be accessed as follows:
  - Access onto the west operations pad from the site access point
  - Access to the east operations pad via the west operations pad and south embankment dam crest

5.3.5 Surface Water Management

The site grading plan will manage surface water within Site A and reduce erosion of any areas down slope of Site A, as well as control surface water and reduce erosion along the site access road. The grading plan may comprise berms, swales, ditches, and culverts to control surface water within the site boundary. The grading plan will be designed based on the following parameters:

- Infrastructure will be sized to control, at a minimum, the 1-in-25 year, 24-hour storm event using historical weather data from the Gibsons weather station (#1043150) (to be confirmed during future design stages).
- Surfaces will be designed with erosion and sediment control mitigation measures where required (e.g. hydroseeding, riprap, erosion control blankets, check dams, etc.).
- Maintain minimum depth for ditches at 0.5 m wherever possible, shallower depths will be confirmed if needed.
- Maintain minimum depth for swales at 0.3 m wherever possible, shallower depths will be confirmed if needed.
- Maintain minimum slope for ditches at 0.5% wherever possible, lesser slopes will be confirmed if needed.
- Ditch and swale side slopes will be 3H:1V.
- Minimum slope for culverts will be 1.0%.
- Culverts will act under gravity flow for the design storm event.

5.3.6 Trafficable Surfaces

Trafficable surfaces for the operations pads, reservoir perimeter access road, and site access road will consist of the following, as a minimum, from top to bottom:

- A 75 mm thick 25 mm crushed gravel
- A 300 mm thick 80 mm crushed gravel
- Compacted fill

It is assumed that gravel and compacted fill for trafficable surfaces will comprise material excavated during construction of the reservoir and processed as needed.

The thickness of the trafficable surfaces will be fit for purpose and assumes that the SCRD will maintain the surface when unsuitable deformation and ruts have formed.

5.3.7 Site Security and Wildlife Mitigation

The site security system will consist of a perimeter chain link fence to prevent unauthorized personnel from entering surrounding the operational portion of Site A. In addition, the perimeter security fence will also act as a terrestrial wildlife deterrent to prevent terrestrial wildlife from entering the site. The site security system will be designed as follows:

- Standard chain link fencing (minimum 2 m in height) encompassing the perimeter of the reservoir and operations pads (excluding the stockpiles)
- Cantilever sliding gates positioned at the site access point

5.3.8 Water Conveyance

Water intake/outtake, conveyance piping, and pump systems have been included in the design, based on the following criteria and assumptions:

- Incoming water and outflowing water will be conveyed to and from Site A, respectively, from an assumed tie-point on the existing Chapman raw water pipeline which is at approximately El. 155 m via a 508 mm (20") high density polyethylene (HDPE) pipe. This pipe was sized based on the maximum daily water deficit during the month of August (peak water demand) (Integrated Sustainability 2018a), a maximum velocity of 3.1 m/s, and a maximum pressure drop of 12.8 kPa/100 m.
- A conceptual pipeline route has been assumed based on review of topography. The length of the assumed pipeline route is approximately 1,700 m.
- Water will be transferred at a design flow rate of 42,000 m^3/day into and out of the reservoir, assuming a 20% water conservation model and 2050 population, based on the results of the Water Demand Analysis (Integrated Sustainability 2018a).
- The flowrate out of the reservoir is based on the maximum daily demand flowrate in August (Integrated Sustainability 2018a), which assumes a 20% water conservation scenario and a population of 43,000 in year 2050.
- The flowrate into the reservoir was assumed to be the same as the flowrate out of the reservoir to allow for utilization of the same piping (flow rates to be confirmed and refined as needed during future design stages). The available flow from Chapman Creek in winter was referenced in the 2014 Watershed Assessment (Horel 2014). The Chapman Creek watershed flowrate in the months of November to March averages over 400,000 m^3/day.
- Water is assumed to be conveyed directly into the reservoir from the water conveyance pipeline at the location along the west crest of the embankment dam.
- The water outtake structure is designed based on the following assumptions:

  - Design and positioning of outtake structure to avoid pipe penetration of the embankment dam, to minimize risk to stability of embankment dam and to avoid routing of pipeline through bedrock.
  - A concrete caisson will be installed at the base of the inner embankment dam side slope.
  - The outtake pumps will be installed in a pump building situated on top of the caisson. It is assumed that two vertical line shaft vertical turbine pumps will be used (to be confirmed during future design stages).
  - A metal platform/walkway will extend from the west embankment dam crest to the pump building to allow operations access and conveyance pipeline connection from the west operations pad.
- Preliminary sizing for pumps for water conveyance into and out of the reservoir assume the following:
  - Pumps have been designed to have 100% redundancy (Government of BC 2012).
  - Two 100 KPag incoming water pumps have been assumed for conveying water to the reservoir (to be verified based on vendor quotes).
  - The incoming water pumps are assumed to be located in a building at the tie-point on the existing Chapman raw water pipeline at an elevation of El. 155 m.
  - A static pressure of 276 kPag in the existing Chapman raw water pipeline was assumed (pressures provided by the SCRD, Raph Shay and Trevor Rutley, email correspondence, 05 September 2019).
  - Outlet of pipe at the reservoir assumed to be located at the embankment dam crest elevation (El. 177.5 m).
  - Two 350 KPag static pressure outtake pumps have been assumed for conveying water from the reservoir (to be verified based on vendor quotes).
  - The outtake pumps are assumed to be located in a pump building on the outtake structure. The pump building will comprise, at a minimum, an electrical pump and hypochlorite rooms with emergency backup generator.
- It is assumed that all pumps will be controlled using a Supervisory Control and Data Acquisition (SCADA) system. Details on instrumentation and controls will be provided in future design stages.

5.4 Site B

The following criteria and assumptions were used as basis for the conceptual design:

- Development area of approximately 45.2 ha.
- One storage reservoir, comprising below-grade excavation and an embankment dam above grade to achieve the design storage volume.

- Excavated materials to be used as fill, with excess materials stockpiled onsite.
- Surface water management infrastructure.
- Two operations pads.
- Site access.
- Wildlife mitigation and security fencing.
- A new water intake on Chapman Creek at El. 300 m (details to be determined during future design stages).
- Water conveyance piping (details to be determined during future design stages).
- Outtake structure and outtake pumps to convey water out of the reservoir (details to be determined during detailed design).
- Instrumentation and controls systems.
- Access and operations are planned for 365 days a year.
- Infrastructure is considered to be permanent (minimum of 50-year lifespan).
- Routine sediment removal will be required and is assumed to include dredging of the reservoir (details to be determined during future design stages).
- It is assumed that the storage capacity of the reservoir may be expanded in the future (by increasing dam height or by expanding reservoir footprint).

5.4.1 Site Preparation and Earthworks

The site preparation and earthworks at Site B will be designed based on the following parameters and assumptions:

- Tree clearing, and grubbing will be dictated by requirements for site access, construction and laydown areas, and regulatory requirements.
- The existing organic layers (i.e. topsoil and subsoil) will be stripped completely within the confines of areas designed for development and stockpiled separately onsite. Topsoil and subsoil depths of 100 mm have been assumed based on the Terrain Assessment site reconnaissance (Section 4.3) and have been used to estimate topsoil and subsoil stripping and stockpiling requirements (to be confirmed based on recommendations provided following a geotechnical and environmental assessment and incorporated during future design stages). The post-stripping surface will be the basis of the earthworks design.
- Topsoil and subsoil stockpiles will be sloped at 4H:1V. A 30% bulking factor will be applied for topsoil and subsoil stockpile sizing. Topsoil and subsoil stockpile slope angles should be confirmed based on geotechnical recommendations during future design stages.
- An overburden thickness of 3 m has been assumed based on the Terrain Assessment site reconnaissance (Section 4.3) and has been used to estimate approximate excavation volumes of soil and bedrock and stockpiling requirements (to be

confirmed based on geotechnical recommendations and incorporated during future design stages).

- Soil and bedrock will be excavated to achieve the target storage volume. It is assumed that excavated soil will be used for construction of embankments first. Processed, excavated rock will be used for construction of the operations pads and site access road.
- The footprint of the embankment dam will be over excavated to bedrock to create a foundation for the dam.
- The diaphragm rockfill embankment dam will be constructed using suitable native material, including soil and bedrock. It is assumed that excavated bedrock will be processed to produce rockfill suitable for embankment construction. Gradation requirements and processing methods should be determined based on geotechnical recommendations during future design stages.
- Excess excavated bedrock will be stockpiled in an excavation stockpile, which will be sloped at 3H:1V. A bulking factor of 80% will be applied to the excavated bedrock for stockpile sizing. Excavation stockpile slope angles and bulking factors should be confirmed based on geotechnical recommendations during future design stages.
- Stockpiles will be positioned onsite with offset distances from the reservoir crests and nearby buried utilities to avoid excessive loading, and to avoid interference with construction activities and access points (offset distances will be determined based on geotechnical recommendations and incorporated during future design stages).
- The operations pads, tops of the embankment dam, and access road will be graveled to maintain a workable surface, as detailed in Section 5.4.6.

5.4.2 Storage Reservoir

The reservoir will generally be designed based on the following parameters and assumptions:

- Embankment dam crest elevation at El. 215.5 m.
- MWL at El. 213.50 m.
- Maximum dam height of less than 15 m, measured as the difference in elevation between the minimum water level elevation (reservoir base) and the maximum dam crest elevation, so as not to trigger the dam height thresholds for 'large dams' as defined by ICOLD (ICOLD 2011, 2016).
- Maximum dam height, H, and maximum reservoir volume, V, such that $H^2 \times \sqrt{V} < 200$, where H is measured as the difference in elevation between the minimum water level elevation (reservoir base) and the maximum dam crest elevation, so as not to trigger the dam height thresholds for 'large dams' as defined by ICOLD (ICOLD 2011, 2016).
- Minimum reservoir operating volume of approximately 1,270,000 m^3.

- Upstream embankment dam slopes of 3H:1V and downstream embankment dam slopes of 4H:1V. Slope angles should be verified based on geotechnical recommendations during future design stages to maintain a design minimum factor of safety.
- Assumed normal freeboard allowance of 2.0 m at MWL (details to be determined during future design stages).
- Emergency spillway with an assumed depth of 1.0 m and assumed minimum width of 6.0 m (details to be determined during future design stages).
- Perimeter access will provide light vehicle and personnel access around the reservoir for inspection and maintenance only (no public access).
- Embankment dam crest widths of 10 m, to allow space for perimeter access and barriers on either side of the embankment crest (to be confirmed during future design stages).
- Guard rails along the inner and outer edges of the embankment dam crest to provide a safety barrier.
- Recommendations on acceptable embankment settlement should be provided following a geotechnical study and incorporated in future design stages.
- It is assumed that the embankment dam will be founded directly on bedrock.
- The foundation will be treated to minimize seepage through the foundation and provide sufficient friction between the foundation and dam base. Foundation treatment may include rock shaping/scraping and grouting and will be determined during future design stages.
- An upstream facing concrete diaphragm on the upstream slopes of the embankment dam will be used to create an impervious barrier on the upstream face of the embankment dam and will comprise reinforced concrete. The concrete membrane shall have physical properties (i.e. density, strength, flexibility, permeability, weather resistance) that are fit for the purpose intended.
- A concrete diaphragm thickness of 500 mm has been assumed (to be determined during future design stages).
- Drains and filters will be used to manage groundwater flow from the upstream reservoir side slopes and base, as well as seepage (details to be determined during future design stages).
- It is assumed that seepage management will be required within the dam foundation to reduce and manage system below the embankment dam and to achieve a seal between the dam membrane and foundation. A concrete cut-off wall or other similar structure may be used (details to be determined during future design stages).
- It is assumed that the entire base of the reservoir will comprise bedrock. The base of the reservoir and side slopes will be grouted as needed to prevent seepage into the

substrate. Grouting requirements will be based on geotechnical recommendations and determined during future design stages.

5.4.3 Site Access

Site access design and considerations will generally be based on the following parameters and assumptions:

- One site access point, located on the west side of Site B.
- Site B will be accessed via the Sechelt-Airport FSR located directly west of Site B. The site access road will be used to gain direct access to Site B. The site access road is assumed to be approximately 150 m long and have a minimum width of 6 m.
- Configuration of site infrastructure to allow for future access to excavation stockpile for the purposes of hauling excavated rock offsite.

5.4.4 Operations Pads

The operations pad design will generally be based on the following parameters and assumptions:

- Two operations pads, one on the east end and one on the west end of the reservoir, each with a minimum width of 30 m wide to provide space for intake/outtake structures, equipment laydown, rockfill material processing, staging area, and/or space for other operations requirements.
- A minimum cross slope of 1% across the operations pads away from the embankment dam for drainage.
- The operations pads will be accessed as follows:
  - Access onto the west operations pad from the site access point
  - Access to the east operations pad via the west operations pad and south embankment dam crest

5.4.5 Surface Water Management

The site grading plan will manage surface water within Site B and reduce erosion of any areas down slope of Site B, as well as control surface water and reduce erosion along the site access road. The grading plan may comprise berms, swales, ditches, and culverts to control surface water within the site boundary. The grading plan will be designed based on the following parameters:

- Infrastructure will be sized to control, at a minimum, the 1-in-25 year, 24-hour storm event using historical weather data from the Gibsons weather station (#1043150) (to be confirmed during future design stages).
- Surfaces will be designed with erosion and sediment control mitigation measures where required (e.g. hydroseeding, riprap, erosion control blankets, check dams, etc.).

- Maintain minimum depth for ditches at 0.5 m wherever possible, shallower depths will be confirmed if needed.
- Maintain minimum depth for swales at 0.3 m wherever possible, shallower depths will be confirmed if needed.
- Maintain minimum slope for ditches at 0.5% wherever possible, lesser slopes will be confirmed if needed.
- Ditch and swale side slopes will be 3H:1V.
- Minimum slope for culverts will be 1.0%.
- Culverts will act under gravity flow for the design storm event.

5.4.6 Trafficable Surfaces

Trafficable surfaces for the operations pads, reservoir perimeter access road, and site access road will consist of the following, as a minimum, from top to bottom:

- A 75 mm thick 25 mm crushed gravel
- A 300 mm thick 80 mm crushed gravel
- Compacted fill

It is assumed that gravel and compacted fill for trafficable surfaces will comprise material excavated during construction of the reservoir and processed as needed.

The thickness of the trafficable surfaces will be fit for purpose and assumes that the SCRD will maintain the surface when unsuitable deformation and ruts have formed.

5.4.7 Site Security and Wildlife Mitigation

The site security system will consist of a perimeter chain link fence to prevent unauthorized personnel from entering surrounding the operational portion of Site B. In addition, the perimeter security fence will also act as a terrestrial wildlife deterrent to prevent terrestrial wildlife from entering the site. The site security system will be designed as follows:

- Standard chain link fencing (minimum 2 m in height) encompassing the perimeter of the reservoir and operations pads (excluding the stockpiles)
- Cantilever sliding gates positioned at the site access point

5.4.8 Water Conveyance

Water intake/outtake, conveyance piping, and pump systems have been included in the design, based on the following criteria and assumptions:

- An intake location on Chapman Creek at approximately El. 300 m, known as the POD Site B intake, was assumed, based on recommendations provided by Integrated Sustainability following a POD assessment at four sites (POD Sites 1 through 4) (Integrated Sustainability 2019f), as well as input provided by SCRD in a meeting on

20 September 2019). Confirmation of a POD location and intake design to support conveyance of water to Site B should be completed in future design stages.

- Incoming water will be conveyed to the reservoir at Site B from a new water intake at El. 300 m, via a 508 mm (20") HDPE pipe.
- Outgoing water will be conveyed using gravity flow to an assumed tie-point on the existing Chapman raw water pipeline, which is assumed to be located at El. 155 m, via a 508 mm (20") HDPE pipe. This pipe was sized based on the maximum daily water deficit during the month of August (peak water demand) (Integrated Sustainability 2018a), a maximum velocity of 3.1 m/s, and a maximum pressure drop of 12.8 kPa/100 m.
- Conceptual pipeline routes have been assumed based on review of topography. The length of the assumed pipeline route from the intake to the reservoir is 3,900 m. The length of the assumed pipeline route from the reservoir to the assumed tie point on the existing Chapman water pipeline is 500 m.
- The water will be transferred at a design flow rate of 42,000 m^3/day in both pipelines.
- The flowrate out of the reservoir is based on the maximum daily demand flowrate in August (Integrated Sustainability 2018a), which assumes a 20% water conservation scenario and a population of 43,000 in year 2050.
- Pumps are not required for conveying water from the new intake to the reservoir at Site B.
- Water is assumed to be conveyed directly into the reservoir from the incoming water conveyance pipeline at the location along the west crest of the embankment dam.
- The water outtake structure is designed based on the following assumptions:
  - Design and positioning of outtake structure to avoid pipe penetration of the embankment dam, to minimize risk to stability of embankment dam and to avoid routing of pipeline through bedrock.
  - A concrete caisson will be installed at the base of the inner embankment dam side slope.
  - The outtake pumps will be installed in a pump building situated on top of the caisson. It is assumed that the two vertical line shaft vertical turbine pumps will be used (to be confirmed during future design stages).
  - A metal platform/walkway will extend from the west embankment dam crest to the pump building to allow operations access and conveyance pipeline connection from the west operations pad.
- Preliminary sizing for pumps for water conveyance out of the reservoir assume the following:
  - Pumps have been designed to have 100% redundancy (Government of BC 2012).

  - A static pressure of 276 kPag in the existing Chapman raw water pipeline was assumed (pressures provided by the SCRD, Raph Shay and Trevor Rutley, email correspondence, 05 September 2019).
  - Outlet of pipe at the reservoir located at the embankment dam crest elevation (215.5 m).
  - Two 200 kPag static pressure outtake pumps have been assumed for conveying water from the reservoir (to be verified based on vendor quotes).
  - The outtake pumps are assumed to be located in a pump building on the outtake structure. The pump building will comprise, at a minimum, an electrical pump and hypochlorite rooms with emergency backup generator.
- It is assumed that all pumps will be controlled using a Supervisory Control and Data Acquisition (SCADA) system. Details on instrumentation and controls will be provided in future design stages.

5.5 Site C3

The following criteria and assumptions were used as basis for the conceptual design:

- Development area of approximately 23.3 ha
- Concrete gravity dam positioned at the downstream, south end of subalpine lake basin at the outlet to Tsawcome Creek
- Excess excavation materials stockpiled adjacent to the site access road
- Surface water management infrastructure
- Operations area allowance
- Site access
- Site security
- Instrumentation and controls systems
- Access and operations are planned for 365 days a year
- Infrastructure is expected to be permanent (minimum of 50-year lifespan)

5.5.1 Site Preparation and Earthworks

The site preparation and earthworks at Site C3 will be designed based on the following parameters and assumptions:

- Tree clearing, and grubbing will be dictated by requirements for site access, construction and laydown areas, and regulatory requirements. It is assumed that the dam footprint, operations area allowance, and access road will be cleared and grubbed, as well as allowance for construction activities. The remaining site area is not assumed to be cleared and grubbed.
- The existing organic layers (i.e. topsoil and subsoil) will be stripped completely below the concrete gravity dam and operations pad footprints. Topsoil and subsoil will be

stockpiled separately adjacent to the site access roads. Topsoil depths of 400 mm and subsoil depths of 200 mm have been assumed based on the Terrain Assessment site reconnaissance (Section 4.4) and have been used to estimate topsoil and subsoil stripping and stockpiling requirements (to be confirmed based on recommendations provided following a geotechnical and environmental assessment and incorporated during future design stages). The post stripping surface will be the basis of the earthworks design.

- Topsoil and subsoil stockpiles will be sloped at 4H:1V. A 30% bulking factor will be applied for topsoil and subsoil stockpile sizing. Topsoil and subsoil stockpile slope angles should be confirmed based on geotechnical recommendations during future design stages.
- The footprint of the concrete gravity dam will be over excavated to bedrock to create a foundation for the dam.
- An overburden thickness of 2 m has been assumed below the concrete gravity dam and operations pad based on the Terrain Assessment site reconnaissance (Section 4.4) and has been used to estimate approximate excavation volumes and stockpiling requirements (to be confirmed based on geotechnical recommendations and incorporated during future design stages).
- Excavated soil will be stockpiled in a common excavation stockpile, which will be sloped at 3H:1V. A bulking factor of 30% will be applied to the excavated soil for stockpile sizing. Excavation stockpile slope angles and bulking factors should be confirmed based on geotechnical recommendations during future design stages.
- Stockpiles will be positioned adjacent to site access roads with offset distances from the dam and operations pad to avoid excessive loading, and to avoid interference with construction activities and access points (offset distances will be determined based on geotechnical recommendations and incorporated during future design stages).
- The operations are allowance and access road will be graveled to maintain a workable surface, as detailed in Section 5.5.6.

5.5.2 Storage Reservoir

The reservoir will generally be designed based on the following parameters and assumptions:

- Dam crest elevation at El. 1,005 m.
- MWL of approximately El. 1,003 m (to be updated during future design stages).
- Maximum dam height of less than 15 m, measured as the difference in elevation between the outlet creek bed elevation and the maximum dam crest elevation, so as not to trigger the dam height thresholds for ‘large dams’ as defined by ICOLD (ICOLD 2011, 2016).

- Maximum dam height, H, and maximum reservoir volume, V, such that $H^2 \times \sqrt{V} < 200$, where H is measured as the difference in elevation between the outlet creek bed elevation and the maximum dam crest elevation, so as not to trigger the dam height thresholds for 'large dams' as defined by ICOLD (ICOLD 2011, 2016).
- Minimum reservoir operating volume of approximately 1,056,700 m^3, based on the following considerations:
  - At this stage in design, the design volume excludes the volume of the existing water body at Site C3 (due to limitations of topography data to capture the lake bottom surface). In future design stages, the design volume should be updated using bathymetry data for the existing water body.
  - Reservoir has been sized based on the maximum reservoir height, H, and volume, such as to not trigger thresholds for 'large dams' as defined by ICOLD (ICOLD 2011, 2016). Annual and monthly water availability are summarized in the Sites C3 and C4 Hydrological Study (Integrated Sustainability 2019h) and should be considered in future design stages.
  - Given that water is assumed to be conveyed to the Chapman Creek WTP via overland flow in Tsawcome Creek and Chapman Creek, losses due to infiltration or evaporation may reduce the total volume conveyed to the Chapman Creek WTP from the volume stored at the reservoir.
- Upstream dam slopes of 1H:10V and downstream dam slopes of 1H:1V. Slope angles should be verified based on structural and geotechnical recommendations during future design stages to maintain a design minimum factor of safety.
- The dam will be constructed with roller-compacted concrete (RCC). The concrete shall have physical properties (i.e. density, strength, flexibility, permeability, weather resistance) that are fit for the purpose intended (to be determined during future design stages).
- During construction of the dam, a cofferdam and water diversion will need to be installed upstream of the dam footprint to isolate the construction area. Details of the cofferdam and water diversion will be determined during future design stages.
- Assumed normal freeboard allowance of 2.0 m at MWL (details to be determined during future design stages).
- Emergency spillway with an assumed depth of 1.0 m and assumed minimum width of 6.0 m (details to be determined during future design stages).
- Dam crest width of 10 m, to allow space for access and barriers on either side of the dam (to be confirmed during future design stages).
- Guard rails along the inner and outer edges of the dam crest to provide a safety barrier.
- Recommendations on acceptable dam settlement should be provided following a geotechnical study and incorporated in future design stages.

- It is assumed that the dam will be founded directly on bedrock. The base of the dam will be grouted as needed to prevent seepage into the substrate. Grouting requirements will be based on geotechnical recommendations and determined during future design stages.
- The foundation will be treated to minimize seepage through the foundation and provide sufficient friction between the foundation and dam base. Foundation treatment may include rock shaping/scraping and grouting and will be determined during future design stages.
- Drains will be required to manage seepage into the dam foundation (details to be determined during future design stages).

5.5.3 Site Access

Site access to Site C3 will be achieved with a combination of recommissioning (i.e. upgrading) existing, decommissioned roads and construction of a new access road to gain direct site access. There are currently two site access options, as described in Section 4.6.

Assumed upgrades required for recommissioning existing, decommissioned roads are as follows:

- Brushing of vegetation (assume brush less than 2 m high).
- Road grading and ditching.
- Culvert installation (assume culvert spacing of 25 m).
- Bridge upgrades (assume two bridges along Access Road Option 1 and one bridge along Access Road Options 2). Bridges will have loading capacities sufficient for construction and operations.
- Construction of pullouts along existing road to allow for two-way traffic (assume pullout spacing of 500 m).
- No road widening will be required, other than at pullouts.

Design parameters for new access roads are as follows (to be refined during future design phases):

- Direct access to the dam crest.
- The existing organic layers (i.e. topsoil and subsoil) will be stripped completely within the new access road footprint. Topsoil and subsoil depths of 100 mm have been assumed and have been used to estimate topsoil and subsoil stripping and stockpiling requirements (to be confirmed during future design stages).
- The road surface will be constructed with cut and fill using native materials (bedrock and surficial soils).
- The design will aim to achieve a cut / fill balance, where possible.

- Cut and fill slopes will be a minimum of 1.5H:1V (to be confirmed in future design stages).
- Road width will be a minimum of 6 m.
- Culverts will be required every 25 m. This assumption is based on approximate culvert spacing along existing, decommissioned roads, and will be verified and refined as needed during future design stages.
- No bridges will be required.
- A maximum road grade of 10%.

5.5.4 Operations Area Allowance

An allowance for site operations has been included in the design based on the following parameters and assumptions:

- The dam crest will be accessed directly from the west via the site access road to facilitate site operations (as per Section 5.5.3).
- An additional allowance for site operations has been assumed at a location along the site access road to accommodate equipment laydown and turnaround. A minimum width of 20 m along this section of the site access road shall be used as the basis of design and will be refined during future design stages. The exact location and dimensions will be constrained by the terrain surrounding the subalpine lake basin.
- A minimum cross slope of 1% across the operations pads away from the reservoir for drainage.

During construction, it is assumed that an additional space allowance will be required for a concrete batch plant and aggregate stockpiles for dam construction, as well as to provide space for equipment laydown and turnaround, staging, and space for other construction requirements. Given the steep topography and shallow bedrock at Site C3, it is assumed that this area will be located within the proposed footprint of the reservoir (at lower elevations than the site access road) and will be temporary in nature (active construction only). Details on this construction area allowance should be confirmed during future design stages.

5.5.5 Surface Water Management

The site grading plan will manage surface water within Site C3 and reduce erosion of any areas downstream of Site C3, as well as control surface water and reduce erosion along the site access road (recommissioned and new) and operations pad. The grading plan may comprise berms, swales, ditches, and culverts to control surface water within the site boundary. The grading plan will be designed based on the following parameters:

- Infrastructure will be sized to control, at a minimum, the 1-in-25 year, 24-hour storm event using historical weather data from the Gibsons weather station (#1043150) (to be confirmed during future design stages).

- Surfaces will be designed with erosion and sediment control mitigation measures where required (e.g. hydroseeding, riprap, erosion control blankets, check dams, etc.).
- Maintain minimum depth for ditches at 0.5 m wherever possible, shallower depths will be confirmed if needed.
- Maintain minimum depth for swales at 0.3 m wherever possible, shallower depths will be confirmed if needed.
- Maintain minimum slope for ditches at 0.5% wherever possible, lesser slopes will be confirmed if needed.
- Ditch and swale side slopes will be 3H:1V.
- Minimum slope for culverts will be 1.0%.
- Culverts will act under gravity flow for the design storm event.
- Erosion and sediment control for outlet structure will be designed for release flows and may require upgrades all along creek to prevent damages.

5.5.6 Trafficable Surfaces

Trafficable surfaces for the operations area allowance and site access road (recommissioned and new) will consist of the following, as a minimum, from top to bottom:

- A 75 mm thick 25 mm crushed gravel
- A 300 mm thick 80 mm crushed gravel
- Compacted fill

It is assumed that gravel and compacted fill for trafficable surfaces will comprise material excavated during construction of the dam and access roads and processed as needed.

The thickness of the trafficable surfaces will be fit for purpose and assumes that the SCRD will maintain the surface when unsuitable deformation and ruts have formed.

5.5.7 Site Security

The following site security measures will be put in place to prevent unauthorized personnel from entering the site (to be refined during future design stages):

- Security gate at each end of the dam crest.
- Fencing (minimum 2 m in height) and gates (as required) around instrumentation and controls systems, including the low level outlet gate.
- Security gate at the entrance to the operations area allowance.

5.5.8 Low Level Outlet and Gate Works

Water will flow through the concrete gravity dam via a low level outlet structure designed based on the following criteria (to be refined during future design stages):

- Aligned generally with the current subalpine lake basin's creek outlet at the same elevation as the creek's invert.
- Minimum 0.5% slope designed to prevent back flooding from the downstream channel.
- Minimum diameter of 0.6 m (to be sized during future design stages).
- Energy dissipation and erosion and sediment control measures in place downstream of the outlet.

The low level outlet structure will have a gate designed based on the following criteria (to be refined during future design stages):

- Gate is watertight.
- Operable during all water level fluctuations and reservoir conditions.

5.6 Site C4

The following criteria and assumptions were used as basis for the conceptual design:

- Development area of approximately 26.6 ha.
- Concrete gravity dam positioned at the downstream, end of subalpine lake basin at the outlet to an unnamed creek.
- Excess excavation materials stockpiled adjacent to the site access road.
- Surface water management infrastructure.
- Operations area allowance.
- Site access.
- Site security.
- Instrumentation and controls systems.
- Access and operations are planned for 365 days a year.
- Infrastructure is expected to be permanent (minimum of 50-year lifespan).

5.6.1 Site Preparation and Earthworks

The site preparation and earthworks at Site C4 will be designed based on the following parameters and assumptions:

- Tree clearing, and grubbing will be dictated by requirements for site access, construction and laydown areas, and regulatory requirements. It is assumed that the dam footprint, operations area allowance, and access road will be cleared and grubbed, as well as allowance for construction activities. The remaining site area is not assumed to be cleared and grubbed.
- The existing organic layers (i.e. topsoil and subsoil) will be stripped completely below the concrete gravity dam and operations pad footprints. Topsoil and subsoil will be stockpiled separately adjacent to the site access roads. Topsoil depths of 400 mm

and subsoil depths of 200 mm have been assumed based on the Terrain Assessment site reconnaissance (Section 4.5) and have been used to estimate topsoil and subsoil stripping and stockpiling requirements (to be confirmed based on recommendations provided following a geotechnical and environmental assessment and incorporated during future design stages). The post stripping surface will be the basis of the earthworks design.

- Topsoil and subsoil stockpiles will be sloped at 4H:1V. A 30% bulking factor will be applied for topsoil and subsoil stockpile sizing. Topsoil and subsoil stockpile slope angles should be confirmed based on geotechnical recommendations during future design stages.
- The footprint of the concrete gravity dam will be over excavated to bedrock to create a foundation for the dam.
- An overburden thickness of 2 m has been assumed below the concrete gravity dam and operations pad based on the Terrain Assessment site reconnaissance (Section 4.5) and has been used to estimate approximate excavation volumes and stockpiling requirements (to be confirmed based on geotechnical recommendations and incorporated during future design stages).
- Excavated soil will be stockpiled in a common excavation stockpile, which will be sloped at 3H:1V. A bulking factor of 30% will be applied to the excavated soil for stockpile sizing. Excavation stockpile slope angles and bulking factors should be confirmed based on geotechnical recommendations during future design stages.
- Stockpiles will be positioned adjacent to site access roads with offset distances from the dam and operations pad to avoid excessive loading, and to avoid interference with construction activities and access points (offset distances will be determined based on geotechnical recommendations and incorporated during future design stages).
- The operations area allowance and access road will be graveled to maintain a workable surface, as detailed in Section 5.6.6.

5.6.2 Storage Reservoir

The reservoir will generally be designed based on the following parameters and assumptions:

- Dam crest elevation at El. 1,062 m.
- MWL of approximately El. 1,060 m (to be updated during future design stages).
- Maximum dam height of less than 15 m, measured as the difference in elevation between the outlet creek bed elevation and the maximum dam crest elevation, so as not to trigger the dam height thresholds for 'large dams' as defined by ICOLD (ICOLD 2011, 2016).
- Maximum dam height, H, and maximum reservoir volume, V, such that $H^2 \times \sqrt{V} < 200$, where H is measured as the difference in elevation between the outlet creek bed

elevation and the maximum dam crest elevation, so as not to trigger the dam height thresholds for 'large dams' as defined by ICOLD (ICOLD 2011, 2016).

- Minimum reservoir operating volume of approximately 764,500 m^3, based on the following considerations:
  - At this stage in design, the design volume excludes the volume of the existing water body at Site C4 (due to limitations of topography data to capture the lake bottom surface). In future design stages, the design volume should be updated using bathymetry data for the existing water body.
  - Reservoir has been sized based on the maximum reservoir height, H, and volume, such as to not trigger thresholds for 'large dams' as defined by ICOLD (ICOLD 2011, 2016). Annual and monthly water availability are summarized in the Sites C3 and C4 Hydrological Study (Integrated Sustainability 2019h), and should be considered in future design stages.
  - Given that water is assumed to be conveyed to the Chapman Creek WTP via overland flow in the unnamed creek between Sites C3 and C4, Tsawcome Creek, and Chapman Creek, losses due to infiltration or evaporation may reduce the total volume conveyed to the Chapman Creek WTP from the volume stored at the reservoir.
- Upstream dam slopes of 1H:10V and downstream dam slopes of 1H:1V. Slope angles should be verified based on structural and geotechnical recommendations during future design stages to maintain a design minimum factor of safety.
- The dam will be constructed with roller-compacted concrete (RCC). The concrete shall have physical properties (i.e. density, strength, flexibility, permeability, weather resistance) that are fit for the purpose intended (to be determined during future design stages).
- During construction of the dam, a cofferdam and water diversion will need to be installed upstream of the dam footprint to isolate the construction area. Details of the cofferdam and water diversion will be determined during future design stages.
- Assumed normal freeboard allowance of 2.0 m at MWL (details to be determined during future design stages).
- Emergency spillway with an assumed depth of 1.0 m and assumed minimum width of 6.0 m (details to be determined during future design stages).
- Dam crest width of 10 m, to allow space for access and barriers on either side of the dam (to be confirmed during future design stages).
- Guard rails along the inner and outer edges of the dam crest to provide a safety barrier.
- Recommendations on acceptable dam settlement should be provided following a geotechnical study and incorporated in future design stages.

- It is assumed that the dam will be founded directly on bedrock. The base of the dam will be grouted as needed to prevent seepage into the substrate. Grouting requirements will be based on geotechnical recommendations and determined during future design stages.
- The foundation will be treated to minimize seepage through the foundation and provide sufficient friction between the foundation and dam base. Foundation treatment may include rock shaping/scraping and grouting and will be determined during future design stages.
- Drains will be required to manage seepage into the dam foundation (details to be determined during future design stages).

5.6.3 Site Access

Site access to Site C4 will be achieved with a combination of recommissioning (i.e. upgrading) existing, decommissioned roads and construction of a new access road to gain direct site access. construction. There are currently two site access options, as described in Section 4.6:

Assumed upgrades required for recommissioning existing, decommissioned roads are as follows:

- Brushing of vegetation (assume brush less than 2 m high).
- Road grading and ditching.
- Culvert installation (assume culvert spacing of 25 m).
- Bridge upgrades (assume two bridges along Access Road Option 1 and one bridge along Access Road Options 2).
- Construction of pullouts along existing road to allow for two-way traffic (assume pullout spacing of 500 m).
- No road widening will be required.

Design parameters for new access roads are as follows (to be refined during future design phases):

- Direct access to the dam crest.
- The existing organic layers (i.e. topsoil and subsoil) will be stripped completely within the new access road footprint. Topsoil and subsoil depths of 100 mm have been assumed and have been used to estimate topsoil and subsoil stripping and stockpiling requirements (to be confirmed during future design stages).
- The road surface will be constructed with cut and fill using native materials (bedrock and surficial soils).
- The design will aim to achieve a cut / fill balance, where possible.
- Cut and fill slopes will be a minimum of 1.5H:1V (to be confirmed during future design stages).

- Road width will be a minimum of 6 m.
- Culverts will be required every 25 m. This assumption is based on approximate culvert spacing along existing, decommissioned roads, and will be verified and refined as needed during future design stages.
- No bridges will be required.
- A maximum road grade of 10%.

5.6.4 Operations Pad

An allowance for site operations has been included in the design based on the following parameters and assumptions:

- The dam crest will be accessed directly from the west via the site access road to facilitate site operations (as per Section 5.5.3).
- An additional allowance for site operations has been assumed at a location along the site access road to accommodate equipment laydown and turnaround. A minimum width of 20 m along this section of the site access road shall be used as the basis of design and will be refined during future design stages. The exact location and dimensions will be constrained by the terrain surrounding the subalpine lake basin.
- A minimum cross slope of 1% across the operations pads away from the reservoir for drainage.

During construction, it is assumed that an additional space allowance will be required for a concrete batch plant and aggregate stockpiles for dam construction, as well as to provide space for equipment laydown and turnaround, staging, and space for other construction requirements. Given the steep topography and shallow bedrock at Site C4, it is assumed that this area will be located within the proposed footprint of the reservoir (at lower elevations than the site access road) and will be temporary in nature (active construction only). Details on this construction area allowance should be confirmed during future design stages.

5.6.5 Surface Water Management

The site grading plan will manage surface water within Site C4 and reduce erosion of any areas downstream of Site C4, as well as control surface water and reduce erosion along the site access road (recommissioned and new) and operations pad. The grading plan may comprise berms, swales, ditches, and culverts to control surface water within the site boundary. The grading plan will be designed based on the following parameters:

- Infrastructure will be sized to control, at a minimum, the 1-in-25 year, 24-hour storm event using historical weather data from the Gibsons weather station (#1043150) (to be confirmed during future design stages).
- Surfaces will be designed with erosion and sediment control mitigation measures where required (e.g. hydroseeding, riprap, erosion control blankets, check dams, etc.).

- Maintain minimum depth for ditches at 0.5 m wherever possible, shallower depths will be confirmed if needed.
- Maintain minimum depth for swales at 0.3 m wherever possible, shallower depths will be confirmed if needed.
- Maintain minimum slope for ditches at 0.5% wherever possible, lesser slopes will be confirmed if needed.
- Ditch and swale side slopes will be 3H:1V.
- Minimum slope for culverts will be 1.0%.
- Culverts will act under gravity flow for the design storm event.
- Erosion and sediment control for outlet structure will be designed for release flows and may require upgrades all along creek to prevent damages.

5.6.6 Trafficable Surfaces

Trafficable surfaces for the operations area allowance, and site access road (recommissioned and new) will consist of the following, as a minimum, from top to bottom:

- A 75 mm thick 25 mm crushed gravel
- A 300 mm thick 80 mm crushed gravel
- Compacted fill
- It is assumed that gravel and compacted fill for trafficable surfaces will comprise material excavated during construction of the dam and access roads and processed as needed

The thickness of the trafficable surfaces will be fit for purpose and assumes that the SCRD will maintain the surface when unsuitable deformation and ruts have formed.

5.6.7 Site Security

The following site security measures will be put in place to prevent unauthorized personnel from entering the site (to be refined during future design stages):

- Security gate at each end of the dam crest.
- Fencing (minimum 2 m in height) and gates (as required) around instrumentation and controls systems, including the low level outlet gate.
- Security gate at the entrance to the operations pad.

5.6.8 Low Level Outlet and Gate Works

- Aligned generally with the current subalpine lake basin's creek outlet at the same elevation as the creek's invert.
- Minimum 0.5% slope designed to prevent back flooding from the downstream channel.

- Minimum diameter of 0.6 m (to be sized during future design stages).
- Energy dissipation and erosion and sediment control measures in place downstream of the outlet.

The low level outlet structure will have a gate designed based on the following criteria (to be refined during future design stages):

- Gate is watertight.
- Operable during all water level fluctuations and reservoir conditions.

6 CONSTRUCTION CONSIDERATIONS

Constructability was considered in development of the design criteria and assumptions provided in Section 5. Detailed construction considerations will be provided in future design stages. Construction considerations will address the following, at a minimum, for the Sites:

- Site preparation
- Groundwater control and surface water management during construction
- Dust and particulate control during construction
- Temporary excavations
- Subgrade preparation
- Material specifications
- Material placement/installation procedures
- Considerations pertaining to construction in wet or freezing conditions

7 MULTI-CRITERIA ANALYSIS (MCA)

7.1 Methodology

An MCA was completed during Phase 2 of the Project and has been updated for the purposes of comparing the Sites based on information gained during Phases 1 and 2 and new information collected during Phase 3. The MCA provides an evaluation of technical, economic, environmental, and regulatory/stakeholder considerations for each of the Sites. The MCA framework compares the Sites based on a set of predefined criteria, which are divided into four categories:

- Technical Feasibility
- Economics
- Environmental Impacts
- Regulatory and Stakeholder Sensitivity

The criteria under each category are assigned a value ranging from 1 (Significant Disadvantage) to 5 (Significant Advantage) based on the benefits and drawbacks

associated with one of the Sites when compared to the other Sites. The outcome of the comparison produces a total score for each of the Sites, which then provides an unweighted ranked summary of the Sites. For example:

$$Criteria\ 1\ Ranking\ (Site\ A) + Criteria\ 2\ Ranking (Site\ A) \ldots + Criteria\ 25\ Ranking\ (Site\ A) = Total\ Site\ A\ Unweighted\ Ranking$$

Site option rankings were initially developed in Phase 2 of the Project (Integrated Sustainability 2019a), based on how the Sites ranked for each criterion, relative to one another. Site option rankings were refined during a workshop held between Integrated Sustainability and SCRD during Phase 3 of the Project.

A weighting is placed on each criterion based on the level of importance of that criterion within the context of the Project. Criteria weightings were initially developed in Phase 2 of the Project (Integrated Sustainability 2019a) and were determined based on the relative importance of different criteria in terms of site feasibility and SCRD values and preferences. Criteria weightings were refined during a workshop held between Integrated Sustainability and SCRD during Phase 3 of the Project.

The initial weightings applied are based on a set of Base Case weightings that are typically placed on each of the four categories. The overall weights assigned to the Technical Feasibility, Economics, Environmental, and Regulatory/Stakeholder Sensitivity categories for the Base Case are approximately 45%, 25%, 20%, and 10%, respectively.

To provide a total weighted score for each of the Sites, the unweighted value (between 1 and 5) for each criterion is multiplied by the criterion's weighting, and the sum of the weighted scores is then calculated for each of the Sites. For example:

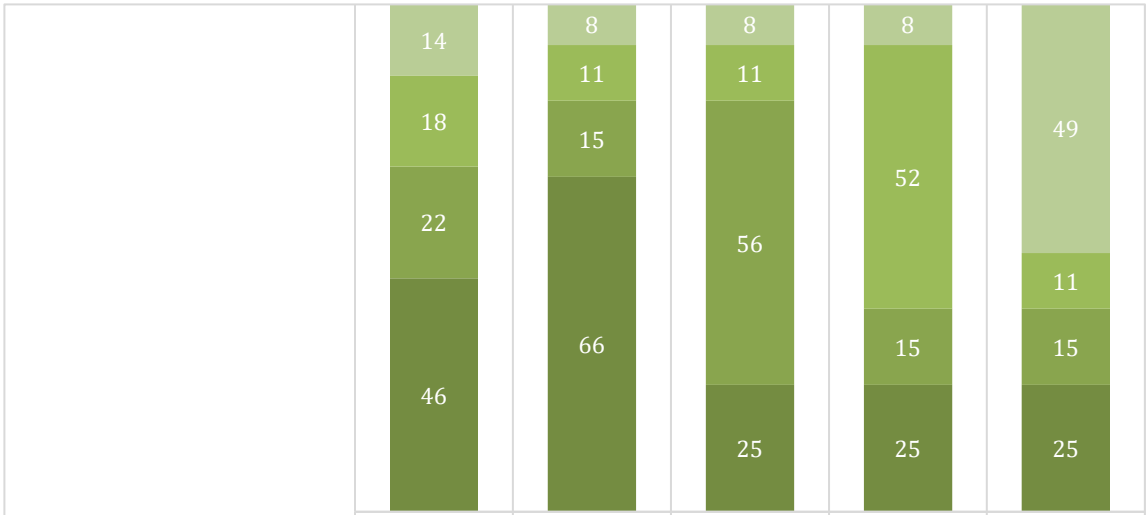
$$(Criteria\ 1\ Ranking\ (Site\ A)\ x\ Criteria\ 1\ Weighting) +$$
$$(Criteria\ 2\ Ranking\ (Site\ A)\ x\ Criteria\ 2\ Weighting) \ldots +$$
$$(Criteria\ 25\ Ranking\ (Site\ A)\ x\ Criteria\ 25\ Weighting) = Total\ Site\ A\ Weighted\ Ranking$$

To provide alternate perspectives on the MCA results, four sensitivity analysis cases were prepared using adjusted weightings for the four categories.

- Technically Focused case applies higher weightings against the criteria under Technical Feasibility
- Economics Focused Case increases the weightings for the criteria under Economics
- Environmental Focused Case increases the weightings for the criteria under Environmental Impacts
- Regulatory and Stakeholder Focused Case applies higher weighting to the criteria under Regulatory and Stakeholder Sensitivity

Similar to the Base Case criteria weightings, the sensitivity analysis case criteria weightings were initially developed during Phase 2 of the Project (Integrated Sustainability 2019a) and were refined during Phase 3 of the Project in a workshop held between Integrated Sustainability and SCRD during Phase 3 of the Project.

The criteria within each category and criteria weightings applied for the Base Case and four sensitivity analysis cases are provided in Table 1, attached. A summary of the sensitivity analysis weightings by category as they compare to the Base Case are summarized in Figure A.



	Base Case	Technically Focused Case	Economics Focused Case	Environmental Focused Case	Regulatory and Stakeholder Focused Case
Regulatory and Stakeholder Sensitivity	14	8	8	8	49
Environmental Impacts	18	11	11	52	11
Economics	22	15	56	15	15
Technical Feasibility	46	66	25	25	25

Figure A. Sensitivity Analyses Weightings

7.2 Multi-Criteria Analysis Results and Sensitivity Analysis

The Sites were evaluated for technical feasibility, environmental impacts, and regulatory and stakeholder sensitivity based on the design criteria summarized within this report, as well as within the technical reports completed during Phases 2 and 3 of the Project (Section 1.2). The economic evaluation is based on the Class C/D capital costs and the Basis of Estimate (Integrated Sustainability 2019r).

The complete MCA summary tables for the following cases are provided in Tables 2 through 6, attached.

- Base Case
- Technically Focused Case
- Economics Focused Case
- Environmental Focused Case
- Regulatory and Stakeholder Focused Case

7.2.1 Base Case

When evaluated using the Base Case, Site B has the overall highest weighted score. The complete MCA summary table for the Base Case is provided in Table 2, attached. Table B provides a summary of the ranking of sites based on the results of the MCA using the Base Case weightings shown in Table 1.

Table B. MCA Results and Ranking of Sites (Base Case)

Option	Unweighted Score	Unweighted Rank	Weighted Score	Weighted Rank
Option 1: Site A	70	3	277	3
Option 2: Site B	78	1	312	1
Option 3: Site C3	71	2	295	2
Option 4: Site C4	68	4	276	4

7.2.2 Technically Focused Case

When evaluated using the Technically Focused Case, Site B had the highest overall weighted score. Table C provides the results of the Technically Focused Case.

Table C. MCA Results and Ranking of Sites (Technically Focused Case)

Option	Unweighted Score	Unweighted Rank	Weighted Score	Weighted Rank
Option 1: Site A	70	3	264	4
Option 2: Site B	78	1	304	1
Option 3: Site C3	71	2	303	2
Option 4: Site C4	68	4	283	3

Key technical advantages identified for Site B that differentiate it from one or more of the Sites are as follows:

- Largest operational storage volume
- Potential for future site expansion (ICOLD thresholds for large dams including height and volume would be exceeded)
- Site location is easily accessible for construction and operations and significant road infrastructure will not be required for site access
- Ability to convey water from the reservoir to the Chapman Creek WTP via gravity flow (bypassing the existing pump station), requiring pumping only to convey water from the base of the reservoir to the crest

- Subsurface conditions appear favorable for potential to reuse of excavated material as fill
- No significant areas of interpreted terrain instability or geohazards (based on desktop assessment and site reconnaissance)

The complete MCA summary table for the Technically Focused Case is provided in Table 3, attached.

7.2.3 Economics Focused Case

When evaluated using the Economics Focused Case, Site C3 has the highest overall weighted score. Table D provides the results of the Economics Focused Case.

Table D. MCA Results and Ranking of Sites (Economics Focused Case)

Option	Unweighted Score	Unweighted Rank	Weighted Score	Weighted Rank
Option 1: Site A	70	2	259	4
Option 2: Site B	78	1	304	3
Option 3: Site C3	71	2	328	1
Option 4: Site C4	68	4	321	2

Site C3 has lower capital costs given its relatively small development size compared to Sites A and B. As the natural topography allows for water to be captured within a natural basin, which results in earthworks required for dam construction.

Site C4 is closely ranked as second, with advantages similar to those for Site C3.

Site B is ranked third, and has the following unique economic advantages:

- Lower anticipated operational costs, given that Site B is located such that water can be conveyed via gravity flow from the new intake on Chapman Creek to the Chapman Creek WTP, requiring pumping only to convey water from the base of the reservoir to the crest
- Estimated lower lifecycle cost, given that development of a new intake may allow for operational optimization of the existing Chapman Water System, allowing for gravity feed of water directly to the Chapman Creek WTP from Chapman Creek, eliminating the need to utilize the existing pump station
- Potential for industry partnership (i.e. sale of excavated material)
- Potential for development of hydro-electric power generation

Site A ranks lowest, as it has a large development area and fewer potential operational benefits than Site B.

The complete MCA summary table for the Economics Focused Case is provided in Table 4, attached.

7.2.4 Environmental Focused Case

When evaluated using the Environmental Focused Case, Site B has the highest overall weighted score. Table E provides the results of the Environmental Focused Case.

Table E. MCA Results and Ranking of Sites (Environmental Focused Case)

Option	Unweighted Score	Unweighted Rank	Weighted Score	Weighted Rank
Option 1: Site A	70	2	281	2
Option 2: Site B	78	1	310	1
Option 3: Site C3	71	2	278	3
Option 4: Site C4	68	4	271	4

While more wildlife species, special habitat zones, and species at risk were identified at Sites A and B than at Sites C3 and C4, mitigation of these risks is anticipated to be feasible. In contrast, at Sites C3 and C4, the risks associated with wetlands and the natural waterbodies and watercourses present may pose significant challenges. Though at the time of the preliminary aquatics investigation, no fish were documented or observed, given that Sites C3 and C4 were interpreted to be suitable fish habitat, a risk pertaining to fish presence remains. Additionally, downstream environmental impacts (i.e. erosion and sedimentation) on the creeks downstream of Sites C3 and C4 (unnamed creek between Sites C3 and C4, Tsawcome Creek, Chapman Creek) will need to be considered based on expected low and high flow conditions. Based on the above, it is expected that authorization under DFO will be required for Sites C3 and C4.

The complete MCA summary table for the Environmentally Focused Case is provided in Table 5, attached.

7.2.5 Regulatory and Stakeholder Focused Case

When evaluated using the Regulatory and Stakeholder Focused Case, Site B has the highest overall weighted score. Table F provides the results of the Regulatory and Stakeholder Focused Case.

Table F. MCA Results and Ranking of Sites (Regulatory Focused Case)

Option	Unweighted Score	Unweighted Rank	Weighted Score	Weighted Rank
Option 1: Site A	70	3	290	2
Option 2: Site B	78	1	311	1
Option 3: Site C3	71	2	226	3

Option	Unweighted Score	Unweighted Rank	Weighted Score	Weighted Rank
Option 4: Site C4	68	4	219	4

Overall, regulatory requirements for Sites A and B are expected to pose fewer potential challenges than for Sites C3 and C4. Specifically, for Sites C3 and C4, it is expected that requirements for an Environmental Assessment Certificate will be more stringent than for Sites A and B. Additionally, Sites C3 and C4 may require authorization under DFO. It is also assumed that Sites C3 and C4 are generally less favorable from a community perspective due to the perceived environmental impact of development at Sites C3 and C4 in comparison to that at Sites A and B.

The complete MCA summary table for the Regulatory and Stakeholder Focused Case is provided in Table 6, attached.

7.3 Discussion and Conclusions

The Sites were evaluated for technical feasibility, economics, environmental impacts, and regulatory and stakeholder sensitivity based on a desktop review and preliminary site reconnaissance, conceptual designs, and Class C/D cost estimates. Based on the results from the Phase 3 MCA, all Sites are deemed feasible at this stage of the Project. However, for the purposes of site comparison and selection, it is recommended that at a minimum, Site B be progressed to future project stages as the preferred site. Site C3 is recommended to be progressed as the second preferred site.

Site B ranked highest in the Base Case, as well as the Technically Focused Case, Environmentally Focused Case, and Regulatory and Stakeholder Focused Case. It ranked third in the Economics Focused Case. Overall, Site B has the following key advantages:

- Largest operational storage volume
- Site location that is easily accessible for construction and operations
- Ability to convey water from the reservoir to the Chapman Creek WTP via gravity flow (pump required to convey water out of reservoir)
- Potential to improve the operability of the existing Chapman water conveyance system by eliminating use of the existing pump station
- Potential for industry partnership (economic benefits)
- No significant areas of interpreted terrain instability or other geohazards
- Limited impact to wetlands and surface water bodies

Site C3 ranked highest in the Economics Focused Case and ranked closely as second to Site B in the Base Case and Technically Focused Case. Overall, Site C3 has the following key advantages:

- Lower capital cost of development, given the small earthworks volumes and overall smaller size of development

- Relatively high storage volume
- Small site footprint
- Water conveyance via overland flow (no pipelines or pumps required)
- No significant areas of interpreted terrain instability or other geohazards

Phase 3 of the Project has supported site comparison and recommendations on preferred site(s). However, advantages, disadvantage, and key risks and opportunities associated with the Sites progressed to future stages of the Project may be adjusted as additional information is collected. This may pertain to the technical, economic, environmental, and regulatory and stakeholder criteria. New information should be evaluated such that risks can be managed effectively as the Project progresses.

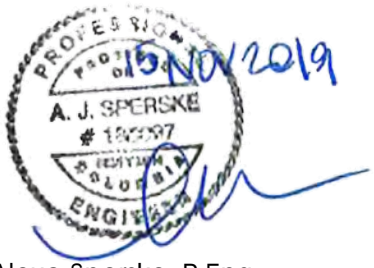
8 CLOSURE

Integrated Sustainability would like to thank Sunshine Coast Regional District for the opportunity to support the Raw Water Reservoir Feasibility Study – Phase 3. We trust that this design summary report meets the needs and expectations of Sunshine Coast Regional District. If you have any questions, please contact the undersigned at any time.

Sincerely,

Integrated Sustainability

Haley Massong, P.Eng.
Geotechnical Engineer



Alexa Sperske, P.Eng.
Senior Geotechnical Engineer

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INTEGRATED SUSTAINABILITY

Tables

Table 1 - MCA Framing Summary

Project Name: Raw Water Reservoir Feasibility Study
Client Name: Sunshine Coast Regional District
Project Manager: AJ MacDonald
Project Number: VP19-SCR-01-00
Date: November 14, 2019
Rev #: 1

Objective

Phase 3 Multi-Criteria Analysis (MCA) of four raw water reservoir sites to support the future water demand in the Chapman Water System.

Options for Analysis		Ranking System (Qualitative)				
1	Site A (1,066,400 m^3 reservoir)	Significant Disadvantage	Moderate Disadvantage	Null	Moderate Advantage	Significant Advantage
2	Site B (1,270,000 m^3 reservoir)					
3	Site C3 (1,056,700 m^3 reservoir)					
4	Site C4 (764,500 m^3 reservoir)					

Evaluation Criteria			Criteria Weightings				
Criteria	Sub-Criteria	Description	Base Case	Technically Focused Case	Economics Focused Case	Environmental Focused Case	Regulatory and Stakeholder Focused Case
			46	66	25	25	25
Technical Feasibility	Total operational storage volume (m^3)	Total operational storage volume in the reservoir, assuming 2 m freeboard (between maximum water level and dam crest elevation)	8	8	3	3	3
	Scalability	Ability to expand to achieve larger storage capacity, while maintaining maximum dam height, H, and maximum reservoir volume, V, such that $H2 \times \sqrt{V} < 200$, where H is measured as the difference in elevation between the minimum water level elevation (reservoir base) and the maximum dam crest elevation, so as not to trigger the dam height thresholds for 'large dams' as defined by the International Commission on Large Dams (ICOLD)	2	6	2	2	2
	Total site area and approximate clearing and grubbing area (ha)	Total area to be developed (approximate area of reservoir with allowance for material stockpiles, operational area, etc.), approximate area required to be cleared and grubbed	2	3	1	1	1
	Overburden excavation, bedrock excavation, earthworks fill volume, excess excavation stockpile volume, topsoil and subsoil stripping volumes (m^3)	Approximate earthworks quantities based on conceptual designs, including overburden excavation volume, bedrock excavation volume, and fill volumes required at the site to achieve the storage volume, and topsoil and subsoil stripping volumes	4	7	3	3	3
	Offsite construction material required (m^3)[1]	Requirement for offsite construction material (if onsite material is not suitable or sufficient in volume)	4	6	2	2	2
	Site access	Site proximity to existing road, length of new access road required to connect the site to an existing road, length of existing road that is likely to require upgrading prior to construction (if applicable)	4	6	2	2	2
	Proximity to third party infrastructure	Site proximity to and spatial constraints posed by third party infrastructure and dispositions (e.g. utility and road rights-of-way (ROWs), land tenures, private land ownership, etc.)	2	2	1	1	1
	Water conveyance method from source to reservoir site	Infrastructure (existing and new) required to transport water from the source to the reservoir	3	4	1	1	1
	Conveyance method from reservoir site to Chapman Creek WTP	Infrastructure (existing and new) required to transport water from the reservoir to the Chapman Creek WTP	3	4	1	1	1
	Subsurface conditions[1,2]	Characteristics and estimated thickness of surficial deposits, depth to bedrock, potential for use of surficial soils as construction materials, estimated groundwater depth)	2	3	1	1	1
	Terrain instability, geohazards, seismotectonic conditions[3]	Site characteristics including terrain instability, geohazards, seismotectonic conditions	7	10	5	5	5
	Dam consequence of failure classification (preliminary)[4]	Preliminary dam consequence of failure classification based on the estimated loss or damage caused by a failure of a dam, and evaluates loss of life, injury, and general disruption of the lives of the population in the inundated area, environmental and cultural impacts, and damage to infrastructure and economic assets	5	7	3	3	3

Table 1 - MCA Framing Summary

INTEGRATED SUSTAINABILITY

Project Name: Raw Water Reservoir Feasibility Study
Client Name: Sunshine Coast Regional District
Project Manager: AJ MacDonald

Project Number: VP19-SCR-01-00
Date: November 14, 2019
Rev #: 1

Objective

Phase 3 Multi-Criteria Analysis (MCA) of four raw water reservoir sites to support the future water demand in the Chapman Water System.

Options for Analysis		Ranking System (Qualitative)				
1	Site A (1,066,400 m^3 reservoir)	Significant Disadvantage	Moderate Disadvantage	Null	Moderate Advantage	Significant Advantage
2	Site B (1,270,000 m^3 reservoir)					
3	Site C3 (1,056,700 m^3 reservoir)					
4	Site C4 (764,500 m^3 reservoir)					

Evaluation Criteria			Criteria Weightings				
Criteria	**Sub-Criteria**	**Description**	**Base Case**	**Technically Focused Case**	**Economics Focused Case**	**Environmental Focused Case**	**Regulatory and Stakeholder Focused Case**
			22	**15**	**56**	**15**	**15**
Economics	Capital cost of reservoir site and supporting infrastructure	Class C Capital Cost Estimates (-15% / +30%) for reservoir sites, Class D Capital Cost Estimates (-30%/+50%) (for supporting infrastructure (e.g. access roads, water conveyance pipelines, intake)	9	7	24	7	7
	Lifecycle cost	Qualitative asset management cost	5	3	12	3	3
	Operating cost	Qualitative assessment of requirements for operations, maintenance, and surveillance	5	3	12	3	3
	Potential economic co-benefits (i.e. industry partnerships, hydroelectric potential)	Potential economic co-benefit opportunities (i.e. industry partnerships, hydroelectric potential, etc.)	3	2	8	2	2
			18	**11**	**11**	**52**	**11**
Environmental Impacts	Species at risk (SAR) and species of concern (SOC)	Federal and provincial SAR and provincial SOC within a 10 km radius of site locations	4	3	3	10	3
	Important habitat features	Special habitat zone, important habitats, and special access zones identified in area	4	3	3	10	3
	Wildlife presence and potential impact	Wildlife identified within 10 km radius of site locations and interpreted potential impact to wildlife	3	1	1	9	1
	Fish presence	Fish identified in water bodies downslope of reservoir site	1	1	1	4	1
	Wetlands and surface water	Wetlands identified within footprint and proximity to mapped wetlands and proximity to surface water	4	2	2	10	2
	Water quality for Chapman Water System	Potential for improved raw water quality	2	1	1	9	1
			14	**8**	**8**	**8**	**49**
Regulatory and Stakeholder Sensitivity	Regulatory requirements	Identified permits and authorizations required at this stage of project definition	7	5	5	5	20
	Key potential regulatory challenges	Identification of regulatory requirements that may pose significant challenges	3	2	2	2	17
	General community favourability	Interpreted expected support from community stakeholders	4	1	1	1	12
			100	100	100	100	100

NOTES:

1. Suitability of onsite materials for use as fill material is based on desktop review of regional-scale geological maps and one-day site reconnaissance only. An intrusive geotechnical investigation is recommended to be completed at the site locations during future design stages to confirm material suitability, and is not included in this scope of work.
2. Bedrock depths should be confirmed during an intrusive geotechnical investigation during future design stages (not included in the currently scope of work).
3. Identified potential geohazards are based on desktop review of available information and one-day site reconnaissance only. A detailed visual geohazards site assessment and intrusive geotechnical investigation are recommended to be completed at the site locations during future design stages, and are not included in this scope of work.
4. Preliminary dam consequence of failure classification is intended as high level only and is based on the conceptual design. Analyses to fully evaluate is required, and is outside of the scope of work for this project.
5. Criteria weightings for the base case and sensitivity analysis cases were initially developed in Phase 2 (refer to Phase 2 Feasibility Study Report - VP18-SCR-01-00-RPT-CI-Feasibility_Study-Rev0). Criteria weightings were refined during Phase 3.

Table 2 - Multi-Criteria Analysis Matrix: Base Case

Project Name: Raw Water Reservoir Feasibility Study
Client Name: Sunshine Coast Regional District
Project Manager: AJ MacDonald

Project Number: VP19-SCR-01-00
Date: November 14, 2019
Rev #: 1

Weighting Sensitivity Case Base Case

Ranking System (Qualitative)

Significant Disadvantage	1
Moderate Disadvantage	2
Null	3
Moderate Advantage	4
Significant Advantage	5

Evaluation Criteria				Options							
Criteria	Sub-Criteria	Description	Weighting	Option 1: Site A		Option 2: Site B		Option 3: Site C3		Option 4: Site C4	
				Ranking	Comments	Ranking	Comments	Ranking	Comments	Ranking	Comments
			46								
Technical Feasibility	Total operational storage volume (m^3)	Total operational storage volume in the reservoir, assuming 2 m freeboard (between maximum water level and dam crest elevation)	8	4	1,066,400	5	1,270,000	4	1,056,700 (excluding volume of existing water body at site) Based on hydrogeological modelling, 90% annual exceedance flow is approximately 3,900,000	2	764,500 (excluding volume of existing water body at site) Based on hydrogeological modelling, 90% annual exceedance flow is approximately 970,000
	Scalability	Ability to expand to achieve larger storage capacity, while maintaining maximum dam height, H, and maximum reservoir volume, V, such that $H^2 \times \sqrt{V} < 200$, where H is measured as the difference in elevation between the minimum water level elevation (reservoir base) and the maximum dam crest elevation, so as not to trigger the dam height thresholds for 'large dams' as defined by the International Commission on Large Dams (ICOLD)	2	2	No potential for lateral or vertical expansion without breaching thresholds for 'large dams' as defined by ICOLD. Notwithstanding the ICOLD thresholds, there is limited potential for lateral expansion to the east (constrained by Hudson Creek and the existing, unnamed road east of the site). No expansion potential to the south (due to the steep terrain and potential terrain instability), north (Fortis gas pipeline), or west (road and Chapman Creek). Limited lateral expansion potential given ICOLD thresholds for 'large dams'. Limited potential to increase reservoir volume by raising the dam height, given the steeply sloping terrain.	4	No potential for lateral or vertical expansion without breaching thresholds for 'large dams' as defined by ICOLD. Notwithstanding the ICOLD thresholds, there is potential to increase reservoir volume by expanding laterally to the west. In this case, expansion would encroach on Sunshine Coast Rod and Gun Club (SCRGC) range. There is also potential to expand the reservoir by increasing the dam height.	2	No potential for lateral or vertical expansion without breaching thresholds for 'large dams' as defined by ICOLD. Notwithstanding the ICOLD thresholds, there is limited potential for lateral expansion given terrain constraints. There is potential to increase reservoir volume by increasing the dam height.	2	No potential for lateral or vertical expansion without breaching thresholds for 'large dams' as defined by ICOLD. Notwithstanding the ICOLD thresholds, there is limited potential for lateral expansion given terrain constraints. There is potential to increase reservoir volume by increasing the dam height.
	Total site area and approximate clearing and grubbing area (ha)	Total area to be developed (approximate area of reservoir with allowance for material stockpiles, operational area, etc.), approximate area required to be cleared and grubbed	2	2	Total site area: 47.4 Clearing and grubbing: 47.4	2	Total site area: 45.2 Clearing and grubbing: 45.2	4	Total site area: 23.3 Clearing and grubbing (approximate): 2 (excluding clearing and grubbing required for access road)	4	Total site area: 26.6 Clearing and grubbing (approximate): 2 (excluding clearing and grubbing required for access road)
	Overburden excavation, bedrock excavation, earthworks fill volume, excess excavation stockpile volume, topsoil and subsoil stripping volumes (m^3)	Approximate earthworks quantities based on conceptual designs, including overburden excavation volume, bedrock excavation volume, and fill volumes required at the site to achieve the storage volume, and topsoil and subsoil stripping volumes	4	2	Overburden excavation: 883,200 Bedrock excavation: 271,300 Embankment, access road, and operations pad fill: 966,000 Bedrock to stockpile: 188,500 Topsoil stripping (assumed 100 mm thick): 43,300 Subsoil stripping (assumed 100 mm thick): 39,900 *Stockpiling bedrock only, all overburden is utilized as fill material	2	Overburden excavation: 725,293 Bedrock excavation: 267,418 Embankment, access road, and operations pad fill: 736,243 Bedrock to stockpile: 256,468 Topsoil stripping (assumed 100 mm thick): 36,780 Subsoil stripping (assumed 100 mm thick): 39,970 *Stockpiling bedrock only, all overburden is utilized as fill material	5	Overburden excavation: 15,174 Bedrock excavation: N/A Fill: 3,034 Overburden stockpile(s): 12,140 Topsoil stripping (assumed 100 mm thick): 3,231 Subsoil stripping (assumed 100 mm thick): 1,615	5	Overburden excavation: 9,322 Bedrock excavation: N/A Fill: 3,034 Overburden stockpile(s): 6,288 Topsoil stripping (assumed 100 mm thick): 3,087 Subsoil stripping (assumed 100 mm thick): 1,543
	Offsite construction material required (m^3)[1]	Requirement for offsite construction material (if onsite material is not suitable or sufficient in volume)	4	2	Yes, concrete will be required. Embankment dam will be constructed of onsite, excavated materials including both overburden and processed bedrock, and a concrete membrane will be used to create an impervious barrier on the upstream face of the embankment dam. Concrete volume required for the membrane is greater than the concrete volume required for dams at Sites C3 and C4.	2	Yes, concrete will be required. Embankment dam will be constructed of onsite, excavated materials including both overburden and processed bedrock, and a concrete membrane will be used to create an impervious barrier on the upstream face of the embankment dam. Concrete volume required for the membrane is greater than the concrete volume required for dams at Sites C3 and C4.	3	Yes, concrete will be required. A concrete gravity dam will be constructed. Concrete volume required for the dam is less than the volume required for the concrete membranes at Sites A and B.	3	Yes, concrete will be required. A concrete gravity dam will be constructed. Concrete volume required for the dam is less than the volume required for the concrete membranes at Sites A and B.
	Site access	Site proximity to existing road, length of new access road required to connect the site to an existing road, length of existing road that is likely to require upgrading prior to construction (if applicable)	4	5	Site is located within close proximity of the Sechelt-Airport FSR to the west. This road may require upgrades (approximate length is 3,500 m), however this is unlikely due to the road being currently well travelled by logging trucks and other heavy equipment. A 120 m long new access road would be required to access the site from the Sechelt-Airport Forestry Service Road (FSR).	5	Site is located within close proximity of the Sechelt-Airport FSR to the west. This road may require upgrades (approximate length is 4,500 m), however this is unlikely due to the road being currently well travelled by logging trucks and other heavy equipment. A 150 m long new access road would be required to access the site from the Sechelt-Airport FSR.	1	Site is located approximately 1 km from an existing, decommissioned road to the northwest (Option 1), and approximately 5 km from an unnamed decommissioned road to the southwest (Option 2). The existing roads would require upgrades, and new access roads would be required to gain direct access to the site from either option. Access Road Option 1: approximately 9 km of existing, decommissioned road (accessed via Grey Creek Road) and approximately 1 km of new access road Access Road Option 2: approximately 14 km of existing, decommissioned road (accessed via Grey Creek Road) and approximately 5 km of new access road	1	Site is located approximately 1 km from an existing, decommissioned road to the northwest (Option 1), and approximately 5 km from an unnamed decommissioned road to the southwest (Option 2). The existing roads would require upgrades, and new access roads would be required to gain direct access to the site from either option. Access Road Option 1: approximately 9 km of existing, decommissioned road (accessed via Grey Creek Road) and approximately 1 km of new access road Access Road Option 2: approximately 14 km of existing, decommissioned road (accessed via Grey Creek Road) and approximately 5 km of new access road

Evaluation Criteria				Options							
Criteria	Sub-Criteria	Description	Weighting	Option 1: Site A		Option 2: Site B		Option 3: Site C3		Option 4: Site C4	
				Ranking	Comments	Ranking	Comments	Ranking	Comments	Ranking	Comments
Technical Feasibility	Proximity to third party infrastructure	Site proximity to and spatial constraints posed by third party infrastructure and dispositions (e.g. utility and road rights-of-way (ROWs), land tenures, private land ownership, etc.)	2	2	A Fortis BC ROW is located immediately north of the site boundary. A BC Hydro ROW is located approximately 500 m south of the site boundary. No ROW crossings would be required to access the site off of the Sechelt-Airport FSR. The water conveyance pipeline to and from reservoir will be required to cross the Fortis BC ROW.	2	A Fortis BC ROW is located immediately south of the site boundary. No ROW crossings would be required to access the site off of the Sechelt-Airport FSR. No ROW crossings would be required for the water conveyance pipelines to and from the site. The SCRGC access road is located immediately north of the site boundary, and the SCRGC facility is located immediately east of the site boundary. The SCRGC also holds a land tenure that spans a portion of the site area.	4	No pipeline crossings would be required to access the site from existing roads. Existing access road to be evaluated for potential crossings required during recommissioning.	4	No pipeline crossings would be required to access the site from existing roads. Existing access road to be evaluated for potential crossings required during recommissioning.
	Water conveyance method from source to reservoir site	Infrastructure (existing and new) required to transport water from the source to the reservoir	3	2	The existing Chapman intake and raw water pipeline will be utilized to convey water to the site. Incoming water will be conveyed to the site from an assumed tie-point on the existing Chapman raw water pipeline at approximately El. 155 m via an approximately 1,700 m long HDPE pipe (bidirectional pipe that also conveys water from the reservoir back to the tie-point). Pumps will be required to convey water from the tie-point to the site.	2	A new intake on Chapman Creek and a new water conveyance pipeline will be used to convey water from Chapman Creek to the site. Incoming water will be conveyed to the reservoir from a new water intake at approximately El. 300 m, via an approximately 3900 m long HDPE pipeline. The water will gravity flow from the intake to the reservoir (no pumps required).	4	No infrastructure required (conveyance via overland surface water capture) Based on results from Hydrological Study, there is potential for substantially more water to be captured than can be held by reservoir.	4	No infrastructure required (conveyance via overland surface water capture) Based on results from Hydrological Study, there is potential for there to not be enough overland flow to fill reservoir.
	Conveyance method from reservoir site to Chapman Creek WTP	Infrastructure (existing and new) required to transport water from the reservoir to the Chapman Creek WTP	3	2	The existing Chapman raw water pipeline will be utilized to convey water from the reservoir to the Chapman Creek WTP. Outflowing water will be conveyed from the site to an assumed tie-point on the existing Chapman raw water pipeline at approximately El. 155 m via an approximately 1,700 m long HDPE pipe (bidirectional pipe that also conveys water to the site from the tie-point). From the tie-point, water will be conveyed to the Chapman Creek WTP via the existing Chapman raw water pipeline. Pumps will be required to convey water from the site to the tie-point.	3	The existing Chapman raw water pipeline will be utilized to convey water from the reservoir to the Chapman Creek WTP. Outgoing water will be conveyed to an assumed tie-point on the existing Chapman raw water pipeline at approximately El. 155 m via an approximately 500 m long HDPE pipe. Pumps will be required to convey water out of the reservoir at the site, from where it will gravity flow to the tie-point.	4	Water would be conveyed to Chapman Creek via Tsawcome Creek. Water would then be conveyed from Chapman Creek to the Chapman Creek WTP via the existing Chapman intake and raw water pipeline. If water will be conveyed overland from reservoir to Chapman Creek, there is potential to lose water due to evaporation and infiltration. Release of water will likely require rehabilitation and erosion control along Tsawcome Creek.	3	Water would be conveyed to Chapman Creek via an unnamed creek that flows between Sites C3 and C4, through the Site C3 lake basin, and Tsawcome Creek. Water would then be conveyed from Chapman Creek to the Chapman Creek WTP via the existing Chapman intake and raw water pipeline. If water will be conveyed overland from reservoir to Chapman Creek, there is potential to lose water due to evaporation and infiltration. Release of water from Site C4 will need to provide enough flow to overflow natural basin at Site C3 before flowing to Tsawcome Creek. Release of water will likely require rehabilitation and erosion control along the unnamed creek between Sites C3 and C4, and along Tsawcome Creek.
	Subsurface conditions[1,2]	Characteristics and estimated thickness of surficial deposits, depth to bedrock, potential for use of surficial soils as construction materials, estimated groundwater depth)	2	4	Surficial soils across the site are interpreted to comprise a thin layer of coarse-grained marine sediment deposits (sand, gravel, and cobbles, with variable amounts of silt) overlying discontinuous coarse grained Morainal deposits (sand with variable amounts of gravel and silt), overlying bedrock. It is assumed that bedrock at the site comprises massive to slightly fractured, high strength, low permeability, intrusive granodioritic rocks. The bedrock contact is interpreted to range from 2 mbgs to 10 mbgs and is interpreted to be undulating. For the purposes of design, bedrock depth is assumed to range from 2 mbgs at the north end of the site to 5 mbgs at the south end of the site. The surficial soils and bedrock are expected to be suitable for reuse as construction materials for the embankment dam, operations pads, roads, and site access point, provided that the required processing is conducted to provide granular material suitable for construction of the site infrastructure. Approximately 100 mm of topsoil and 100 mm of subsoil is assumed. Groundwater is assumed at approximately 1 mbgs.	3	Surficial soils across the site are interpreted to comprise a thin layer of coarse-grained marine sediment deposits (sand, gravel, and cobbles, with variable amounts of silt) overlying discontinuous coarse grained Morainal deposits (sand with variable amounts of gravel and silt), overlying bedrock. It is assumed that bedrock at the site comprises massive to slightly fractured, high strength, low permeability, intrusive granodioritic rocks. The bedrock contact is interpreted to range from 1 mbgs to 5 mbgs and is interpreted to be undulating. For the purposes of design, bedrock depth is assumed at 3 mbgs. The surficial soils and bedrock are expected to be suitable for reuse as construction materials for the embankment dam, operations pads, roads, and site access point, provided that the required processing is conducted to provide granular material suitable for construction of the site infrastructure. Approximately 100 mm of topsoil and 100 mm of subsoil is assumed. Groundwater is assumed at approximately 1 mbgs.	3	Surficial soils across the site are interpreted to comprise a veneer (0 m to 1 m thick) of colluvium (sands and gravels with variable amounts of silt) overlying bedrock on steep bedrock-controlled slopes, and veneers to blankets (1 m to 3 m thick) of coarse grained till overlying undulating bedrock within the lake basin. It is assumed that bedrock at the site comprises massive to slightly fractured, high strength, low permeability, intrusive granodioritic rocks. The bedrock contact is interpreted to range from at surface (0 mbgs) on higher slopes and up to 4 mbgs near the valley slope toes and base. For the purposes of design, a bedrock contact at approximately 2 mbgs is assumed. The surficial soils and bedrock at Site C3 are not expected to be suitable for reuse as construction materials for the dam, operations pads, roads, and site access point. Approximately 400 mm of topsoil and 200 mm of subsoil is assumed. Groundwater is assumed at approximately 1 mbgs on valley slopes and at surface along the lake basin.	3	Surficial soils across the site are interpreted to comprise a veneer (0 m to 1 m thick) of colluvium (sands and gravels with variable amounts of silt) overlying bedrock on steep bedrock-controlled slopes, and veneers to blankets (1 m to 3 m thick) of coarse grained till overlying undulating bedrock within the lake basin. It is assumed that bedrock at the site comprises massive to slightly fractured, high strength, low permeability, intrusive granodioritic rocks. The bedrock contact is interpreted to range from at surface (0 mbgs) on higher slopes and up to 4 mbgs near the valley slope toes and base. For the purposes of design, a bedrock contact at approximately 2 mbgs is assumed. The surficial soils and bedrock at Site C3 are not expected to be suitable for reuse as construction materials for the dam, operations pads, roads, and site access point. Approximately 400 mm of topsoil and 200 mm of subsoil is assumed. Groundwater is assumed at approximately 1 mbgs on valley slopes and at surface along the lake basin.

Evaluation Criteria				Options							
Criteria	Sub-Criteria	Description	Weighting	Option 1: Site A		Option 2: Site B		Option 3: Site C3		Option 4: Site C4	
				Ranking	Comments	Ranking	Comments	Ranking	Comments	Ranking	Comments
Technical Feasibility	Terrain instability, geohazards, seismotectonic conditions[3]	Site characteristics including terrain instability, geohazards, seismotectonic conditions	7	2	The terrain stability classification (TSC) within the site was classed as II, indicating a very low likelihood of instability occurring as a result of forest harvesting. Within and surrounding Site A, instability in the form of shallow translational or rotational surficial soil landslides was observed to be generally active along the lower Chapman Creek valley slopes, the southwest aspect slope south of Site A, gully walls, and on localized steep areas. No evidence of avulsion (debris flows) was identified. Of significance at Site A, the westernmost portion of the southwest aspect slope immediately south of the site has a TSC of IV. Given its proximity to Site A, the terrain instability within this area has the potential to impact development at Site A and is considered a geohazard. No other areas within or surrounding Site A have been interpreted to pose a significant hazard to the site. The site is located in a high seismic hazard region and all structures included in the designs will need to be designed to accommodate a 1:10,000 return period earthquake. Based on the interpreted subsurface conditions, the site is interpreted to have a relatively low risk of liquefaction during a seismic event.	3	In general, the TSC within the site is II, indicating a very low likelihood of instability occurring as a result of forest harvesting. Within and surrounding Site B, the terrain is generally stable, with localized areas of slope instability along valley slopes and on localized steep areas. No evidence of previous slope movement was observed within or within the immediate proximity of Site B; however, slope instability was identified within the Chapman Creek valley, as well as within the Vashon Deposits overlying steep bedrock-controlled terrain to the east of Hudson Creek. No evidence of avulsion (debris flows) was identified. Topographic relief within the western portion of the site is bedrock-controlled and is stable. No areas within or surrounding Site B have been interpreted to pose a significant hazard to the site. The site is located in a high seismic hazard region and all structures included in the designs will need to be designed to accommodate a 1:10,000 return period earthquake. Based on the interpreted subsurface conditions, the site is interpreted to have a relatively low risk of liquefaction during a seismic event.	3	In general, the TSC within the site ranges from I to III. Topographic relief within the site is bedrock-controlled and not indicative of slope instability. Surficial soils are unconsolidated deposits that are saturated at lower elevations. where shallow slope instabilities were primarily observed. Given that soil thickness is thin, slope movement mechanisms are likely shallow slope creep and shallow debris slides and not large or deep-seated slope failures. No areas within or surrounding Site B have been interpreted to pose a significant hazard to the site. The site is located in a high seismic hazard region and all structures included in the designs will need to be designed to accommodate a 1:10,000 return period earthquake. Based on the interpreted subsurface conditions, the site is interpreted to have a relatively low risk of liquefaction during a seismic event.	3	In general, the TSC within the site ranges from I to III. Topographic relief within the site is bedrock-controlled and not indicative of slope instability. Surficial soils are unconsolidated deposits that are saturated at lower elevations. where shallow slope instabilities were primarily observed. Given that soil thickness is thin, slope movement mechanisms are likely shallow slope creep and shallow debris slides and not large or deep-seated slope failures. No areas within or surrounding Site B have been interpreted to pose a significant hazard to the site. The site is located in a high seismic hazard region and all structures included in the designs will need to be designed to accommodate a 1:10,000 return period earthquake. Based on the interpreted subsurface conditions, the site is interpreted to have a relatively low risk of liquefaction during a seismic event.
	Dam consequence of failure classification (preliminary)[4]	Preliminary dam consequence of failure classification based on the estimated loss or damage caused by a failure of a dam, and evaluates loss of life, injury, and general disruption of the lives of the population in the inundated area, environmental and cultural impacts, and damage to infrastructure and economic assets	5	2	Extreme (Class III) (based on an assumed sunny day failure scenario)	2	Extreme (Class III) (based on an assumed sunny day failure scenario)	2	Extreme (Class III) (based on an assumed sunny day failure scenario)	2	Extreme (Class III) (based on an assumed sunny day failure scenario)
Economics			**22**								
	Capital cost of reservoir site and supporting infrastructure	Class C Capital Cost Estimates (-15% / +30%) for reservoir sites, Class D Capital Cost Estimates (-30%/+50%) (for supporting infrastructure (e.g. access roads, water conveyance pipelines, intake)	9	2	Total installed cost (including contingency): **$49,096,000** Cost per m^3 of water storage: **$46.0**	2	Total installed cost (including contingency): **$53,120,000** Cost per m^3 of water storage: **$41.8**	5	Total installed cost (including contingency): **$16,415,000** Cost per m^3 of water storage: **$15.5**	5	Total installed cost (including contingency): **$12,812,000** Cost per m^3 of water storage: **$16.8**
	Lifecycle cost	Qualitative asset management cost	5	2	Reservoir and associated infrastructure, new site access road, fence, pumps, and water conveyance piping	3	Reservoir, new site access road, fence, pumps, additional water intake, and water conveyance piping. However, there is a potential benefit for this site associated with bypassing the existing pump station by having water gravity feed from the Chapman Creek WTP.	4	Reservoir, fence, upgraded access road, new site access road, gates, automation and controls system. Maintenance of control structure gates will require automation for overflow. Upkeep/restoration of creek downstream of dam and spillway will also require maintenance.	4	Reservoir, fence, upgraded access road, new site access road, gates, automation and controls system. Maintenance of control structure gates will require automation for overflow. Upkeep/restoration of creek downstream of dam and spillway will also require maintenance.
	Operating cost	Qualitative assessment of requirements for operations, maintenance, and surveillance	5	3	Operations assumed to be conducted mainly onsite. Maintenance of reservoir and other supporting site infrastructure, pumps, piping, road. Surveillance assumed to be comprised of visual monitoring in addition to instrumentation. Benefit of low elevation water supply that could be used for fire water.	4	Operations assumed to be conducted mainly onsite. Maintenance of reservoir and other supporting site infrastructure, pumps, piping, road, intake infrastructure. Surveillance assumed to be comprised of visual monitoring in addition to instrumentation. Benefit of low elevation water supply that could be used for fire water.	3	Operations assumed to be conducted using a combination of onsite and remote (automated) procedures (given the remote location). Maintenance of dam and other supporting site infrastructure, access road. Surveillance assumed to be comprised primarily of instrumentation, as well as visual monitoring as needed (not as frequent as for Sites A and B) The above requirements consider the greater distance for site access than for Sites A and B.	3	Operations assumed to be conducted using a combination of onsite and remote (automated) procedures (given the remote location). Maintenance of dam and other supporting site infrastructure, access road. Surveillance assumed to be comprised primarily of instrumentation, as well as visual monitoring as needed (not as frequent as for Sites A and B) The above requirements consider the greater distance for site access than for Sites A and B.
	Potential economic co-benefits (i.e. industry partnerships, hydroelectric potential)	Potential economic co-benefit opportunities (i.e. industry partnerships, hydroelectric potential, etc.)	3	4	Potential industry partnership opportunities, potential for hydroelectric power generation	5	Potential industry partnership opportunities, potential for hydroelectric power generation	1	None identified	1	None identified
Environmental Impacts			**18**								
	Species at risk (SAR) and species of concern (SOC)	Federal and provincial SAR and provincial SOC within a 10 km radius of site locations	4	2	**Federal Species at Risk (SAR):** Band-tailed pigeon - Special Concern Coastal tailed frog - Special Concern Northern goshawk (Laingi subspecies) - Threatened Northern red-legged frog - Special Concern Northern rubber boa - Special Concern Olive-sided flycatcher - Threatened **Provincial SAR:** Hutton's vireo - Red List Northern goshawk (Laingi subspecies) - Red List **Provincial Species of Concern:** Band-tailed pigeon (Blue List) Northern red-legged frog (Blue List) Olive-sided flycatcher (Blue List) Winter wren (Blue List)	2	**Federal SAR:** Band-tailed pigeon - Special Concern Coastal tailed frog - Special Concern Northern goshawk (Laingi subspecies) - Threatened Northern red-legged frog - Special Concern Northern rubber boa - Special Concern Olive-sided flycatcher - Threatened **Provincial SAR:** Hutton's vireo - Red List Northern goshawk (Laingi subspecies) - Red List **Provincial Species of Concern:** Band-tailed pigeon (Blue List) Northern red-legged frog (Blue List) Olive-sided flycatcher (Blue List) Winter wren (Blue List)	3	**Federal SAR:** Band-tailed pigeon - Special Concern Olive-sided flycatcher - Threatened **Provincial SAR:** None Identified **Provincial SOC:** Band-tailed pigeon (Blue List) Olive-sided flycatcher (Blue List) Winter wren (Blue List)	3	**Federal SAR:** Band-tailed pigeon - Special Concern Olive-sided flycatcher - Threatened **Provincial SAR:** None Identified **Provincial SOC:** Band-tailed pigeon (Blue List) Olive-sided flycatcher (Blue List) Winter wren (Blue List)

Evaluation Criteria				Options							
Criteria	Sub-Criteria	Description	Weighting	Option 1: Site A		Option 2: Site B		Option 3: Site C3		Option 4: Site C4	
				Ranking	Comments	Ranking	Comments	Ranking	Comments	Ranking	Comments
Environmental Impacts	Important habitat features	Special habitat zone, important habitats, and special access zones identified in area	4	2	**Special Habitat Zone:** Multiple areas of federally listed Critical Habitat for Marbled Murrelet within 10 km of site. Closest is within 500 m. **Important Habitats/Special Access Zones:** Sitka spruce / salmonberry Dry ecosystem - Red List (within 300 m)	2	**Special Habitat Zone:** Multiple areas of federally listed Critical Habitat for Marbled Murrelet within 10 km of site. Closest is within 200 m. **Important Habitats/Special Access Zones:** Sitka spruce / salmonberry Dry ecosystem - Red List (within 225 m)	3	**Special Habitat Zone:** Multiple areas of federally listed Critical Habitat for Marbled Murrelet within 10 km of site. Closest is approximately 110 m. **Important Habitats/Special Access Zones:** None identified	3	**Special Habitat Zone:** Multiple areas of federally listed Critical Habitat for Marbled Murrelet within 10 km of site. Closest is approximately 290 m. **Important Habitats/Special Access Zones:** None identified
	Wildlife presence and potential impact	Wildlife identified within 10 km radius of site locations and interpreted potential impact to wildlife	3	3	American robin, bald eagle, band-tailed pigeon, bobcat, black-headed grosbeak, black-throated gray warbler, brown-headed cowbird, Cassin's vireo, cedar waxwing, chestnut-backed chickadee, coastal tailed frog, common raven, dark-eyed junco, European starling, glaucous-winged gull, golden-crowned kinglet, hairy woodpecker, Hammond's flycatcher, harbour seal, Hutton's vireo, Johnson's hairstreak, MacGillivray's warbler, mule deer, northern alligator lizard, northern flicker, northern goshawk (Laingi subspecies), northern red-legged frog, northern rubber boa, northwestern crow, olive-sided flycatcher, orange-crowned warbler, pacific-slope flycatcher, pelagic cormorant, pine siskin, purple finch, red crossbill, red-breasted nuthatch, ruffed grouse, Rufous hummingbird, snow bramble, song sparrow, sooty grouse, spotted towhee, Steller's jay, Swainson's thrush, Townsend's warbler, turkey vulture, varied thrush, violet-green swallow, warbling vireo, western tanager, western wood-pewee, white-crowned sparrow, winter wren, yellow-rumped warbler Interpreted potential impact to wildlife is lower for this site than for Sites C3 and C4, based on the fact that human activity and disturbance (forestry) has taken place within and surrounding this site.	3	American robin, bald eagle, band-tailed pigeon, bobcat, black-headed grosbeak, black-throated gray warbler, brown-headed cowbird, Cassin's vireo, cedar waxwing, chestnut-backed chickadee, coastal tailed frog, common raven, dark-eyed junco, European starling, glaucous-winged gull, golden-crowned kinglet, hairy woodpecker, Hammond's flycatcher, harbour seal, Hutton's vireo, Johnson's hairstreak, MacGillivray's warbler, mule deer, northern alligator lizard, northern flicker, northern goshawk (Laingi subspecies), northern red-legged frog, northern rubber boa, northwestern crow, olive-sided flycatcher, orange-crowned warbler, pacific-slope flycatcher, pelagic cormorant, pine siskin, purple finch, red crossbill, red-breasted nuthatch, ruffed grouse, Rufous hummingbird, snow bramble, song sparrow, sooty grouse, spotted towhee, Steller's jay, Swainson's thrush, Townsend's warbler, turkey vulture, varied thrush, violet-green swallow, warbling vireo, western tanager, western wood-pewee, white-crowned sparrow, winter wren, yellow-rumped warbler Interpreted potential impact to wildlife is lower for this site than for Sites C3 and C4, based on the fact that human activity and disturbance (forestry) has taken place within and surrounding this site.	3	Species identified in desktop study include American robin, band-tailed pigeon, barred owl, black-headed grosbeak, black-throated gray warbler, brown-headed cowbird, Cassin's vireo, cedar waxwing, chestnut-backed chickadee, common raven, dark-eyed junco, golden-crowned kinglet, hairy woodpecker, Hammond's flycatcher, Johnson's hairstreak, MacGillivray's warbler, northern flicker, northwestern crow, olive-sided flycatcher, orange-crowned warbler, pacific-slope flycatcher, pine siskin, red-breasted nuthatch, ruffed grouse, Rufous hummingbird, spotted towhee, Steller's jay, Swainson's thrush, Townsend's warbler, varied thrush, violet-green swallow, warbling vireo, western tanager, white-crowned sparrow, willow flycatcher, Wilson's warbler, winter wren, yellow-rumped warbler Preliminary field identified species include elk (tracks, scat), bear (scat), pacific chorus frog (adults), northern red-legged frog (tadpole [potential]), northwestern salamanders (all life stages) Interpreted potential impact to wildlife is higher for this site than for Sites A and B, based on this site having had less impact and disturbance previously.	3	Species identified in desktop study include American robin, band-tailed pigeon, barred owl, black-headed grosbeak, black-throated gray warbler, brown-headed cowbird, Cassin's vireo, cedar waxwing, chestnut-backed chickadee, common raven, dark-eyed junco, golden-crowned kinglet, hairy woodpecker, Hammond's flycatcher, Johnson's hairstreak, MacGillivray's warbler, northern flicker, northwestern crow, olive-sided flycatcher, orange-crowned warbler, pacific-slope flycatcher, pine siskin, red-breasted nuthatch, ruffed grouse, Rufous hummingbird, spotted towhee, Steller's jay, Swainson's thrush, Townsend's warbler, varied thrush, violet-green swallow, warbling vireo, western tanager, white-crowned sparrow, willow flycatcher, Wilson's warbler, winter wren, yellow-rumped warbler Preliminary field identified species include elk (tracks, scat), bear (scat), pacific chorus frog (adults), northern red-legged frog (tadpole [potential]), northwestern salamanders (all life stages) Interpreted potential impact to wildlife is higher for this site than for Sites A and B, based on this site having had less impact and disturbance previously.
	Fish presence	Fish identified in water bodies downslope of reservoir site	1	3	Based on desktop review, no documented fish presence within the site boundary, as there appears to be no waterbody within the site boundary. However, waterbodies were identified to both the west (approximately 750 m) and east (approximately 325 m) of the site boundary. These waterbodies, including upstream and downstream extents have the documented presence of brook trout, chinook salmon, chum salmon, coho salmon, cutthroat trout, dolly varden, lamprey, pink salmon, rainbow trout, and sculpin.	3	Based on desktop review, no documented fish presence within the site boundary, as there appears to be no waterbody within the site boundary. However, waterbodies were identified to both the north (approximately 380 m) and southeast (approximately 280 m) of the site boundary. These waterbodies, including upstream and downstream extents have the documented presence of brook trout, chinook salmon, chum salmon, coho salmon, cutthroat trout, dolly varden, lamprey, pink salmon, rainbow trout, and sculpin.	2	Based on desktop review, no documented fish presence within the existing natural waterbody, located within the site boundary. This may be due to a lack of fishing effort on this waterbody. However, various species were identified within downstream waterbodies that provide surface flow to Chapman Creek, including brook trout, chinook salmon, chum salmon, coho salmon, cutthroat trout, dolly varden, pink salmon, rainbow trout. Migratory species are unlikely to be present in the existing waterbody (due to potential fish barriers), however, resident sportfish may be present and would require a fish survey to further investigate. At time of preliminary aquatics investigation, no fish were documented or observed. However, given that lakes were interpreted to be suitable fish habitat, further investigation will be required.	2	Based on desktop review, no documented fish presence within the existing natural waterbody, located within the site boundary. This may be due to a lack of fishing effort on this waterbody. However, various species were identified within downstream waterbodies that provide surface flow to Chapman Creek, including brook trout, chinook salmon, chum salmon, coho salmon, cutthroat trout, dolly varden, pink salmon, rainbow trout. Migratory species are unlikely to be present in the existing waterbody (due to potential fish barriers), however, resident sportfish may be present and would require a fish survey to further investigate At time of preliminary aquatics investigation, no fish were documented or observed. However, given that lakes were interpreted to be suitable fish habitat, further investigation will be required.
	Wetlands and surface water	Wetlands identified within footprint and proximity to mapped wetlands and proximity to surface water	4	4	No mapped wetlands identified within site area. Site is located 2.2 km from a mapped wetland. Hudson Creek (325 m east of site boundary) Chapman Creek (725 m west of site boundary)	4	No mapped wetlands identified within site area. Site is 1.8 km from a mapped wetland. Hudson Creek (280 m southeast of site boundary) Chapman Creek (380 m north of site boundary)	1	Based on desktop review, no mapped wetlands identified within site area. Site is 2.6 km from a mapped wetland. Based on preliminary field observations, wetlands are prevalent along and above the lake shoreline. Site is located on a natural unnamed lake. Chapman Creek (650 m east of site boundary). Multiple smaller waterbodies, including tributaries within 500 m. Downstream environmental impacts (i.e. erosion and sedimentation) on the creeks downstream of Site C3 (Tsawcome Creek, Chapman Creek) will need to be considered based on expected low and high flow conditions.	1	Based on desktop review, no mapped wetlands identified within site area. Site is 1.7 km from a mapped wetland. Based on preliminary field observations, wetlands are prevalent along and above the lake shoreline. Located on a natural unnamed lake. Chapman Creek (800 m east of site boundary). Multiple smaller waterbodies, including tributaries within 500 m. Unnamed lake (640 m north of site boundary). Downstream environmental impacts (i.e. erosion and sedimentation) on the creeks downstream of Site C4 (unnamed creek between Sites C3 and C4, Tsawcome Creek, Chapman Creek) will need to be considered based on expected low and high flow conditions.
	Water quality for Chapman Water System	Potential for improved raw water quality	2	4	Water stored in reservoir is protected from large rain events or landslides that cause poor water quality in Chapman Creek.	5	Water stored in reservoir is protected from large rain events or landslides that cause poor water quality in Chapman Creek. Intake installed upstream of development will likely provide higher quality of raw water.	3	No improvement over existing water quality.	3	No improvement over existing water quality.

Evaluation Criteria				Options							
Criteria	Sub-Criteria	Description	Weighting	Option 1: Site A		Option 2: Site B		Option 3: Site C3		Option 4: Site C4	
				Ranking	Comments	Ranking	Comments	Ranking	Comments	Ranking	Comments
Regulatory and Stakeholder Sensitivity			**10**								
	Regulatory requirements	Identified permits and authorizations required at this stage of project definition	7	3	**Identified permits/authorizations**: Development permit, Geotechnical development permit, Water license (Section 9), Licensing under BC Dam Safety Regulation, License of Occupation (Section 39), Conduct of non-farm use with the ALR, Vancouver Coastal Health notification, License to Cut, Environmental Assessment Certificate, Waterworks Construction Permit, Operating Permit, Fisheries and Oceans Canada request for review **Potential**: approval under the Canadian Environmental Assessment Act, Building permit, new drinking water source assessment, approval under the Navigation Protection Act, approval by Transport Canada, approval by NAV Canada, approval under Section 10 of the Water Sustainability Act	3	**Identified permits/authorizations**: Development permit, Geotechnical development permit, Water license (Section 9), Licensing under BC Dam Safety Regulation, License of Occupation (Section 39), Conduct of non-farm use with the ALR, Vancouver Coastal Health notification, License to Cut, Environmental Assessment Certificate, Waterworks Construction Permit, Operating Permit, Fisheries and Oceans Canada request for review, Riparian Development Permit **Potential**: approval under the Canadian Environmental Assessment Act, Building permit, new drinking water source assessment, approval under the Navigation Protection Act, approval by Transport Canada, approval by NAV Canada, approval under Section 10 of the Water Sustainability Act	1	**Identified permits/authorizations**: Geotechnical development permit, Water license (Section 9), Licensing under BC Dam Safety Regulation, License of Occupation (Section 39), Vancouver Coastal Health notification, License to Cut, Environmental Assessment Certificate, Waterworks Construction Permit, Operating Permit, Fisheries and Oceans Canada request for review, Riparian Development Permit **Potential**: Fisheries and Oceans Canada authorization, approval under the Canadian Environmental Assessment Act, Building permit, new drinking water source assessment, approval under the Navigation Protection Act, approval by Transport Canada, approval by NAV Canada, approval under Section 10 of the Water Sustainability Act	1	**Identified permits/authorizations**: Geotechnical development permit, Water license (Section 9), Licensing under BC Dam Safety Regulation, License of Occupation (Section 39), Vancouver Coastal Health notification, License to Cut, Environmental Assessment Certificate, Waterworks Construction Permit, Operating Permit, Fisheries and Oceans Canada request for review, Riparian Development Permit **Potential**: Fisheries and Oceans Canada authorization, approval under the Canadian Environmental Assessment Act, Building permit, new drinking water source assessment, approval under the Navigation Protection Act, approval by Transport Canada, approval by NAV Canada, approval under Section 10 of the Water Sustainability Act
	Key potential regulatory challenges	Identification of regulatory requirements that may pose significant challenges	3	3	No significant challenges identified	3	Licence to Cut (under the Forest Act)	1	Licence to Cut (under the Forest Act), Fisheries and Oceans Canada authorization, Environmental Assessment Certificate	1	Licence to Cut (LTC) (under the Forest Act), Fisheries and Oceans Canada authorization, Environmental Assessment Certificate
	General community favourability	Interpreted expected support from community stakeholders	4	4	Site is located in area previously heavily impacted by forestry	4	Site is located in area previously heavily impacted by forestry	2	Site is located in largely unimpacted area, and located near Tetrahedron Park	2	Site is located in largely unimpacted area, and located near Tetrahedron Park
Total Score			**100**	**70**		**78**		**71**		**68**	
Unweighted Ranking				**3**		**1**		**2**		**4**	
Total Weighted Score				**277**		**312**		**295**		**276**	
Weighted Ranking				**3**		**1**		**2**		**4**	

NOTES:

1. Suitability of onsite materials for use as fill material is based on desktop review of regional-scale geological maps and one-day site reconnaissance only. An intrusive geotechnical investigation is recommended to be completed at the site locations during future design stages to confirm material suitability, and is not included in this scope of work.
2. Bedrock depths should be confirmed during an intrusive geotechnical investigation during future design stages (not included in the currently scope of work).
3. Identified potential geohazards are based on desktop review of available information and one-day site reconnaissance only. A detailed visual geohazards site assessment and intrusive geotechnical investigation are recommended to be completed at the site locations during future design stages, and are not included in this scope of work.
4. Preliminary dam consequence of failure classification is intended as high level only and is based on the conceptual design. Analyses to fully evaluate is required, and is outside of the scope of work for this project.
5. MCA criteria and site option descriptions are based on design criteria and assumptions included in the Phase 3 Design Summary Report (VP19-SCR-01-00-RPT-CI-DesignSummary_Rev1) and Phase 3 Rev B drawings (VP19-SCR-01-00-DWG-CI-100-104, VP19-SCR-01-00-DWG-CI-200-204, VP19-SCR-01-00-DWG-CI-300-305, VP19-SCR-01-00-DWG-CI-400-405))
6. Criteria weightings for the base case and sensitivity analysis cases, as well as site option rankings, were initially developed in Phase 2 (refer to Phase 2 Feasibility Study Report - VP18-SCR-01-00-RPT-CI-Feasibility_Study-Rev0). Criteria weightings and site option rankings were refined during Phase 3.
7. Sources of input data include:

Phase 2 Detailed Desktop Study Report (VP18-SCR-01-00-RPT-CI-Desktop_Study_Rev0)
Phase 2 Feasibility Study Report (VP18-SCR-01-00-RPT-CI-Feasibility_Study-Rev0)
Terrain Assessment Report (VP19-SCR-01-00-RPT-CI-Terrain_Assessment_Rev0)
Preliminary Aquatics Assessment Report (VP19-SCR-01-00-RPT-WR-Aquatic_Assessments-Rev0)
Regulatory Roadmap (VP19-SCR-01-00-TAB-RG-Roadmap_Rev2)
Site B POD Assessment (VP19-SCR-01-00-RPT-WR-ChapmanCreek_Intake_Eval-Rev0)
Environmental Scoping Assessment (VP19-SCR-01-00-RPT-EN-Env_Scoping_Rev1)
Consequence of Failure Classification Reports (VP19-SCR-01-00-RPT-CI-Conseq_Fail_Class_SiteA-Rev0, VP19-SCR-01-00-RPT-CI-Conseq_Fail_Class_SiteB-Rev0, VP19-SCR-01-00-RPT-CI-Conseq_Fail_Class_SiteC3-Rev0, VP19-SCR-01-00-RPT-CI-Conseq_Fail_Class_SiteC4-Rev0)
Phase 3 Design Summary Report (VP19-SCR-01-00-RPT-CI-DesignSummary_Rev1)
Phase 3 Rev B Conceptual Drawings (VP19-SCR-01-00-DWG-CI-100-104, VP19-SCR-01-00-DWG-CI-200-204, VP19-SCR-01-00-DWG-CI-300-305, VP19-SCR-01-00-DWG-CI-400-405)
Phase 3 Cost Estimates and Basis of Estimate (VP19-SCR-01-00-EST-CI-BOE_Phase 3_Rev1)

Table 3 - Multi-Criteria Analysis Matrix: Technically Focused Case

Project Name: Raw Water Reservoir Feasibility Study
Client Name: Sunshine Coast Regional District
Project Manager: AJ MacDonald

Project Number: VP19-SCR-01-00
Date: November 14, 2019
Rev #: 1

Weighting Sensitivity Case Technically Focused Case

Ranking System (Qualitative)

Significant Disadvantage	1
Moderate Disadvantage	2
Null	3
Moderate Advantage	4
Significant Advantage	5

Evaluation Criteria				Options							
Criteria	Sub-Criteria	Description	Weighting	Option 1: Site A		Option 2: Site B		Option 3: Site C3		Option 4: Site C4	
				Ranking	Comments	Ranking	Comments	Ranking	Comments	Ranking	Comments
Technical Feasibility			66								
	Total operational storage volume (m^3)	Total operational storage volume in the reservoir, assuming 2 m freeboard (between maximum water level and dam crest elevation)	8	4	1,066,400	5	1,270,000	4	1,056,700 (excluding volume of existing water body at site) Based on hydrogeological modelling, 90% annual exceedance flow is approximately 3,900,000	2	764,500 (excluding volume of existing water body at site) Based on hydrogeological modelling, 90% annual exceedance flow is approximately 970,000
	Scalability	Ability to expand to achieve larger storage capacity, while maintaining maximum dam height, H, and maximum reservoir volume, V, such that $H^2 \times \sqrt{V} < 200$, where H is measured as the difference in elevation between the minimum water level elevation (reservoir base) and the maximum dam crest elevation, so as not to trigger the dam height thresholds for 'large dams' as defined by the International Commission on Large Dams (ICOLD)	6	2	No potential for lateral or vertical expansion without breaching thresholds for 'large dams' as defined by ICOLD. Notwithstanding the ICOLD thresholds, there is limited potential for lateral expansion to the east (constrained by Hudson Creek and the existing, unnamed road east of the site). No expansion potential to the south (due to the steep terrain and potential terrain instability), north (Fortis gas pipeline), or west (road and Chapman Creek). Limited lateral expansion potential given ICOLD thresholds for 'large dams'. Limited potential to increase reservoir volume by raising the dam height, given the steeply sloping terrain.	4	No potential for lateral or vertical expansion without breaching thresholds for 'large dams' as defined by ICOLD. Notwithstanding the ICOLD thresholds, there is potential to increase reservoir volume by expanding laterally to the west. In this case, expansion would encroach on Sunshine Coast Rod and Gun Club (SCRGC) range. There is also potential to expand the reservoir by increasing the dam height.	2	No potential for lateral or vertical expansion without breaching thresholds for 'large dams' as defined by ICOLD. Notwithstanding the ICOLD thresholds, there is limited potential for lateral expansion given terrain constraints. There is potential to increase reservoir volume by increasing the dam height.	2	No potential for lateral or vertical expansion without breaching thresholds for 'large dams' as defined by ICOLD. Notwithstanding the ICOLD thresholds, there is limited potential for lateral expansion given terrain constraints. There is potential to increase reservoir volume by increasing the dam height.
	Total site area and approximate clearing and grubbing area (ha)	Total area to be developed (approximate area of reservoir with allowance for material stockpiles, operational area, etc.), approximate area required to be cleared and grubbed	3	2	Total site area: 47.4 Clearing and grubbing: 47.4	2	Total site area: 45.2 Clearing and grubbing: 45.2	4	Total site area: 23.3 Clearing and grubbing (approximate): 2 (excluding clearing and grubbing required for access road)	4	Total site area: 26.6 Clearing and grubbing (approximate): 2 (excluding clearing and grubbing required for access road)
	Overburden excavation, bedrock excavation, earthworks fill volume, excess excavation stockpile volume, topsoil and subsoil stripping volumes (m^3)	Approximate earthworks quantities based on conceptual designs, including overburden excavation volume, bedrock excavation volume, and fill volumes required at the site to achieve the storage volume, and topsoil and subsoil stripping volumes	7	2	Overburden excavation: 883,200 Bedrock excavation: 271,300 Embankment, access road, and operations pad fill: 966,000 Bedrock to stockpile: 188,500 Topsoil stripping (assumed 100 mm thick): 43,300 Subsoil stripping (assumed 100 mm thick): 39,900 *Stockpiling bedrock only, all overburden is utilized as fill material	2	Overburden excavation: 725,293 Bedrock excavation: 267,418 Embankment, access road, and operations pad fill: 736,243 Bedrock to stockpile: 256,468 Topsoil stripping (assumed 100 mm thick): 36,780 Subsoil stripping (assumed 100 mm thick): 39,970 *Stockpiling bedrock only, all overburden is utilized as fill material	5	Overburden excavation: 15,174 Bedrock excavation: N/A Fill: 3,034 Overburden stockpile(s): 12,140 Topsoil stripping (assumed 100 mm thick): 3,231 Subsoil stripping (assumed 100 mm thick): 1,615	5	Overburden excavation: 9,322 Bedrock excavation: N/A Fill: 3,034 Overburden stockpile(s): 6,288 Topsoil stripping (assumed 100 mm thick): 3,087 Subsoil stripping (assumed 100 mm thick): 1,543
	Offsite construction material required (m^3)[1]	Requirement for offsite construction material (if onsite material is not suitable or sufficient in volume)	6	2	Yes, concrete will be required. Embankment dam will be constructed of onsite, excavated materials including both overburden and processed bedrock, and a concrete membrane will be used to create an impervious barrier on the upstream face of the embankment dam. Concrete volume required for the membrane is greater than the concrete volume required for dams at Sites C3 and C4.	2	Yes, concrete will be required. Embankment dam will be constructed of onsite, excavated materials including both overburden and processed bedrock, and a concrete membrane will be used to create an impervious barrier on the upstream face of the embankment dam. Concrete volume required for the membrane is greater than the concrete volume required for dams at Sites C3 and C4.	3	Yes, concrete will be required. A concrete gravity dam will be constructed. Concrete volume required for the dam is less than the volume required for the concrete membranes at Sites A and B.	3	Yes, concrete will be required. A concrete gravity dam will be constructed. Concrete volume required for the dam is less than the volume required for the concrete membranes at Sites A and B.
	Site access	Site proximity to existing road, length of new access road required to connect the site to an existing road, length of existing road that is likely to require upgrading prior to construction (if applicable)	6	5	Site is located within close proximity of the Sechelt-Airport FSR to the west. This road may require upgrades (approximate length is 3,500 m), however this is unlikely due to the road being currently well travelled by logging trucks and other heavy equipment. A 120 m long new access road would be required to access the site from the Sechelt-Airport Forestry Service Road (FSR).	5	Site is located within close proximity of the Sechelt-Airport FSR to the west. This road may require upgrades (approximate length is 4,500 m), however this is unlikely due to the road being currently well travelled by logging trucks and other heavy equipment. A 150 m long new access road would be required to access the site from the Sechelt-Airport FSR.	1	Site is located approximately 1 km from an existing, decommissioned road to the northwest (Option 1), and approximately 5 km from an unnamed decommissioned road to the southwest (Option 2). The existing roads would require upgrades, and new access roads would be required to gain direct access to the site from either option. Access Road Option 1: approximately 9 km of existing, decommissioned road (accessed via Grey Creek Road) and approximately 1 km of new access road Access Road Option 2: approximately 14 km of existing, decommissioned road (accessed via Grey Creek Road) and approximately 5 km of new access road	1	Site is located approximately 1 km from an existing, decommissioned road to the northwest (Option 1), and approximately 5 km from an unnamed decommissioned road to the southwest (Option 2). The existing roads would require upgrades, and new access roads would be required to gain direct access to the site from either option. Access Road Option 1: approximately 9 km of existing, decommissioned road (accessed via Grey Creek Road) and approximately 1 km of new access road Access Road Option 2: approximately 14 km of existing, decommissioned road (accessed via Grey Creek Road) and approximately 5 km of new access road

Evaluation Criteria				Options							
Criteria	Sub-Criteria	Description	Weighting	Option 1: Site A		Option 2: Site B		Option 3: Site C3		Option 4: Site C4	
				Ranking	Comments	Ranking	Comments	Ranking	Comments	Ranking	Comments
Technical Feasibility	Proximity to third party infrastructure	Site proximity to and spatial constraints posed by third party infrastructure and dispositions (e.g. utility and road rights-of-way (ROWs), land tenures, private land ownership, etc.)	2	2	A Fortis BC ROW is located immediately north of the site boundary. A BC Hydro ROW is located approximately 500 m south of the site boundary. No ROW crossings would be required to access the site off of the Sechelt-Airport FSR. The water conveyance pipeline to and from reservoir will be required to cross the Fortis BC ROW.	2	A Fortis BC ROW is located immediately south of the site boundary. No ROW crossings would be required to access the site off of the Sechelt-Airport FSR. No ROW crossings would be required for the water conveyance pipelines to and from the site. The SCRGC access road is located immediately north of the site boundary, and the SCRGC facility is located immediately east of the site boundary. The SCRGC also holds a land tenure that spans a portion of the site area.	4	No pipeline crossings would be required to access the site from existing roads. Existing access road to be evaluated for potential crossings required during recommissioning.	4	No pipeline crossings would be required to access the site from existing roads. Existing access road to be evaluated for potential crossings required during recommissioning.
	Water conveyance method from source to reservoir site	Infrastructure (existing and new) required to transport water from the source to the reservoir	4	2	The existing Chapman intake and raw water pipeline will be utilized to convey water to the site. Incoming water will be conveyed to the site from an assumed tie-point on the existing Chapman raw water pipeline at approximately El. 155 m via an approximately 1,700 m long HDPE pipe (bidirectional pipe that also conveys water from the reservoir back to the tie-point). Pumps will be required to convey water from the tie-point to the site.	2	A new intake on Chapman Creek and a new water conveyance pipeline will be used to convey water from Chapman Creek to the site. Incoming water will be conveyed to the reservoir from a new water intake at approximately El. 300 m, via an approximately 3900 m long HDPE pipeline. The water will gravity flow from the intake to the reservoir (no pumps required).	4	No infrastructure required (conveyance via overland surface water capture) Based on results from Hydrological Study, there is potential for substantially more water to be captured than can be held by reservoir.	4	No infrastructure required (conveyance via overland surface water capture) Based on results from Hydrological Study, there is potential for there to not be enough overland flow to fill reservoir.
	Conveyance method from reservoir site to Chapman Creek WTP	Infrastructure (existing and new) required to transport water from the reservoir to the Chapman Creek WTP	4	2	The existing Chapman raw water pipeline will be utilized to convey water from the reservoir to the Chapman Creek WTP. Outflowing water will be conveyed from the site to an assumed tie-point on the existing Chapman raw water pipeline at approximately El. 155 m via an approximately 1,700 m long HDPE pipe (bidirectional pipe that also conveys water to the site from the tie-point). From the tie-point, water will be conveyed to the Chapman Creek WTP via the existing Chapman raw water pipeline. Pumps will be required to convey water from the site to the tie-point.	3	The existing Chapman raw water pipeline will be utilized to convey water from the reservoir to the Chapman Creek WTP. Outgoing water will be conveyed to an assumed tie-point on the existing Chapman raw water pipeline at approximately El. 155 m via an approximately 500 m long HDPE pipe. Pumps will be required to convey water out of the reservoir at the site, from where it will gravity flow to the tie-point.	4	Water would be conveyed to Chapman Creek via Tsawcome Creek. Water would then be conveyed from Chapman Creek to the Chapman Creek WTP via the existing Chapman intake and raw water pipeline. If water will be conveyed overland from reservoir to Chapman Creek, there is potential to lose water due to evaporation and infiltration. Release of water will likely require rehabilitation and erosion control along Tsawcome Creek.	3	Water would be conveyed to Chapman Creek via an unnamed creek that flows between Sites C3 and C4, through the Site C3 lake basin, and Tsawcome Creek. Water would then be conveyed from Chapman Creek to the Chapman Creek WTP via the existing Chapman intake and raw water pipeline. If water will be conveyed overland from reservoir to Chapman Creek, there is potential to lose water due to evaporation and infiltration. Release of water from Site C4 will need to provide enough flow to overflow natural basin at Site C3 before flowing to Tsawcome Creek. Release of water will likely require rehabilitation and erosion control along the unnamed creek between Sites C3 and C4, and along Tsawcome Creek.
	Subsurface conditions[1,2]	Characteristics and estimated thickness of surficial deposits, depth to bedrock, potential for use of surficial soils as construction materials, estimated groundwater depth)	3	4	Surficial soils across the site are interpreted to comprise a thin layer of coarse-grained marine sediment deposits (sand, gravel, and cobbles, with variable amounts of silt) overlying discontinuous coarse grained Morainal deposits (sand with variable amounts of gravel and silt), overlying bedrock. It is assumed that bedrock at the site comprises massive to slightly fractured, high strength, low permeability, intrusive granodioritic rocks. The bedrock contact is interpreted to range from 2 mbgs to 10 mbgs and is interpreted to be undulating. For the purposes of design, bedrock depth is assumed to range from 2 mbgs at the north end of the site to 5 mbgs at the south end of the site. The surficial soils and bedrock are expected to be suitable for reuse as construction materials for the embankment dam, operations pads, roads, and site access point, provided that the required processing is conducted to provide granular material suitable for construction of the site infrastructure. Approximately 100 mm of topsoil and 100 mm of subsoil is assumed. Groundwater is assumed at approximately 1 mbgs.	3	Surficial soils across the site are interpreted to comprise a thin layer of coarse-grained marine sediment deposits (sand, gravel, and cobbles, with variable amounts of silt) overlying discontinuous coarse grained Morainal deposits (sand with variable amounts of gravel and silt), overlying bedrock. It is assumed that bedrock at the site comprises massive to slightly fractured, high strength, low permeability, intrusive granodioritic rocks. The bedrock contact is interpreted to range from 1 mbgs to 5 mbgs and is interpreted to be undulating. For the purposes of design, bedrock depth is assumed at 3 mbgs. The surficial soils and bedrock are expected to be suitable for reuse as construction materials for the embankment dam, operations pads, roads, and site access point, provided that the required processing is conducted to provide granular material suitable for construction of the site infrastructure. Approximately 100 mm of topsoil and 100 mm of subsoil is assumed. Groundwater is assumed at approximately 1 mbgs.	3	Surficial soils across the site are interpreted to comprise a veneer (0 m to 1 m thick) of colluvium (sands and gravels with variable amounts of silt) overlying bedrock on steep bedrock-controlled slopes, and veneers to blankets (1 m to 3 m thick) of coarse grained till overlying undulating bedrock within the lake basin. It is assumed that bedrock at the site comprises massive to slightly fractured, high strength, low permeability, intrusive granodioritic rocks. The bedrock contact is interpreted to range from at surface (0 mbgs) on higher slopes and up to 4 mbgs near the valley slope toes and base. For the purposes of design, a bedrock contact at approximately 2 mbgs is assumed. The surficial soils and bedrock at Site C3 are not expected to be suitable for reuse as construction materials for the dam, operations pads, roads, and site access point. Approximately 400 mm of topsoil and 200 mm of subsoil is assumed. Groundwater is assumed at approximately 1 mbgs on valley slopes and at surface along the lake basin.	3	Surficial soils across the site are interpreted to comprise a veneer (0 m to 1 m thick) of colluvium (sands and gravels with variable amounts of silt) overlying bedrock on steep bedrock-controlled slopes, and veneers to blankets (1 m to 3 m thick) of coarse grained till overlying undulating bedrock within the lake basin. It is assumed that bedrock at the site comprises massive to slightly fractured, high strength, low permeability, intrusive granodioritic rocks. The bedrock contact is interpreted to range from at surface (0 mbgs) on higher slopes and up to 4 mbgs near the valley slope toes and base. For the purposes of design, a bedrock contact at approximately 2 mbgs is assumed. The surficial soils and bedrock at Site C3 are not expected to be suitable for reuse as construction materials for the dam, operations pads, roads, and site access point. Approximately 400 mm of topsoil and 200 mm of subsoil is assumed. Groundwater is assumed at approximately 1 mbgs on valley slopes and at surface along the lake basin.

Evaluation Criteria				Options							
Criteria	Sub-Criteria	Description	Weighting	Option 1: Site A		Option 2: Site B		Option 3: Site C3		Option 4: Site C4	
				Ranking	Comments	Ranking	Comments	Ranking	Comments	Ranking	Comments
Technical Feasibility	Terrain instability, geohazards, seismotectonic conditions[3]	Site characteristics including terrain instability, geohazards, seismotectonic conditions	10	2	The terrain stability classification (TSC) within the site was classed as II, indicating a very low likelihood of instability occurring as a result of forest harvesting. Within and surrounding Site A, instability in the form of shallow translational or rotational surficial soil landslides was observed to be generally active along the lower Chapman Creek valley slopes, the southwest aspect slope south of Site A, gully walls, and on localized steep areas. No evidence of avulsion (debris flows) was identified. Of significance at Site A, the westernmost portion of the southwest aspect slope immediately south of the site has a TSC of IV. Given its proximity to Site A, the terrain instability within this area has the potential to impact development at Site A and is considered a geohazard. No other areas within or surrounding Site A have been interpreted to pose a significant hazard to the site. The site is located in a high seismic hazard region and all structures included in the designs will need to be designed to accommodate a 1:10,000 return period earthquake. Based on the interpreted subsurface conditions, the site is interpreted to have a relatively low risk of liquefaction during a seismic event.	3	In general, the TSC within the site is II, indicating a very low likelihood of instability occurring as a result of forest harvesting. Within and surrounding Site B, the terrain is generally stable, with localized areas of slope instability along valley slopes and on localized steep areas. No evidence of previous slope movement was observed within or within the immediate proximity of Site B; however, slope instability was identified within the Chapman Creek valley, as well as within the Vashon Deposits overlying steep bedrock-controlled terrain to the east of Hudson Creek. No evidence of avulsion (debris flows) was identified. Topographic relief within the western portion of the site is bedrock-controlled and is stable. No areas within or surrounding Site B have been interpreted to pose a significant hazard to the site. The site is located in a high seismic hazard region and all structures included in the designs will need to be designed to accommodate a 1:10,000 return period earthquake. Based on the interpreted subsurface conditions, the site is interpreted to have a relatively low risk of liquefaction during a seismic event.	3	In general, the TSC within the site ranges from I to III. Topographic relief within the site is bedrock-controlled and not indicative of slope instability. Surficial soils are unconsolidated deposits that are saturated at lower elevations. where shallow slope instabilities were primarily observed. Given that soil thickness is thin, slope movement mechanisms are likely shallow slope creep and shallow debris slides and not large or deep-seated slope failures. No areas within or surrounding Site B have been interpreted to pose a significant hazard to the site. The site is located in a high seismic hazard region and all structures included in the designs will need to be designed to accommodate a 1:10,000 return period earthquake. Based on the interpreted subsurface conditions, the site is interpreted to have a relatively low risk of liquefaction during a seismic event.	3	In general, the TSC within the site ranges from I to III. Topographic relief within the site is bedrock-controlled and not indicative of slope instability. Surficial soils are unconsolidated deposits that are saturated at lower elevations. where shallow slope instabilities were primarily observed. Given that soil thickness is thin, slope movement mechanisms are likely shallow slope creep and shallow debris slides and not large or deep-seated slope failures. No areas within or surrounding Site B have been interpreted to pose a significant hazard to the site. The site is located in a high seismic hazard region and all structures included in the designs will need to be designed to accommodate a 1:10,000 return period earthquake. Based on the interpreted subsurface conditions, the site is interpreted to have a relatively low risk of liquefaction during a seismic event.
	Dam consequence of failure classification (preliminary)[4]	Preliminary dam consequence of failure classification based on the estimated loss or damage caused by a failure of a dam, and evaluates loss of life, injury, and general disruption of the lives of the population in the inundated area, environmental and cultural impacts, and damage to infrastructure and economic assets	7	2	Extreme (Class III) (based on an assumed sunny day failure scenario)	2	Extreme (Class III) (based on an assumed sunny day failure scenario)	2	Extreme (Class III) (based on an assumed sunny day failure scenario)	2	Extreme (Class III) (based on an assumed sunny day failure scenario)
Economics			**15**								
	Capital cost of reservoir site and supporting infrastructure	Class C Capital Cost Estimates (-15% / +30%) for reservoir sites, Class D Capital Cost Estimates (-30%/+50%) (for supporting infrastructure (e.g. access roads, water conveyance pipelines, intake)	7	2	Total installed cost (including contingency): **$49,096,000** Cost per m^3 of water storage: **$46.0**	2	Total installed cost (including contingency): **$53,120,000** Cost per m^3 of water storage: **$41.8**	5	Total installed cost (including contingency): **$16,415,000** Cost per m^3 of water storage: **$15.5**	5	Total installed cost (including contingency): **$12,812,000** Cost per m^3 of water storage: **$16.8**
	Lifecycle cost	Qualitative asset management cost	3	2	Reservoir and associated infrastructure, new site access road, fence, pumps, and water conveyance piping	3	Reservoir, new site access road, fence, pumps, additional water intake, and water conveyance piping. However, there is a potential benefit for this site associated with bypassing the existing pump station by having water gravity feed from the Chapman Creek WTP.	4	Reservoir, fence, upgraded access road, new site access road, gates, automation and controls system. Maintenance of control structure gates will require automation for overflow. Upkeep/restoration of creek downstream of dam and spillway will also require maintenance.	4	Reservoir, fence, upgraded access road, new site access road, gates, automation and controls system. Maintenance of control structure gates will require automation for overflow. Upkeep/restoration of creek downstream of dam and spillway will also require maintenance.
	Operating cost	Qualitative assessment of requirements for operations, maintenance, and surveillance	3	3	Operations assumed to be conducted mainly onsite. Maintenance of reservoir and other supporting site infrastructure, pumps, piping, road. Surveillance assumed to be comprised of visual monitoring in addition to instrumentation. Benefit of low elevation water supply that could be used for fire water.	4	Operations assumed to be conducted mainly onsite. Maintenance of reservoir and other supporting site infrastructure, pumps, piping, road, intake infrastructure. Surveillance assumed to be comprised of visual monitoring in addition to instrumentation. Benefit of low elevation water supply that could be used for fire water.	3	Operations assumed to be conducted using a combination of onsite and remote (automated) procedures (given the remote location). Maintenance of dam and other supporting site infrastructure, access road. Surveillance assumed to be comprised primarily of instrumentation, as well as visual monitoring as needed (not as frequent as for Sites A and B) The above requirements consider the greater distance for site access than for Sites A and B.	3	Operations assumed to be conducted using a combination of onsite and remote (automated) procedures (given the remote location). Maintenance of dam and other supporting site infrastructure, access road. Surveillance assumed to be comprised primarily of instrumentation, as well as visual monitoring as needed (not as frequent as for Sites A and B) The above requirements consider the greater distance for site access than for Sites A and B.
	Potential economic co-benefits (i.e. industry partnerships, hydroelectric potential)	Potential economic co-benefit opportunities (i.e. industry partnerships, hydroelectric potential, etc.)	2	4	Potential industry partnership opportunities, potential for hydroelectric power generation	5	Potential industry partnership opportunities, potential for hydroelectric power generation	1	None identified	1	None identified
Environmental Impacts			**11**								
	Species at risk (SAR) and species of concern (SOC)	Federal and provincial SAR and provincial SOC within a 10 km radius of site locations	3	2	**Federal Species at Risk (SAR):** Band-tailed pigeon - Special Concern Coastal tailed frog - Special Concern Northern goshawk (Laingi subspecies) - Threatened Northern red-legged frog - Special Concern Northern rubber boa - Special Concern Olive-sided flycatcher - Threatened **Provincial SAR:** Hutton's vireo - Red List Northern goshawk (Laingi subspecies) - Red List **Provincial Species of Concern:** Band-tailed pigeon (Blue List) Northern red-legged frog (Blue List) Olive-sided flycatcher (Blue List) Winter wren (Blue List)	2	**Federal SAR:** Band-tailed pigeon - Special Concern Coastal tailed frog - Special Concern Northern goshawk (Laingi subspecies) - Threatened Northern red-legged frog - Special Concern Northern rubber boa - Special Concern Olive-sided flycatcher - Threatened **Provincial SAR:** Hutton's vireo - Red List Northern goshawk (Laingi subspecies) - Red List **Provincial Species of Concern:** Band-tailed pigeon (Blue List) Northern red-legged frog (Blue List) Olive-sided flycatcher (Blue List) Winter wren (Blue List)	3	**Federal SAR:** Band-tailed pigeon - Special Concern Olive-sided flycatcher - Threatened **Provincial SAR:** None Identified **Provincial SOC:** Band-tailed pigeon (Blue List) Olive-sided flycatcher (Blue List) Winter wren (Blue List)	3	**Federal SAR:** Band-tailed pigeon - Special Concern Olive-sided flycatcher - Threatened **Provincial SAR:** None Identified **Provincial SOC:** Band-tailed pigeon (Blue List) Olive-sided flycatcher (Blue List) Winter wren (Blue List)

Evaluation Criteria				Options							
Criteria	Sub-Criteria	Description	Weighting	Option 1: Site A		Option 2: Site B		Option 3: Site C3		Option 4: Site C4	
				Ranking	Comments	Ranking	Comments	Ranking	Comments	Ranking	Comments
Environmental Impacts	Important habitat features	Special habitat zone, important habitats, and special access zones identified in area	3	2	**Special Habitat Zone:** Multiple areas of federally listed Critical Habitat for Marbled Murrelet within 10 km of site. Closest is within 500 m. **Important Habitats/Special Access Zones:** Sitka spruce / salmonberry Dry ecosystem - Red List (within 300 m)	2	**Special Habitat Zone:** Multiple areas of federally listed Critical Habitat for Marbled Murrelet within 10 km of site. Closest is within 200 m. **Important Habitats/Special Access Zones:** Sitka spruce / salmonberry Dry ecosystem - Red List (within 225 m)	3	**Special Habitat Zone:** Multiple areas of federally listed Critical Habitat for Marbled Murrelet within 10 km of site. Closest is approximately 110 m. **Important Habitats/Special Access Zones:** None identified	3	**Special Habitat Zone:** Multiple areas of federally listed Critical Habitat for Marbled Murrelet within 10 km of site. Closest is approximately 290 m. **Important Habitats/Special Access Zones:** None identified
	Wildlife presence and potential impact	Wildlife identified within 10 km radius of site locations and interpreted potential impact to wildlife	1	3	American robin, bald eagle, band-tailed pigeon, bobcat, black-headed grosbeak, black-throated gray warbler, brown-headed cowbird, Cassin's vireo, cedar waxwing, chestnut-backed chickadee, coastal tailed frog, common raven, dark-eyed junco, European starling, glaucous-winged gull, golden-crowned kinglet, hairy woodpecker, Hammond's flycatcher, harbour seal, Hutton's vireo, Johnson's hairstreak, MacGillivray's warbler, mule deer, northern alligator lizard, northern flicker, northern goshawk (Laingi subspecies), northern red-legged frog, northern rubber boa, northwestern crow, olive-sided flycatcher, orange-crowned warbler, pacific-slope flycatcher, pelagic cormorant, pine siskin, purple finch, red crossbill, red-breasted nuthatch, ruffed grouse, Rufous hummingbird, snow bramble, song sparrow, sooty grouse, spotted towhee, Steller's jay, Swainson's thrush, Townsend's warbler, turkey vulture, varied thrush, violet-green swallow, warbling vireo, western tanager, western wood-pewee, white-crowned sparrow, winter wren, yellow-rumped warbler Interpreted potential impact to wildlife is lower for this site than for Sites C3 and C4, based on the fact that human activity and disturbance (forestry) has taken place within and surrounding this site.	3	American robin, bald eagle, band-tailed pigeon, bobcat, black-headed grosbeak, black-throated gray warbler, brown-headed cowbird, Cassin's vireo, cedar waxwing, chestnut-backed chickadee, coastal tailed frog, common raven, dark-eyed junco, European starling, glaucous-winged gull, golden-crowned kinglet, hairy woodpecker, Hammond's flycatcher, harbour seal, Hutton's vireo, Johnson's hairstreak, MacGillivray's warbler, mule deer, northern alligator lizard, northern flicker, northern goshawk (Laingi subspecies), northern red-legged frog, northern rubber boa, northwestern crow, olive-sided flycatcher, orange-crowned warbler, pacific-slope flycatcher, pelagic cormorant, pine siskin, purple finch, red crossbill, red-breasted nuthatch, ruffed grouse, Rufous hummingbird, snow bramble, song sparrow, sooty grouse, spotted towhee, Steller's jay, Swainson's thrush, Townsend's warbler, turkey vulture, varied thrush, violet-green swallow, warbling vireo, western tanager, western wood-pewee, white-crowned sparrow, winter wren, yellow-rumped warbler Interpreted potential impact to wildlife is lower for this site than for Sites C3 and C4, based on the fact that human activity and disturbance (forestry) has taken place within and surrounding this site.	3	Species identified in desktop study include American robin, band-tailed pigeon, barred owl, black-headed grosbeak, black-throated gray warbler, brown-headed cowbird, Cassin's vireo, cedar waxwing, chestnut-backed chickadee, common raven, dark-eyed junco, golden-crowned kinglet, hairy woodpecker, Hammond's flycatcher, Johnson's hairstreak, MacGillivray's warbler, northern flicker, northwestern crow, olive-sided flycatcher, orange-crowned warbler, pacific-slope flycatcher, pine siskin, red-breasted nuthatch, ruffed grouse, Rufous hummingbird, spotted towhee, Steller's jay, Swainson's thrush, Townsend's warbler, varied thrush, violet-green swallow, warbling vireo, western tanager, white-crowned sparrow, willow flycatcher, Wilson's warbler, winter wren, yellow-rumped warbler Preliminary field identified species include elk (tracks, scat), bear (scat), pacific chorus frog (adults), northern red-legged frog (tadpole [potential]), northwestern salamanders (all life stages) Interpreted potential impact to wildlife is higher for this site than for Sites A and B, based on this site having had less impact and disturbance previously.	3	Species identified in desktop study include American robin, band-tailed pigeon, barred owl, black-headed grosbeak, black-throated gray warbler, brown-headed cowbird, Cassin's vireo, cedar waxwing, chestnut-backed chickadee, common raven, dark-eyed junco, golden-crowned kinglet, hairy woodpecker, Hammond's flycatcher, Johnson's hairstreak, MacGillivray's warbler, northern flicker, northwestern crow, olive-sided flycatcher, orange-crowned warbler, pacific-slope flycatcher, pine siskin, red-breasted nuthatch, ruffed grouse, Rufous hummingbird, spotted towhee, Steller's jay, Swainson's thrush, Townsend's warbler, varied thrush, violet-green swallow, warbling vireo, western tanager, white-crowned sparrow, willow flycatcher, Wilson's warbler, winter wren, yellow-rumped warbler Preliminary field identified species include elk (tracks, scat), bear (scat), pacific chorus frog (adults), northern red-legged frog (tadpole [potential]), northwestern salamanders (all life stages) Interpreted potential impact to wildlife is higher for this site than for Sites A and B, based on this site having had less impact and disturbance previously.
	Fish presence	Fish identified in water bodies downslope of reservoir site	1	3	Based on desktop review, no documented fish presence within the site boundary, as there appears to be no waterbody within the site boundary. However, waterbodies were identified to both the west (approximately 750 m) and east (approximately 325 m) of the site boundary. These waterbodies, including upstream and downstream extents have the documented presence of brook trout, chinook salmon, chum salmon, coho salmon, cutthroat trout, dolly varden, lamprey, pink salmon, rainbow trout, and sculpin.	3	Based on desktop review, no documented fish presence within the site boundary, as there appears to be no waterbody within the site boundary. However, waterbodies were identified to both the north (approximately 380 m) and southeast (approximately 280 m) of the site boundary. These waterbodies, including upstream and downstream extents have the documented presence of brook trout, chinook salmon, chum salmon, coho salmon, cutthroat trout, dolly varden, lamprey, pink salmon, rainbow trout, and sculpin.	2	Based on desktop review, no documented fish presence within the existing natural waterbody, located within the site boundary. This may be due to a lack of fishing effort on this waterbody. However, various species were identified within downstream waterbodies that provide surface flow to Chapman Creek, including brook trout, chinook salmon, chum salmon, coho salmon, cutthroat trout, dolly varden, pink salmon, rainbow trout. Migratory species are unlikely to be present in the existing waterbody (due to potential fish barriers), however, resident sportfish may be present and would require a fish survey to further investigate. At time of preliminary aquatics investigation, no fish were documented or observed. However, given that lakes were interpreted to be suitable fish habitat, further investigation will be required.	2	Based on desktop review, no documented fish presence within the existing natural waterbody, located within the site boundary. This may be due to a lack of fishing effort on this waterbody. However, various species were identified within downstream waterbodies that provide surface flow to Chapman Creek, including brook trout, chinook salmon, chum salmon, coho salmon, cutthroat trout, dolly varden, pink salmon, rainbow trout. Migratory species are unlikely to be present in the existing waterbody (due to potential fish barriers), however, resident sportfish may be present and would require a fish survey to further investigate At time of preliminary aquatics investigation, no fish were documented or observed. However, given that lakes were interpreted to be suitable fish habitat, further investigation will be required.
	Wetlands and surface water	Wetlands identified within footprint and proximity to mapped wetlands and proximity to surface water	2	4	No mapped wetlands identified within site area. Site is located 2.2 km from a mapped wetland. Hudson Creek (325 m east of site boundary) Chapman Creek (725 m west of site boundary)	4	No mapped wetlands identified within site area. Site is 1.8 km from a mapped wetland. Hudson Creek (280 m southeast of site boundary) Chapman Creek (380 m north of site boundary)	1	Based on desktop review, no mapped wetlands identified within site area. Site is 2.6 km from a mapped wetland. Based on preliminary field observations, wetlands are prevalent along and above the lake shoreline. Site is located on a natural unnamed lake. Chapman Creek (650 m east of site boundary). Multiple smaller waterbodies, including tributaries within 500 m. Downstream environmental impacts (i.e. erosion and sedimentation) on the creeks downstream of Site C3 (Tsawcome Creek, Chapman Creek) will need to be considered based on expected low and high flow conditions.	1	Based on desktop review, no mapped wetlands identified within site area. Site is 1.7 km from a mapped wetland. Based on preliminary field observations, wetlands are prevalent along and above the lake shoreline. Located on a natural unnamed lake. Chapman Creek (800 m east of site boundary). Multiple smaller waterbodies, including tributaries within 500 m. Unnamed lake (640 m north of site boundary). Downstream environmental impacts (i.e. erosion and sedimentation) on the creeks downstream of Site C4 (unnamed creek between Sites C3 and C4, Tsawcome Creek, Chapman Creek) will need to be considered based on expected low and high flow conditions.
	Water quality for Chapman Water System	Potential for improved raw water quality	1	4	Water stored in reservoir is protected from large rain events or landslides that cause poor water quality in Chapman Creek.	5	Water stored in reservoir is protected from large rain events or landslides that cause poor water quality in Chapman Creek. Intake installed upstream of development will likely provide higher quality of raw water.	3	No improvement over existing water quality.	3	No improvement over existing water quality.

Evaluation Criteria				Options							
Criteria	Sub-Criteria	Description	Weighting	Option 1: Site A		Option 2: Site B		Option 3: Site C3		Option 4: Site C4	
				Ranking	Comments	Ranking	Comments	Ranking	Comments	Ranking	Comments
Regulatory and Stakeholder Sensitivity			7								
	Regulatory requirements	Identified permits and authorizations required at this stage of project definition	5	3	**Identified permits/authorizations**: Development permit, Geotechnical development permit, Water license (Section 9), Licensing under BC Dam Safety Regulation, License of Occupation (Section 39), Conduct of non-farm use with the ALR, Vancouver Coastal Health notification, License to Cut, Environmental Assessment Certificate, Waterworks Construction Permit, Operating Permit, Fisheries and Oceans Canada request for review **Potential**: approval under the Canadian Environmental Assessment Act, Building permit, new drinking water source assessment, approval under the Navigation Protection Act, approval by Transport Canada, approval by NAV Canada, approval under Section 10 of the Water Sustainability Act	3	**Identified permits/authorizations**: Development permit, Geotechnical development permit, Water license (Section 9), Licensing under BC Dam Safety Regulation, License of Occupation (Section 39), Conduct of non-farm use with the ALR, Vancouver Coastal Health notification, License to Cut, Environmental Assessment Certificate, Waterworks Construction Permit, Operating Permit, Fisheries and Oceans Canada request for review, Riparian Development Permit **Potential**: approval under the Canadian Environmental Assessment Act, Building permit, new drinking water source assessment, approval under the Navigation Protection Act, approval by Transport Canada, approval by NAV Canada, approval under Section 10 of the Water Sustainability Act	1	**Identified permits/authorizations**: Geotechnical development permit, Water license (Section 9), Licensing under BC Dam Safety Regulation, License of Occupation (Section 39), Vancouver Coastal Health notification, License to Cut, Environmental Assessment Certificate, Waterworks Construction Permit, Operating Permit, Fisheries and Oceans Canada request for review, Riparian Development Permit **Potential**: Fisheries and Oceans Canada authorization, approval under the Canadian Environmental Assessment Act, Building permit, new drinking water source assessment, approval under the Navigation Protection Act, approval by Transport Canada, approval by NAV Canada, approval under Section 10 of the Water Sustainability Act	1	**Identified permits/authorizations**: Geotechnical development permit, Water license (Section 9), Licensing under BC Dam Safety Regulation, License of Occupation (Section 39), Vancouver Coastal Health notification, License to Cut, Environmental Assessment Certificate, Waterworks Construction Permit, Operating Permit, Fisheries and Oceans Canada request for review, Riparian Development Permit **Potential**: Fisheries and Oceans Canada authorization, approval under the Canadian Environmental Assessment Act, Building permit, new drinking water source assessment, approval under the Navigation Protection Act, approval by Transport Canada, approval by NAV Canada, approval under Section 10 of the Water Sustainability Act
	Key potential regulatory challenges	Identification of regulatory requirements that may pose significant challenges	2	3	No significant challenges identified	3	Licence to Cut (under the Forest Act)	1	Licence to Cut (under the Forest Act), Fisheries and Oceans Canada authorization, Environmental Assessment Certificate	1	Licence to Cut (LTC) (under the Forest Act), Fisheries and Oceans Canada authorization, Environmental Assessment Certificate
	General community favourability	Interpreted expected support from community stakeholders	1	4	Site is located in area previously heavily impacted by forestry	4	Site is located in area previously heavily impacted by forestry	2	Site is located in largely unimpacted area, and located near Tetrahedron Park	2	Site is located in largely unimpacted area, and located near Tetrahedron Park
Total Score			**100**	**70**		**78**		**71**		**68**	
Unweighted Ranking				**3**		**1**		**2**		**4**	
Total Weighted Score				**264**		**304**		**303**		**283**	
Weighted Ranking				**4**		**1**		**2**		**3**	

NOTES:

1. Suitability of onsite materials for use as fill material is based on desktop review of regional-scale geological maps and one-day site reconnaissance only. An intrusive geotechnical investigation is recommended to be completed at the site locations during future design stages to confirm material suitability, and is not included in this scope of work.
2. Bedrock depths should be confirmed during an intrusive geotechnical investigation during future design stages (not included in the currently scope of work).
3. Identified potential geohazards are based on desktop review of available information and one-day site reconnaissance only. A detailed visual geohazards site assessment and intrusive geotechnical investigation are recommended to be completed at the site locations during future design stages, and are not included in this scope of work.
4. Preliminary dam consequence of failure classification is intended as high level only and is based on the conceptual design. Analyses to fully evaluate is required, and is outside of the scope of work for this project.
5. MCA criteria and site option descriptions are based on design criteria and assumptions included in the Phase 3 Design Summary Report (VP19-SCR-01-00-RPT-CI-DesignSummary_Rev1) and Phase 3 Rev B drawings (VP19-SCR-01-00-DWG-CI-100-104, VP19-SCR-01-00-DWG-CI-200-204, VP19-SCR-01-00-DWG-CI-300-305, VP19-SCR-01-00-DWG-CI-400-405))
6. Criteria weightings for the base case and sensitivity analysis cases, as well as site option rankings, were initially developed in Phase 2 (refer to Phase 2 Feasibility Study Report - VP18-SCR-01-00-RPT-CI-Feasibility_Study-Rev0). Criteria weightings and site option rankings were refined during Phase 3.
7. Sources of input data include:
   - Phase 2 Detailed Desktop Study Report (VP18-SCR-01-00-RPT-CI-Desktop_Study_Rev0)
   - Phase 2 Feasibility Study Report (VP18-SCR-01-00-RPT-CI-Feasibility_Study-Rev0)
   - Terrain Assessment Report (VP19-SCR-01-00-RPT-CI-Terrain_Assessment_Rev0)
   - Preliminary Aquatics Assessment Report (VP19-SCR-01-00-RPT-WR-Aquatic_Assessments-Rev0)
   - Regulatory Roadmap (VP19-SCR-01-00-TAB-RG-Roadmap_Rev2)
   - Site B POD Assessment (VP19-SCR-01-00-RPT-WR-ChapmanCreek_Intake_Eval-Rev0)
   - Environmental Scoping Assessment (VP19-SCR-01-00-RPT-EN-Env_Scoping_Rev1)
   - Consequence of Failure Classification Reports (VP19-SCR-01-00-RPT-CI-Conseq_Fail_Class_SiteA-Rev0, VP19-SCR-01-00-RPT-CI-Conseq_Fail_Class_SiteB-Rev0, VP19-SCR-01-00-RPT-CI-Conseq_Fail_Class_SiteC3-Rev0, VP19-SCR-01-00-RPT-CI-Conseq_Fail_Class_SiteC4-Rev0)
   - Phase 3 Design Summary Report (VP19-SCR-01-00-RPT-CI-DesignSummary_Rev1)
   - Phase 3 Rev B Conceptual Drawings (VP19-SCR-01-00-DWG-CI-100-104, VP19-SCR-01-00-DWG-CI-200-204, VP19-SCR-01-00-DWG-CI-300-305, VP19-SCR-01-00-DWG-CI-400-405)
   - Phase 3 Cost Estimates and Basis of Estimate (VP19-SCR-01-00-EST-CI-BOE_Phase 3_Rev1)

Table 4 - Multi-Criteria Analysis Matrix: Economics Focused Case

Project Name: Raw Water Reservoir Feasibility Study
Client Name: Sunshine Coast Regional District
Project Manager: AJ MacDonald

Project Number: VP19-SCR-01-00
Date: November 14, 2019
Rev #: 1

Weighting Sensitivity Case Economics Focused Case

Ranking System (Qualitative)

Significant Disadvantage	1
Moderate Disadvantage	2
Null	3
Moderate Advantage	4
Significant Advantage	5

Evaluation Criteria				Options							
Criteria	Sub-Criteria	Description	Weighting	Option 1: Site A		Option 2: Site B		Option 3: Site C3		Option 4: Site C4	
				Ranking	Comments	Ranking	Comments	Ranking	Comments	Ranking	Comments
Technical Feasibility			25								
	Total operational storage volume (m^3)	Total operational storage volume in the reservoir, assuming 2 m freeboard (between maximum water level and dam crest elevation)	3	4	1,066,400	5	1,270,000	4	1,056,700 (excluding volume of existing water body at site) Based on hydrogeological modelling, 90% annual exceedance flow is approximately 3,900,000	2	764,500 (excluding volume of existing water body at site) Based on hydrogeological modelling, 90% annual exceedance flow is approximately 970,000
	Scalability	Ability to expand to achieve larger storage capacity, while maintaining maximum dam height, H, and maximum reservoir volume, V, such that $H^2 \times \sqrt{V} < 200$, where H is measured as the difference in elevation between the minimum water level elevation (reservoir base) and the maximum dam crest elevation, so as not to trigger the dam height thresholds for 'large dams' as defined by the International Commission on Large Dams (ICOLD)	2	2	No potential for lateral or vertical expansion without breaching thresholds for 'large dams' as defined by ICOLD. Notwithstanding the ICOLD thresholds, there is limited potential for lateral expansion to the east (constrained by Hudson Creek and the existing, unnamed road east of the site). No expansion potential to the south (due to the steep terrain and potential terrain instability), north (Fortis gas pipeline), or west (road and Chapman Creek). Limited lateral expansion potential given ICOLD thresholds for 'large dams'. Limited potential to increase reservoir volume by raising the dam height, given the steeply sloping terrain.	4	No potential for lateral or vertical expansion without breaching thresholds for 'large dams' as defined by ICOLD. Notwithstanding the ICOLD thresholds, there is potential to increase reservoir volume by expanding laterally to the west. In this case, expansion would encroach on Sunshine Coast Rod and Gun Club (SCRGC) range. There is also potential to expand the reservoir by increasing the dam height.	2	No potential for lateral or vertical expansion without breaching thresholds for 'large dams' as defined by ICOLD. Notwithstanding the ICOLD thresholds, there is limited potential for lateral expansion given terrain constraints. There is potential to increase reservoir volume by increasing the dam height.	2	No potential for lateral or vertical expansion without breaching thresholds for 'large dams' as defined by ICOLD. Notwithstanding the ICOLD thresholds, there is limited potential for lateral expansion given terrain constraints. There is potential to increase reservoir volume by increasing the dam height.
	Total site area and approximate clearing and grubbing area (ha)	Total area to be developed (approximate area of reservoir with allowance for material stockpiles, operational area, etc.), approximate area required to be cleared and grubbed	1	2	Total site area: 47.4 Clearing and grubbing: 47.4	2	Total site area: 45.2 Clearing and grubbing: 45.2	4	Total site area: 23.3 Clearing and grubbing (approximate): 2 (excluding clearing and grubbing required for access road)	4	Total site area: 26.6 Clearing and grubbing (approximate): 2 (excluding clearing and grubbing required for access road)
	Overburden excavation, bedrock excavation, earthworks fill volume, excess excavation stockpile volume, topsoil and subsoil stripping volumes (m^3)	Approximate earthworks quantities based on conceptual designs, including overburden excavation volume, bedrock excavation volume, and fill volumes required at the site to achieve the storage volume, and topsoil and subsoil stripping volumes	3	2	Overburden excavation: 883,200 Bedrock excavation: 271,300 Embankment, access road, and operations pad fill: 966,000 Bedrock to stockpile: 188,500 Topsoil stripping (assumed 100 mm thick): 43,300 Subsoil stripping (assumed 100 mm thick): 39,900 *Stockpiling bedrock only, all overburden is utilized as fill material	2	Overburden excavation: 725,293 Bedrock excavation: 267,418 Embankment, access road, and operations pad fill: 736,243 Bedrock to stockpile: 256,468 Topsoil stripping (assumed 100 mm thick): 36,780 Subsoil stripping (assumed 100 mm thick): 39,970 *Stockpiling bedrock only, all overburden is utilized as fill material	5	Overburden excavation: 15,174 Bedrock excavation: N/A Fill: 3,034 Overburden stockpile(s): 12,140 Topsoil stripping (assumed 100 mm thick): 3,231 Subsoil stripping (assumed 100 mm thick): 1,615	5	Overburden excavation: 9,322 Bedrock excavation: N/A Fill: 3,034 Overburden stockpile(s): 6,288 Topsoil stripping (assumed 100 mm thick): 3,087 Subsoil stripping (assumed 100 mm thick): 1,543
	Offsite construction material required (m^3)[1]	Requirement for offsite construction material (if onsite material is not suitable or sufficient in volume)	2	2	Yes, concrete will be required. Embankment dam will be constructed of onsite, excavated materials including both overburden and processed bedrock, and a concrete membrane will be used to create an impervious barrier on the upstream face of the embankment dam. Concrete volume required for the membrane is greater than the concrete volume required for dams at Sites C3 and C4.	2	Yes, concrete will be required. Embankment dam will be constructed of onsite, excavated materials including both overburden and processed bedrock, and a concrete membrane will be used to create an impervious barrier on the upstream face of the embankment dam. Concrete volume required for the membrane is greater than the concrete volume required for dams at Sites C3 and C4.	3	Yes, concrete will be required. A concrete gravity dam will be constructed. Concrete volume required for the dam is less than the volume required for the concrete membranes at Sites A and B.	3	Yes, concrete will be required. A concrete gravity dam will be constructed. Concrete volume required for the dam is less than the volume required for the concrete membranes at Sites A and B.
	Site access	Site proximity to existing road, length of new access road required to connect the site to an existing road, length of existing road that is likely to require upgrading prior to construction (if applicable)	2	5	Site is located within close proximity of the Sechelt-Airport FSR to the west. This road may require upgrades (approximate length is 3,500 m), however this is unlikely due to the road being currently well travelled by logging trucks and other heavy equipment. A 120 m long new access road would be required to access the site from the Sechelt-Airport Forestry Service Road (FSR).	5	Site is located within close proximity of the Sechelt-Airport FSR to the west. This road may require upgrades (approximate length is 4,500 m), however this is unlikely due to the road being currently well travelled by logging trucks and other heavy equipment. A 150 m long new access road would be required to access the site from the Sechelt-Airport FSR.	1	Site is located approximately 1 km from an existing, decommissioned road to the northwest (Option 1), and approximately 5 km from an unnamed decommissioned road to the southwest (Option 2). The existing roads would require upgrades, and new access roads would be required to gain direct access to the site from either option. Access Road Option 1: approximately 9 km of existing, decommissioned road (accessed via Grey Creek Road) and approximately 1 km of new access road Access Road Option 2: approximately 14 km of existing, decommissioned road (accessed via Grey Creek Road) and approximately 5 km of new access road	1	Site is located approximately 1 km from an existing, decommissioned road to the northwest (Option 1), and approximately 5 km from an unnamed decommissioned road to the southwest (Option 2). The existing roads would require upgrades, and new access roads would be required to gain direct access to the site from either option. Access Road Option 1: approximately 9 km of existing, decommissioned road (accessed via Grey Creek Road) and approximately 1 km of new access road Access Road Option 2: approximately 14 km of existing, decommissioned road (accessed via Grey Creek Road) and approximately 5 km of new access road

Evaluation Criteria				Options							
Criteria	Sub-Criteria	Description	Weighting	Option 1: Site A		Option 2: Site B		Option 3: Site C3		Option 4: Site C4	
				Ranking	Comments	Ranking	Comments	Ranking	Comments	Ranking	Comments
Technical Feasibility	Proximity to third party infrastructure	Site proximity to and spatial constraints posed by third party infrastructure and dispositions (e.g. utility and road rights-of-way (ROWs), land tenures, private land ownership, etc.)	1	2	A Fortis BC ROW is located immediately north of the site boundary. A BC Hydro ROW is located approximately 500 m south of the site boundary. No ROW crossings would be required to access the site off of the Sechelt-Airport FSR. The water conveyance pipeline to and from reservoir will be required to cross the Fortis BC ROW.	2	A Fortis BC ROW is located immediately south of the site boundary. No ROW crossings would be required to access the site off of the Sechelt-Airport FSR. No ROW crossings would be required for the water conveyance pipelines to and from the site. The SCRGC access road is located immediately north of the site boundary, and the SCRGC facility is located immediately east of the site boundary. The SCRGC also holds a land tenure that spans a portion of the site area.	4	No pipeline crossings would be required to access the site from existing roads. Existing access road to be evaluated for potential crossings required during recommissioning.	4	No pipeline crossings would be required to access the site from existing roads. Existing access road to be evaluated for potential crossings required during recommissioning.
	Water conveyance method from source to reservoir site	Infrastructure (existing and new) required to transport water from the source to the reservoir	1	2	The existing Chapman intake and raw water pipeline will be utilized to convey water to the site. Incoming water will be conveyed to the site from an assumed tie-point on the existing Chapman raw water pipeline at approximately El. 155 m via an approximately 1,700 m long HDPE pipe (bidirectional pipe that also conveys water from the reservoir back to the tie-point). Pumps will be required to convey water from the tie-point to the site.	2	A new intake on Chapman Creek and a new water conveyance pipeline will be used to convey water from Chapman Creek to the site. Incoming water will be conveyed to the reservoir from a new water intake at approximately El. 300 m, via an approximately 3900 m long HDPE pipeline. The water will gravity flow from the intake to the reservoir (no pumps required).	4	No infrastructure required (conveyance via overland surface water capture) Based on results from Hydrological Study, there is potential for substantially more water to be captured than can be held by reservoir.	4	No infrastructure required (conveyance via overland surface water capture) Based on results from Hydrological Study, there is potential for there to not be enough overland flow to fill reservoir.
	Conveyance method from reservoir site to Chapman Creek WTP	Infrastructure (existing and new) required to transport water from the reservoir to the Chapman Creek WTP	1	2	The existing Chapman raw water pipeline will be utilized to convey water from the reservoir to the Chapman Creek WTP. Outflowing water will be conveyed from the site to an assumed tie-point on the existing Chapman raw water pipeline at approximately El. 155 m via an approximately 1,700 m long HDPE pipe (bidirectional pipe that also conveys water to the site from the tie-point). From the tie-point, water will be conveyed to the Chapman Creek WTP via the existing Chapman raw water pipeline. Pumps will be required to convey water from the site to the tie-point.	3	The existing Chapman raw water pipeline will be utilized to convey water from the reservoir to the Chapman Creek WTP. Outgoing water will be conveyed to an assumed tie-point on the existing Chapman raw water pipeline at approximately El. 155 m via an approximately 500 m long HDPE pipe. Pumps will be required to convey water out of the reservoir at the site, from where it will gravity flow to the tie-point.	4	Water would be conveyed to Chapman Creek via Tsawcome Creek. Water would then be conveyed from Chapman Creek to the Chapman Creek WTP via the existing Chapman intake and raw water pipeline. If water will be conveyed overland from reservoir to Chapman Creek, there is potential to lose water due to evaporation and infiltration. Release of water will likely require rehabilitation and erosion control along Tsawcome Creek.	3	Water would be conveyed to Chapman Creek via an unnamed creek that flows between Sites C3 and C4, through the Site C3 lake basin, and Tsawcome Creek. Water would then be conveyed from Chapman Creek to the Chapman Creek WTP via the existing Chapman intake and raw water pipeline. If water will be conveyed overland from reservoir to Chapman Creek, there is potential to lose water due to evaporation and infiltration. Release of water from Site C4 will need to provide enough flow to overflow natural basin at Site C3 before flowing to Tsawcome Creek. Release of water will likely require rehabilitation and erosion control along the unnamed creek between Sites C3 and C4, and along Tsawcome Creek.
	Subsurface conditions[1,2]	Characteristics and estimated thickness of surficial deposits, depth to bedrock, potential for use of surficial soils as construction materials, estimated groundwater depth)	1	4	Surficial soils across the site are interpreted to comprise a thin layer of coarse-grained marine sediment deposits (sand, gravel, and cobbles, with variable amounts of silt) overlying discontinuous coarse grained Morainal deposits (sand with variable amounts of gravel and silt), overlying bedrock. It is assumed that bedrock at the site comprises massive to slightly fractured, high strength, low permeability, intrusive granodioritic rocks. The bedrock contact is interpreted to range from 2 mbgs to 10 mbgs and is interpreted to be undulating. For the purposes of design, bedrock depth is assumed to range from 2 mbgs at the north end of the site to 5 mbgs at the south end of the site. The surficial soils and bedrock are expected to be suitable for reuse as construction materials for the embankment dam, operations pads, roads, and site access point, provided that the required processing is conducted to provide granular material suitable for construction of the site infrastructure. Approximately 100 mm of topsoil and 100 mm of subsoil is assumed. Groundwater is assumed at approximately 1 mbgs.	3	Surficial soils across the site are interpreted to comprise a thin layer of coarse-grained marine sediment deposits (sand, gravel, and cobbles, with variable amounts of silt) overlying discontinuous coarse grained Morainal deposits (sand with variable amounts of gravel and silt), overlying bedrock. It is assumed that bedrock at the site comprises massive to slightly fractured, high strength, low permeability, intrusive granodioritic rocks. The bedrock contact is interpreted to range from 1 mbgs to 5 mbgs and is interpreted to be undulating. For the purposes of design, bedrock depth is assumed at 3 mbgs. The surficial soils and bedrock are expected to be suitable for reuse as construction materials for the embankment dam, operations pads, roads, and site access point, provided that the required processing is conducted to provide granular material suitable for construction of the site infrastructure. Approximately 100 mm of topsoil and 100 mm of subsoil is assumed. Groundwater is assumed at approximately 1 mbgs.	3	Surficial soils across the site are interpreted to comprise a veneer (0 m to 1 m thick) of colluvium (sands and gravels with variable amounts of silt) overlying bedrock on steep bedrock-controlled slopes, and veneers to blankets (1 m to 3 m thick) of coarse grained till overlying undulating bedrock within the lake basin. It is assumed that bedrock at the site comprises massive to slightly fractured, high strength, low permeability, intrusive granodioritic rocks. The bedrock contact is interpreted to range from at surface (0 mbgs) on higher slopes and up to 4 mbgs near the valley slope toes and base. For the purposes of design, a bedrock contact at approximately 2 mbgs is assumed. The surficial soils and bedrock at Site C3 are not expected to be suitable for reuse as construction materials for the dam, operations pads, roads, and site access point. Approximately 400 mm of topsoil and 200 mm of subsoil is assumed. Groundwater is assumed at approximately 1 mbgs on valley slopes and at surface along the lake basin.	3	Surficial soils across the site are interpreted to comprise a veneer (0 m to 1 m thick) of colluvium (sands and gravels with variable amounts of silt) overlying bedrock on steep bedrock-controlled slopes, and veneers to blankets (1 m to 3 m thick) of coarse grained till overlying undulating bedrock within the lake basin. It is assumed that bedrock at the site comprises massive to slightly fractured, high strength, low permeability, intrusive granodioritic rocks. The bedrock contact is interpreted to range from at surface (0 mbgs) on higher slopes and up to 4 mbgs near the valley slope toes and base. For the purposes of design, a bedrock contact at approximately 2 mbgs is assumed. The surficial soils and bedrock at Site C3 are not expected to be suitable for reuse as construction materials for the dam, operations pads, roads, and site access point. Approximately 400 mm of topsoil and 200 mm of subsoil is assumed. Groundwater is assumed at approximately 1 mbgs on valley slopes and at surface along the lake basin.

Evaluation Criteria				Options							
Criteria	Sub-Criteria	Description	Weighting	Option 1: Site A		Option 2: Site B		Option 3: Site C3		Option 4: Site C4	
				Ranking	Comments	Ranking	Comments	Ranking	Comments	Ranking	Comments
Technical Feasibility	Terrain instability, geohazards, seismotectonic conditions[3]	Site characteristics including terrain instability, geohazards, seismotectonic conditions	5	2	The terrain stability classification (TSC) within the site was classed as II, indicating a very low likelihood of instability occurring as a result of forest harvesting. Within and surrounding Site A, instability in the form of shallow translational or rotational surficial soil landslides was observed to be generally active along the lower Chapman Creek valley slopes, the southwest aspect slope south of Site A, gully walls, and on localized steep areas. No evidence of avulsion (debris flows) was identified. Of significance at Site A, the westernmost portion of the southwest aspect slope immediately south of the site has a TSC of IV. Given its proximity to Site A, the terrain instability within this area has the potential to impact development at Site A and is considered a geohazard. No other areas within or surrounding Site A have been interpreted to pose a significant hazard to the site. The site is located in a high seismic hazard region and all structures included in the designs will need to be designed to accommodate a 1:10,000 return period earthquake. Based on the interpreted subsurface conditions, the site is interpreted to have a relatively low risk of liquefaction during a seismic event.	3	In general, the TSC within the site is II, indicating a very low likelihood of instability occurring as a result of forest harvesting. Within and surrounding Site B, the terrain is generally stable, with localized areas of slope instability along valley slopes and on localized steep areas. No evidence of previous slope movement was observed within or within the immediate proximity of Site B; however, slope instability was identified within the Chapman Creek valley, as well as within the Vashon Deposits overlying steep bedrock-controlled terrain to the east of Hudson Creek. No evidence of avulsion (debris flows) was identified. Topographic relief within the western portion of the site is bedrock-controlled and is stable. No areas within or surrounding Site B have been interpreted to pose a significant hazard to the site. The site is located in a high seismic hazard region and all structures included in the designs will need to be designed to accommodate a 1:10,000 return period earthquake. Based on the interpreted subsurface conditions, the site is interpreted to have a relatively low risk of liquefaction during a seismic event.	3	In general, the TSC within the site ranges from I to III. Topographic relief within the site is bedrock-controlled and not indicative of slope instability. Surficial soils are unconsolidated deposits that are saturated at lower elevations. where shallow slope instabilities were primarily observed. Given that soil thickness is thin, slope movement mechanisms are likely shallow slope creep and shallow debris slides and not large or deep-seated slope failures. No areas within or surrounding Site B have been interpreted to pose a significant hazard to the site. The site is located in a high seismic hazard region and all structures included in the designs will need to be designed to accommodate a 1:10,000 return period earthquake. Based on the interpreted subsurface conditions, the site is interpreted to have a relatively low risk of liquefaction during a seismic event.	3	In general, the TSC within the site ranges from I to III. Topographic relief within the site is bedrock-controlled and not indicative of slope instability. Surficial soils are unconsolidated deposits that are saturated at lower elevations. where shallow slope instabilities were primarily observed. Given that soil thickness is thin, slope movement mechanisms are likely shallow slope creep and shallow debris slides and not large or deep-seated slope failures. No areas within or surrounding Site B have been interpreted to pose a significant hazard to the site. The site is located in a high seismic hazard region and all structures included in the designs will need to be designed to accommodate a 1:10,000 return period earthquake. Based on the interpreted subsurface conditions, the site is interpreted to have a relatively low risk of liquefaction during a seismic event.
	Dam consequence of failure classification (preliminary)[4]	Preliminary dam consequence of failure classification based on the estimated loss or damage caused by a failure of a dam, and evaluates loss of life, injury, and general disruption of the lives of the population in the inundated area, environmental and cultural impacts, and damage to infrastructure and economic assets	3	2	Extreme (Class III) (based on an assumed sunny day failure scenario)	2	Extreme (Class III) (based on an assumed sunny day failure scenario)	2	Extreme (Class III) (based on an assumed sunny day failure scenario)	2	Extreme (Class III) (based on an assumed sunny day failure scenario)
Economics			**56**								
	Capital cost of reservoir site and supporting infrastructure	Class C Capital Cost Estimates (-15% / +30%) for reservoir sites, Class D Capital Cost Estimates (-30%/+50%) (for supporting infrastructure (e.g. access roads, water conveyance pipelines, intake)	24	2	Total installed cost (including contingency): **$49,096,000** Cost per m^3 of water storage: **$46.0**	2	Total installed cost (including contingency): **$53,120,000** Cost per m^3 of water storage: **$41.8**	5	Total installed cost (including contingency): **$16,415,000** Cost per m^3 of water storage: **$15.5**	5	Total installed cost (including contingency): **$12,812,000** Cost per m^3 of water storage: **$16.8**
	Lifecycle cost	Qualitative asset management cost	12	2	Reservoir and associated infrastructure, new site access road, fence, pumps, and water conveyance piping	3	Reservoir, new site access road, fence, pumps, additional water intake, and water conveyance piping. However, there is a potential benefit for this site associated with bypassing the existing pump station by having water gravity feed from the Chapman Creek WTP.	4	Reservoir, fence, upgraded access road, new site access road, gates, automation and controls system. Maintenance of control structure gates will require automation for overflow. Upkeep/restoration of creek downstream of dam and spillway will also require maintenance.	4	Reservoir, fence, upgraded access road, new site access road, gates, automation and controls system. Maintenance of control structure gates will require automation for overflow. Upkeep/restoration of creek downstream of dam and spillway will also require maintenance.
	Operating cost	Qualitative assessment of requirements for operations, maintenance, and surveillance	12	3	Operations assumed to be conducted mainly onsite. Maintenance of reservoir and other supporting site infrastructure, pumps, piping, road. Surveillance assumed to be comprised of visual monitoring in addition to instrumentation. Benefit of low elevation water supply that could be used for fire water.	4	Operations assumed to be conducted mainly onsite. Maintenance of reservoir and other supporting site infrastructure, pumps, piping, road, intake infrastructure. Surveillance assumed to be comprised of visual monitoring in addition to instrumentation. Benefit of low elevation water supply that could be used for fire water.	3	Operations assumed to be conducted using a combination of onsite and remote (automated) procedures (given the remote location). Maintenance of dam and other supporting site infrastructure, access road. Surveillance assumed to be comprised primarily of instrumentation, as well as visual monitoring as needed (not as frequent as for Sites A and B) The above requirements consider the greater distance for site access than for Sites A and B.	3	Operations assumed to be conducted using a combination of onsite and remote (automated) procedures (given the remote location). Maintenance of dam and other supporting site infrastructure, access road. Surveillance assumed to be comprised primarily of instrumentation, as well as visual monitoring as needed (not as frequent as for Sites A and B) The above requirements consider the greater distance for site access than for Sites A and B.
	Potential economic co-benefits (i.e. industry partnerships, hydroelectric potential)	Potential economic co-benefit opportunities (i.e. industry partnerships, hydroelectric potential, etc.)	8	4	Potential industry partnership opportunities, potential for hydroelectric power generation	5	Potential industry partnership opportunities, potential for hydroelectric power generation	1	None identified	1	None identified
Environmental Impacts			**11**								
	Species at risk (SAR) and species of concern (SOC)	Federal and provincial SAR and provincial SOC within a 10 km radius of site locations	3	2	**Federal Species at Risk (SAR):** Band-tailed pigeon - Special Concern Coastal tailed frog - Special Concern Northern goshawk (Laingi subspecies) - Threatened Northern red-legged frog - Special Concern Northern rubber boa - Special Concern Olive-sided flycatcher - Threatened **Provincial SAR:** Hutton's vireo - Red List Northern goshawk (Laingi subspecies) - Red List **Provincial Species of Concern:** Band-tailed pigeon (Blue List) Northern red-legged frog (Blue List) Olive-sided flycatcher (Blue List) Winter wren (Blue List)	2	**Federal SAR:** Band-tailed pigeon - Special Concern Coastal tailed frog - Special Concern Northern goshawk (Laingi subspecies) - Threatened Northern red-legged frog - Special Concern Northern rubber boa - Special Concern Olive-sided flycatcher - Threatened **Provincial SAR:** Hutton's vireo - Red List Northern goshawk (Laingi subspecies) - Red List **Provincial Species of Concern:** Band-tailed pigeon (Blue List) Northern red-legged frog (Blue List) Olive-sided flycatcher (Blue List) Winter wren (Blue List)	3	**Federal SAR:** Band-tailed pigeon - Special Concern Olive-sided flycatcher - Threatened **Provincial SAR:** None Identified **Provincial SOC:** Band-tailed pigeon (Blue List) Olive-sided flycatcher (Blue List) Winter wren (Blue List)	3	**Federal SAR:** Band-tailed pigeon - Special Concern Olive-sided flycatcher - Threatened **Provincial SAR:** None Identified **Provincial SOC:** Band-tailed pigeon (Blue List) Olive-sided flycatcher (Blue List) Winter wren (Blue List)

Evaluation Criteria				Options							
Criteria	Sub-Criteria	Description	Weighting	Option 1: Site A		Option 2: Site B		Option 3: Site C3		Option 4: Site C4	
				Ranking	Comments	Ranking	Comments	Ranking	Comments	Ranking	Comments
Environmental Impacts	Important habitat features	Special habitat zone, important habitats, and special access zones identified in area	3	2	**Special Habitat Zone:** Multiple areas of federally listed Critical Habitat for Marbled Murrelet within 10 km of site. Closest is within 500 m. **Important Habitats/Special Access Zones:** Sitka spruce / salmonberry Dry ecosystem - Red List (within 300 m)	2	**Special Habitat Zone:** Multiple areas of federally listed Critical Habitat for Marbled Murrelet within 10 km of site. Closest is within 200 m. **Important Habitats/Special Access Zones:** Sitka spruce / salmonberry Dry ecosystem - Red List (within 225 m)	3	**Special Habitat Zone:** Multiple areas of federally listed Critical Habitat for Marbled Murrelet within 10 km of site. Closest is approximately 110 m. **Important Habitats/Special Access Zones:** None identified	3	**Special Habitat Zone:** Multiple areas of federally listed Critical Habitat for Marbled Murrelet within 10 km of site. Closest is approximately 290 m. **Important Habitats/Special Access Zones:** None identified
	Wildlife presence and potential impact	Wildlife identified within 10 km radius of site locations and interpreted potential impact to wildlife	1	3	American robin, bald eagle, band-tailed pigeon, bobcat, black-headed grosbeak, black-throated gray warbler, brown-headed cowbird, Cassin's vireo, cedar waxwing, chestnut-backed chickadee, coastal tailed frog, common raven, dark-eyed junco, European starling, glaucous-winged gull, golden-crowned kinglet, hairy woodpecker, Hammond's flycatcher, harbour seal, Hutton's vireo, Johnson's hairstreak, MacGillivray's warbler, mule deer, northern alligator lizard, northern flicker, northern goshawk (Laingi subspecies), northern red-legged frog, northern rubber boa, northwestern crow, olive-sided flycatcher, orange-crowned warbler, pacific-slope flycatcher, pelagic cormorant, pine siskin, purple finch, red crossbill, red-breasted nuthatch, ruffed grouse, Rufous hummingbird, snow bramble, song sparrow, sooty grouse, spotted towhee, Steller's jay, Swainson's thrush, Townsend's warbler, turkey vulture, varied thrush, violet-green swallow, warbling vireo, western tanager, western wood-pewee, white-crowned sparrow, winter wren, yellow-rumped warbler Interpreted potential impact to wildlife is lower for this site than for Sites C3 and C4, based on the fact that human activity and disturbance (forestry) has taken place within and surrounding this site.	3	American robin, bald eagle, band-tailed pigeon, bobcat, black-headed grosbeak, black-throated gray warbler, brown-headed cowbird, Cassin's vireo, cedar waxwing, chestnut-backed chickadee, coastal tailed frog, common raven, dark-eyed junco, European starling, glaucous-winged gull, golden-crowned kinglet, hairy woodpecker, Hammond's flycatcher, harbour seal, Hutton's vireo, Johnson's hairstreak, MacGillivray's warbler, mule deer, northern alligator lizard, northern flicker, northern goshawk (Laingi subspecies), northern red-legged frog, northern rubber boa, northwestern crow, olive-sided flycatcher, orange-crowned warbler, pacific-slope flycatcher, pelagic cormorant, pine siskin, purple finch, red crossbill, red-breasted nuthatch, ruffed grouse, Rufous hummingbird, snow bramble, song sparrow, sooty grouse, spotted towhee, Steller's jay, Swainson's thrush, Townsend's warbler, turkey vulture, varied thrush, violet-green swallow, warbling vireo, western tanager, western wood-pewee, white-crowned sparrow, winter wren, yellow-rumped warbler Interpreted potential impact to wildlife is lower for this site than for Sites C3 and C4, based on the fact that human activity and disturbance (forestry) has taken place within and surrounding this site.	3	Species identified in desktop study include American robin, band-tailed pigeon, barred owl, black-headed grosbeak, black-throated gray warbler, brown-headed cowbird, Cassin's vireo, cedar waxwing, chestnut-backed chickadee, common raven, dark-eyed junco, golden-crowned kinglet, hairy woodpecker, Hammond's flycatcher, Johnson's hairstreak, MacGillivray's warbler, northern flicker, northwestern crow, olive-sided flycatcher, orange-crowned warbler, pacific-slope flycatcher, pine siskin, red-breasted nuthatch, ruffed grouse, Rufous hummingbird, spotted towhee, Steller's jay, Swainson's thrush, Townsend's warbler, varied thrush, violet-green swallow, warbling vireo, western tanager, white-crowned sparrow, willow flycatcher, Wilson's warbler, winter wren, yellow-rumped warbler Preliminary field identified species include elk (tracks, scat), bear (scat), pacific chorus frog (adults), northern red-legged frog (tadpole [potential]), northwestern salamanders (all life stages) Interpreted potential impact to wildlife is higher for this site than for Sites A and B, based on this site having had less impact and disturbance previously.	3	Species identified in desktop study include American robin, band-tailed pigeon, barred owl, black-headed grosbeak, black-throated gray warbler, brown-headed cowbird, Cassin's vireo, cedar waxwing, chestnut-backed chickadee, common raven, dark-eyed junco, golden-crowned kinglet, hairy woodpecker, Hammond's flycatcher, Johnson's hairstreak, MacGillivray's warbler, northern flicker, northwestern crow, olive-sided flycatcher, orange-crowned warbler, pacific-slope flycatcher, pine siskin, red-breasted nuthatch, ruffed grouse, Rufous hummingbird, spotted towhee, Steller's jay, Swainson's thrush, Townsend's warbler, varied thrush, violet-green swallow, warbling vireo, western tanager, white-crowned sparrow, willow flycatcher, Wilson's warbler, winter wren, yellow-rumped warbler Preliminary field identified species include elk (tracks, scat), bear (scat), pacific chorus frog (adults), northern red-legged frog (tadpole [potential]), northwestern salamanders (all life stages) Interpreted potential impact to wildlife is higher for this site than for Sites A and B, based on this site having had less impact and disturbance previously.
	Fish presence	Fish identified in water bodies downslope of reservoir site	1	3	Based on desktop review, no documented fish presence within the site boundary, as there appears to be no waterbody within the site boundary. However, waterbodies were identified to both the west (approximately 750 m) and east (approximately 325 m) of the site boundary. These waterbodies, including upstream and downstream extents have the documented presence of brook trout, chinook salmon, chum salmon, coho salmon, cutthroat trout, dolly varden, lamprey, pink salmon, rainbow trout, and sculpin.	3	Based on desktop review, no documented fish presence within the site boundary, as there appears to be no waterbody within the site boundary. However, waterbodies were identified to both the north (approximately 380 m) and southeast (approximately 280 m) of the site boundary. These waterbodies, including upstream and downstream extents have the documented presence of brook trout, chinook salmon, chum salmon, coho salmon, cutthroat trout, dolly varden, lamprey, pink salmon, rainbow trout, and sculpin.	2	Based on desktop review, no documented fish presence within the existing natural waterbody, located within the site boundary. This may be due to a lack of fishing effort on this waterbody. However, various species were identified within downstream waterbodies that provide surface flow to Chapman Creek, including brook trout, chinook salmon, chum salmon, coho salmon, cutthroat trout, dolly varden, pink salmon, rainbow trout. Migratory species are unlikely to be present in the existing waterbody (due to potential fish barriers), however, resident sportfish may be present and would require a fish survey to further investigate. At time of preliminary aquatics investigation, no fish were documented or observed. However, given that lakes were interpreted to be suitable fish habitat, further investigation will be required.	2	Based on desktop review, no documented fish presence within the existing natural waterbody, located within the site boundary. This may be due to a lack of fishing effort on this waterbody. However, various species were identified within downstream waterbodies that provide surface flow to Chapman Creek, including brook trout, chinook salmon, chum salmon, coho salmon, cutthroat trout, dolly varden, pink salmon, rainbow trout. Migratory species are unlikely to be present in the existing waterbody (due to potential fish barriers), however, resident sportfish may be present and would require a fish survey to further investigate At time of preliminary aquatics investigation, no fish were documented or observed. However, given that lakes were interpreted to be suitable fish habitat, further investigation will be required.
	Wetlands and surface water	Wetlands identified within footprint and proximity to mapped wetlands and proximity to surface water	2	4	No mapped wetlands identified within site area. Site is located 2.2 km from a mapped wetland. Hudson Creek (325 m east of site boundary) Chapman Creek (725 m west of site boundary)	4	No mapped wetlands identified within site area. Site is 1.8 km from a mapped wetland. Hudson Creek (280 m southeast of site boundary) Chapman Creek (380 m north of site boundary)	1	Based on desktop review, no mapped wetlands identified within site area. Site is 2.6 km from a mapped wetland. Based on preliminary field observations, wetlands are prevalent along and above the lake shoreline. Site is located on a natural unnamed lake. Chapman Creek (650 m east of site boundary). Multiple smaller waterbodies, including tributaries within 500 m. Downstream environmental impacts (i.e. erosion and sedimentation) on the creeks downstream of Site C3 (Tsawcome Creek, Chapman Creek) will need to be considered based on expected low and high flow conditions.	1	Based on desktop review, no mapped wetlands identified within site area. Site is 1.7 km from a mapped wetland. Based on preliminary field observations, wetlands are prevalent along and above the lake shoreline. Located on a natural unnamed lake. Chapman Creek (800 m east of site boundary). Multiple smaller waterbodies, including tributaries within 500 m. Unnamed lake (640 m north of site boundary). Downstream environmental impacts (i.e. erosion and sedimentation) on the creeks downstream of Site C4 (unnamed creek between Sites C3 and C4, Tsawcome Creek, Chapman Creek) will need to be considered based on expected low and high flow conditions.
	Water quality for Chapman Water System	Potential for improved raw water quality	1	4	Water stored in reservoir is protected from large rain events or landslides that cause poor water quality in Chapman Creek.	5	Water stored in reservoir is protected from large rain events or landslides that cause poor water quality in Chapman Creek. Intake installed upstream of development will likely provide higher quality of raw water.	3	No improvement over existing water quality.	3	No improvement over existing water quality.

Evaluation Criteria				Options							
Criteria	Sub-Criteria	Description	Weighting	Option 1: Site A		Option 2: Site B		Option 3: Site C3		Option 4: Site C4	
				Ranking	Comments	Ranking	Comments	Ranking	Comments	Ranking	Comments
Regulatory and Stakeholder Sensitivity			**7**								
	Regulatory requirements	Identified permits and authorizations required at this stage of project definition	5	3	**Identified permits/authorizations**: Development permit, Geotechnical development permit, Water license (Section 9), Licensing under BC Dam Safety Regulation, License of Occupation (Section 39), Conduct of non-farm use with the ALR, Vancouver Coastal Health notification, License to Cut, Environmental Assessment Certificate, Waterworks Construction Permit, Operating Permit, Fisheries and Oceans Canada request for review **Potential**: approval under the Canadian Environmental Assessment Act, Building permit, new drinking water source assessment, approval under the Navigation Protection Act, approval by Transport Canada, approval by NAV Canada, approval under Section 10 of the Water Sustainability Act	3	**Identified permits/authorizations**: Development permit, Geotechnical development permit, Water license (Section 9), Licensing under BC Dam Safety Regulation, License of Occupation (Section 39), Conduct of non-farm use with the ALR, Vancouver Coastal Health notification, License to Cut, Environmental Assessment Certificate, Waterworks Construction Permit, Operating Permit, Fisheries and Oceans Canada request for review, Riparian Development Permit **Potential**: approval under the Canadian Environmental Assessment Act, Building permit, new drinking water source assessment, approval under the Navigation Protection Act, approval by Transport Canada, approval by NAV Canada, approval under Section 10 of the Water Sustainability Act	1	**Identified permits/authorizations**: Geotechnical development permit, Water license (Section 9), Licensing under BC Dam Safety Regulation, License of Occupation (Section 39), Vancouver Coastal Health notification, License to Cut, Environmental Assessment Certificate, Waterworks Construction Permit, Operating Permit, Fisheries and Oceans Canada request for review, Riparian Development Permit **Potential**: Fisheries and Oceans Canada authorization, approval under the Canadian Environmental Assessment Act, Building permit, new drinking water source assessment, approval under the Navigation Protection Act, approval by Transport Canada, approval by NAV Canada, approval under Section 10 of the Water Sustainability Act	1	**Identified permits/authorizations**: Geotechnical development permit, Water license (Section 9), Licensing under BC Dam Safety Regulation, License of Occupation (Section 39), Vancouver Coastal Health notification, License to Cut, Environmental Assessment Certificate, Waterworks Construction Permit, Operating Permit, Fisheries and Oceans Canada request for review, Riparian Development Permit **Potential**: Fisheries and Oceans Canada authorization, approval under the Canadian Environmental Assessment Act, Building permit, new drinking water source assessment, approval under the Navigation Protection Act, approval by Transport Canada, approval by NAV Canada, approval under Section 10 of the Water Sustainability Act
	Key potential regulatory challenges	Identification of regulatory requirements that may pose significant challenges	2	3	No significant challenges identified	3	Licence to Cut (under the Forest Act)	1	Licence to Cut (under the Forest Act), Fisheries and Oceans Canada authorization, Environmental Assessment Certificate	1	Licence to Cut (LTC) (under the Forest Act), Fisheries and Oceans Canada authorization, Environmental Assessment Certificate
	General community favourability	Interpreted expected support from community stakeholders	1	4	Site is located in area previously heavily impacted by forestry	4	Site is located in area previously heavily impacted by forestry	2	Site is located in largely unimpacted area, and located near Tetrahedron Park	2	Site is located in largely unimpacted area, and located near Tetrahedron Park
Total Score			**100**	**70**		**78**		**71**		**68**	
Unweighted Ranking				**3**		**1**		**2**		**4**	
Total Weighted Score				**259**		**304**		**328**		**321**	
Weighted Ranking				**4**		**3**		**1**		**2**	

NOTES:

1. Suitability of onsite materials for use as fill material is based on desktop review of regional-scale geological maps and one-day site reconnaissance only. An intrusive geotechnical investigation is recommended to be completed at the site locations during future design stages to confirm material suitability, and is not included in this scope of work.
2. Bedrock depths should be confirmed during an intrusive geotechnical investigation during future design stages (not included in the currently scope of work).
3. Identified potential geohazards are based on desktop review of available information and one-day site reconnaissance only. A detailed visual geohazards site assessment and intrusive geotechnical investigation are recommended to be completed at the site locations during future design stages, and are not included in this scope of work.
4. Preliminary dam consequence of failure classification is intended as high level only and is based on the conceptual design. Analyses to fully evaluate is required, and is outside of the scope of work for this project.
5. MCA criteria and site option descriptions are based on design criteria and assumptions included in the Phase 3 Design Summary Report (VP19-SCR-01-00-RPT-CI-DesignSummary_Rev1) and Phase 3 Rev B drawings (VP19-SCR-01-00-DWG-CI-100-104, VP19-SCR-01-00-DWG-CI-200-204, VP19-SCR-01-00-DWG-CI-300-305, VP19-SCR-01-00-DWG-CI-400-405))
6. Criteria weightings for the base case and sensitivity analysis cases, as well as site option rankings, were initially developed in Phase 2 (refer to Phase 2 Feasibility Study Report - VP18-SCR-01-00-RPT-CI-Feasibility_Study-Rev0). Criteria weightings and site option rankings were refined during Phase 3.
7. Sources of input data include:

Phase 2 Detailed Desktop Study Report (VP18-SCR-01-00-RPT-CI-Desktop_Study_Rev0)
Phase 2 Feasibility Study Report (VP18-SCR-01-00-RPT-CI-Feasibility_Study-Rev0)
Terrain Assessment Report (VP19-SCR-01-00-RPT-CI-Terrain_Assessment_Rev0)
Preliminary Aquatics Assessment Report (VP19-SCR-01-00-RPT-WR-Aquatic_Assessments-Rev0)
Regulatory Roadmap (VP19-SCR-01-00-TAB-RG-Roadmap_Rev2)
Site B POD Assessment (VP19-SCR-01-00-RPT-WR-ChapmanCreek_Intake_Eval-Rev0)
Environmental Scoping Assessment (VP19-SCR-01-00-RPT-EN-Env_Scoping_Rev1)
Consequence of Failure Classification Reports (VP19-SCR-01-00-RPT-CI-Conseq_Fail_Class_SiteA-Rev0, VP19-SCR-01-00-RPT-CI-Conseq_Fail_Class_SiteB-Rev0, VP19-SCR-01-00-RPT-CI-Conseq_Fail_Class_SiteC3-Rev0, VP19-SCR-01-00-RPT-CI-Conseq_Fail_Class_SiteC4-Rev0)
Phase 3 Design Summary Report (VP19-SCR-01-00-RPT-CI-DesignSummary_Rev1)
Phase 3 Rev B Conceptual Drawings (VP19-SCR-01-00-DWG-CI-100-104, VP19-SCR-01-00-DWG-CI-200-204, VP19-SCR-01-00-DWG-CI-300-305, VP19-SCR-01-00-DWG-CI-400-405)
Phase 3 Cost Estimates and Basis of Estimate (VP19-SCR-01-00-EST-CI-BOE_Phase 3_Rev1)

Table 5 - Multi-Criteria Analysis Matrix: Environmental Focused Case

Project Name: Raw Water Reservoir Feasibility Study
Client Name: Sunshine Coast Regional District
Project Manager: AJ MacDonald

Project Number: VP19-SCR-01-00
Date: November 14, 2019
Rev #: 1

Weighting Sensitivity Case Environmental Focused Case

Ranking System (Qualitative)

Significant Disadvantage	1
Moderate Disadvantage	2
Null	3
Moderate Advantage	4
Significant Advantage	5

Evaluation Criteria				Options							
Criteria	Sub-Criteria	Description	Weighting	Option 1: Site A		Option 2: Site B		Option 3: Site C3		Option 4: Site C4	
				Ranking	Comments	Ranking	Comments	Ranking	Comments	Ranking	Comments
Technical Feasibility			25								
	Total operational storage volume (m^3)	Total operational storage volume in the reservoir, assuming 2 m freeboard (between maximum water level and dam crest elevation)	3	4	1,066,400	5	1,270,000	4	1,056,700 (excluding volume of existing water body at site) Based on hydrogeological modelling, 90% annual exceedance flow is approximately 3,900,000	2	764,500 (excluding volume of existing water body at site) Based on hydrogeological modelling, 90% annual exceedance flow is approximately 970,000
	Scalability	Ability to expand to achieve larger storage capacity, while maintaining maximum dam height, H, and maximum reservoir volume, V, such that $H^2 \times \sqrt{V} < 200$, where H is measured as the difference in elevation between the minimum water level elevation (reservoir base) and the maximum dam crest elevation, so as not to trigger the dam height thresholds for 'large dams' as defined by the International Commission on Large Dams (ICOLD)	2	2	No potential for lateral or vertical expansion without breaching thresholds for 'large dams' as defined by ICOLD. Notwithstanding the ICOLD thresholds, there is limited potential for lateral expansion to the east (constrained by Hudson Creek and the existing, unnamed road east of the site). No expansion potential to the south (due to the steep terrain and potential terrain instability), north (Fortis gas pipeline), or west (road and Chapman Creek). Limited lateral expansion potential given ICOLD thresholds for 'large dams'. Limited potential to increase reservoir volume by raising the dam height, given the steeply sloping terrain.	4	No potential for lateral or vertical expansion without breaching thresholds for 'large dams' as defined by ICOLD. Notwithstanding the ICOLD thresholds, there is potential to increase reservoir volume by expanding laterally to the west. In this case, expansion would encroach on Sunshine Coast Rod and Gun Club (SCRGC) range. There is also potential to expand the reservoir by increasing the dam height.	2	No potential for lateral or vertical expansion without breaching thresholds for 'large dams' as defined by ICOLD. Notwithstanding the ICOLD thresholds, there is limited potential for lateral expansion given terrain constraints. There is potential to increase reservoir volume by increasing the dam height.	2	No potential for lateral or vertical expansion without breaching thresholds for 'large dams' as defined by ICOLD. Notwithstanding the ICOLD thresholds, there is limited potential for lateral expansion given terrain constraints. There is potential to increase reservoir volume by increasing the dam height.
	Total site area and approximate clearing and grubbing area (ha)	Total area to be developed (approximate area of reservoir with allowance for material stockpiles, operational area, etc.), approximate area required to be cleared and grubbed	1	2	Total site area: 47.4 Clearing and grubbing: 47.4	2	Total site area: 45.2 Clearing and grubbing: 45.2	4	Total site area: 23.3 Clearing and grubbing (approximate): 2 (excluding clearing and grubbing required for access road)	4	Total site area: 26.6 Clearing and grubbing (approximate): 2 (excluding clearing and grubbing required for access road)
	Overburden excavation, bedrock excavation, earthworks fill volume, excess excavation stockpile volume, topsoil and subsoil stripping volumes (m^3)	Approximate earthworks quantities based on conceptual designs, including overburden excavation volume, bedrock excavation volume, and fill volumes required at the site to achieve the storage volume, and topsoil and subsoil stripping volumes	3	2	Overburden excavation: 883,200 Bedrock excavation: 271,300 Embankment, access road, and operations pad fill: 966,000 Bedrock to stockpile: 188,500 Topsoil stripping (assumed 100 mm thick): 43,300 Subsoil stripping (assumed 100 mm thick): 39,900 *Stockpiling bedrock only, all overburden is utilized as fill material	2	Overburden excavation: 725,293 Bedrock excavation: 267,418 Embankment, access road, and operations pad fill: 736,243 Bedrock to stockpile: 256,468 Topsoil stripping (assumed 100 mm thick): 36,780 Subsoil stripping (assumed 100 mm thick): 39,970 *Stockpiling bedrock only, all overburden is utilized as fill material	5	Overburden excavation: 15,174 Bedrock excavation: N/A Fill: 3,034 Overburden stockpile(s): 12,140 Topsoil stripping (assumed 100 mm thick): 3,231 Subsoil stripping (assumed 100 mm thick): 1,615	5	Overburden excavation: 9,322 Bedrock excavation: N/A Fill: 3,034 Overburden stockpile(s): 6,288 Topsoil stripping (assumed 100 mm thick): 3,087 Subsoil stripping (assumed 100 mm thick): 1,543
	Offsite construction material required (m^3)[1]	Requirement for offsite construction material (if onsite material is not suitable or sufficient in volume)	2	2	Yes, concrete will be required. Embankment dam will be constructed of onsite, excavated materials including both overburden and processed bedrock, and a concrete membrane will be used to create an impervious barrier on the upstream face of the embankment dam. Concrete volume required for the membrane is greater than the concrete volume required for dams at Sites C3 and C4.	2	Yes, concrete will be required. Embankment dam will be constructed of onsite, excavated materials including both overburden and processed bedrock, and a concrete membrane will be used to create an impervious barrier on the upstream face of the embankment dam. Concrete volume required for the membrane is greater than the concrete volume required for dams at Sites C3 and C4.	3	Yes, concrete will be required. A concrete gravity dam will be constructed. Concrete volume required for the dam is less than the volume required for the concrete membranes at Sites A and B.	3	Yes, concrete will be required. A concrete gravity dam will be constructed. Concrete volume required for the dam is less than the volume required for the concrete membranes at Sites A and B.
	Site access	Site proximity to existing road, length of new access road required to connect the site to an existing road, length of existing road that is likely to require upgrading prior to construction (if applicable)	2	5	Site is located within close proximity of the Sechelt-Airport FSR to the west. This road may require upgrades (approximate length is 3,500 m), however this is unlikely due to the road being currently well travelled by logging trucks and other heavy equipment. A 120 m long new access road would be required to access the site from the Sechelt-Airport Forestry Service Road (FSR).	5	Site is located within close proximity of the Sechelt-Airport FSR to the west. This road may require upgrades (approximate length is 4,500 m), however this is unlikely due to the road being currently well travelled by logging trucks and other heavy equipment. A 150 m long new access road would be required to access the site from the Sechelt-Airport FSR.	1	Site is located approximately 1 km from an existing, decommissioned road to the northwest (Option 1), and approximately 5 km from an unnamed decommissioned road to the southwest (Option 2). The existing roads would require upgrades, and new access roads would be required to gain direct access to the site from either option. Access Road Option 1: approximately 9 km of existing, decommissioned road (accessed via Grey Creek Road) and approximately 1 km of new access road Access Road Option 2: approximately 14 km of existing, decommissioned road (accessed via Grey Creek Road) and approximately 5 km of new access road	1	Site is located approximately 1 km from an existing, decommissioned road to the northwest (Option 1), and approximately 5 km from an unnamed decommissioned road to the southwest (Option 2). The existing roads would require upgrades, and new access roads would be required to gain direct access to the site from either option. Access Road Option 1: approximately 9 km of existing, decommissioned road (accessed via Grey Creek Road) and approximately 1 km of new access road Access Road Option 2: approximately 14 km of existing, decommissioned road (accessed via Grey Creek Road) and approximately 5 km of new access road

Evaluation Criteria				Options							
Criteria	Sub-Criteria	Description	Weighting	Option 1: Site A		Option 2: Site B		Option 3: Site C3		Option 4: Site C4	
				Ranking	Comments	Ranking	Comments	Ranking	Comments	Ranking	Comments
Technical Feasibility	Proximity to third party infrastructure	Site proximity to and spatial constraints posed by third party infrastructure and dispositions (e.g. utility and road rights-of-way (ROWs), land tenures, private land ownership, etc.)	1	2	A Fortis BC ROW is located immediately north of the site boundary. A BC Hydro ROW is located approximately 500 m south of the site boundary. No ROW crossings would be required to access the site off of the Sechelt-Airport FSR. The water conveyance pipeline to and from reservoir will be required to cross the Fortis BC ROW.	2	A Fortis BC ROW is located immediately south of the site boundary. No ROW crossings would be required to access the site off of the Sechelt-Airport FSR. No ROW crossings would be required for the water conveyance pipelines to and from the site. The SCRGC access road is located immediately north of the site boundary, and the SCRGC facility is located immediately east of the site boundary. The SCRGC also holds a land tenure that spans a portion of the site area.	4	No pipeline crossings would be required to access the site from existing roads. Existing access road to be evaluated for potential crossings required during recommissioning.	4	No pipeline crossings would be required to access the site from existing roads. Existing access road to be evaluated for potential crossings required during recommissioning.
	Water conveyance method from source to reservoir site	Infrastructure (existing and new) required to transport water from the source to the reservoir	1	2	The existing Chapman intake and raw water pipeline will be utilized to convey water to the site. Incoming water will be conveyed to the site from an assumed tie-point on the existing Chapman raw water pipeline at approximately El. 155 m via an approximately 1,700 m long HDPE pipe (bidirectional pipe that also conveys water from the reservoir back to the tie-point). Pumps will be required to convey water from the tie-point to the site.	2	A new intake on Chapman Creek and a new water conveyance pipeline will be used to convey water from Chapman Creek to the site. Incoming water will be conveyed to the reservoir from a new water intake at approximately El. 300 m, via an approximately 3900 m long HDPE pipeline. The water will gravity flow from the intake to the reservoir (no pumps required).	4	No infrastructure required (conveyance via overland surface water capture) Based on results from Hydrological Study, there is potential for substantially more water to be captured than can be held by reservoir.	4	No infrastructure required (conveyance via overland surface water capture) Based on results from Hydrological Study, there is potential for there to not be enough overland flow to fill reservoir.
	Conveyance method from reservoir site to Chapman Creek WTP	Infrastructure (existing and new) required to transport water from the reservoir to the Chapman Creek WTP	1	2	The existing Chapman raw water pipeline will be utilized to convey water from the reservoir to the Chapman Creek WTP. Outflowing water will be conveyed from the site to an assumed tie-point on the existing Chapman raw water pipeline at approximately El. 155 m via an approximately 1,700 m long HDPE pipe (bidirectional pipe that also conveys water to the site from the tie-point). From the tie-point, water will be conveyed to the Chapman Creek WTP via the existing Chapman raw water pipeline. Pumps will be required to convey water from the site to the tie-point.	3	The existing Chapman raw water pipeline will be utilized to convey water from the reservoir to the Chapman Creek WTP. Outgoing water will be conveyed to an assumed tie-point on the existing Chapman raw water pipeline at approximately El. 155 m via an approximately 500 m long HDPE pipe. Pumps will be required to convey water out of the reservoir at the site, from where it will gravity flow to the tie-point.	4	Water would be conveyed to Chapman Creek via Tsawcome Creek. Water would then be conveyed from Chapman Creek to the Chapman Creek WTP via the existing Chapman intake and raw water pipeline. If water will be conveyed overland from reservoir to Chapman Creek, there is potential to lose water due to evaporation and infiltration. Release of water will likely require rehabilitation and erosion control along Tsawcome Creek.	3	Water would be conveyed to Chapman Creek via an unnamed creek that flows between Sites C3 and C4, through the Site C3 lake basin, and Tsawcome Creek. Water would then be conveyed from Chapman Creek to the Chapman Creek WTP via the existing Chapman intake and raw water pipeline. If water will be conveyed overland from reservoir to Chapman Creek, there is potential to lose water due to evaporation and infiltration. Release of water from Site C4 will need to provide enough flow to overflow natural basin at Site C3 before flowing to Tsawcome Creek. Release of water will likely require rehabilitation and erosion control along the unnamed creek between Sites C3 and C4, and along Tsawcome Creek.
	Subsurface conditions[1,2]	Characteristics and estimated thickness of surficial deposits, depth to bedrock, potential for use of surficial soils as construction materials, estimated groundwater depth)	1	4	Surficial soils across the site are interpreted to comprise a thin layer of coarse-grained marine sediment deposits (sand, gravel, and cobbles, with variable amounts of silt) overlying discontinuous coarse grained Morainal deposits (sand with variable amounts of gravel and silt), overlying bedrock. It is assumed that bedrock at the site comprises massive to slightly fractured, high strength, low permeability, intrusive granodioritic rocks. The bedrock contact is interpreted to range from 2 mbgs to 10 mbgs and is interpreted to be undulating. For the purposes of design, bedrock depth is assumed to range from 2 mbgs at the north end of the site to 5 mbgs at the south end of the site. The surficial soils and bedrock are expected to be suitable for reuse as construction materials for the embankment dam, operations pads, roads, and site access point, provided that the required processing is conducted to provide granular material suitable for construction of the site infrastructure. Approximately 100 mm of topsoil and 100 mm of subsoil is assumed. Groundwater is assumed at approximately 1 mbgs.	3	Surficial soils across the site are interpreted to comprise a thin layer of coarse-grained marine sediment deposits (sand, gravel, and cobbles, with variable amounts of silt) overlying discontinuous coarse grained Morainal deposits (sand with variable amounts of gravel and silt), overlying bedrock. It is assumed that bedrock at the site comprises massive to slightly fractured, high strength, low permeability, intrusive granodioritic rocks. The bedrock contact is interpreted to range from 1 mbgs to 5 mbgs and is interpreted to be undulating. For the purposes of design, bedrock depth is assumed at 3 mbgs. The surficial soils and bedrock are expected to be suitable for reuse as construction materials for the embankment dam, operations pads, roads, and site access point, provided that the required processing is conducted to provide granular material suitable for construction of the site infrastructure. Approximately 100 mm of topsoil and 100 mm of subsoil is assumed. Groundwater is assumed at approximately 1 mbgs.	3	Surficial soils across the site are interpreted to comprise a veneer (0 m to 1 m thick) of colluvium (sands and gravels with variable amounts of silt) overlying bedrock on steep bedrock-controlled slopes, and veneers to blankets (1 m to 3 m thick) of coarse grained till overlying undulating bedrock within the lake basin. It is assumed that bedrock at the site comprises massive to slightly fractured, high strength, low permeability, intrusive granodioritic rocks. The bedrock contact is interpreted to range from at surface (0 mbgs) on higher slopes and up to 4 mbgs near the valley slope toes and base. For the purposes of design, a bedrock contact at approximately 2 mbgs is assumed. The surficial soils and bedrock at Site C3 are not expected to be suitable for reuse as construction materials for the dam, operations pads, roads, and site access point. Approximately 400 mm of topsoil and 200 mm of subsoil is assumed. Groundwater is assumed at approximately 1 mbgs on valley slopes and at surface along the lake basin.	3	Surficial soils across the site are interpreted to comprise a veneer (0 m to 1 m thick) of colluvium (sands and gravels with variable amounts of silt) overlying bedrock on steep bedrock-controlled slopes, and veneers to blankets (1 m to 3 m thick) of coarse grained till overlying undulating bedrock within the lake basin. It is assumed that bedrock at the site comprises massive to slightly fractured, high strength, low permeability, intrusive granodioritic rocks. The bedrock contact is interpreted to range from at surface (0 mbgs) on higher slopes and up to 4 mbgs near the valley slope toes and base. For the purposes of design, a bedrock contact at approximately 2 mbgs is assumed. The surficial soils and bedrock at Site C3 are not expected to be suitable for reuse as construction materials for the dam, operations pads, roads, and site access point. Approximately 400 mm of topsoil and 200 mm of subsoil is assumed. Groundwater is assumed at approximately 1 mbgs on valley slopes and at surface along the lake basin.

Evaluation Criteria				Options							
Criteria	Sub-Criteria	Description	Weighting	Option 1: Site A		Option 2: Site B		Option 3: Site C3		Option 4: Site C4	
				Ranking	Comments	Ranking	Comments	Ranking	Comments	Ranking	Comments
Technical Feasibility	Terrain instability, geohazards, seismotectonic conditions[3]	Site characteristics including terrain instability, geohazards, seismotectonic conditions	5	2	The terrain stability classification (TSC) within the site was classed as II, indicating a very low likelihood of instability occurring as a result of forest harvesting. Within and surrounding Site A, instability in the form of shallow translational or rotational surficial soil landslides was observed to be generally active along the lower Chapman Creek valley slopes, the southwest aspect slope south of Site A, gully walls, and on localized steep areas. No evidence of avulsion (debris flows) was identified. Of significance at Site A, the westernmost portion of the southwest aspect slope immediately south of the site has a TSC of IV. Given its proximity to Site A, the terrain instability within this area has the potential to impact development at Site A and is considered a geohazard. No other areas within or surrounding Site A have been interpreted to pose a significant hazard to the site. The site is located in a high seismic hazard region and all structures included in the designs will need to be designed to accommodate a 1:10,000 return period earthquake. Based on the interpreted subsurface conditions, the site is interpreted to have a relatively low risk of liquefaction during a seismic event.	3	In general, the TSC within the site is II, indicating a very low likelihood of instability occurring as a result of forest harvesting. Within and surrounding Site B, the terrain is generally stable, with localized areas of slope instability along valley slopes and on localized steep areas. No evidence of previous slope movement was observed within or within the immediate proximity of Site B; however, slope instability was identified within the Chapman Creek valley, as well as within the Vashon Deposits overlying steep bedrock-controlled terrain to the east of Hudson Creek. No evidence of avulsion (debris flows) was identified. Topographic relief within the western portion of the site is bedrock-controlled and is stable. No areas within or surrounding Site B have been interpreted to pose a significant hazard to the site. The site is located in a high seismic hazard region and all structures included in the designs will need to be designed to accommodate a 1:10,000 return period earthquake. Based on the interpreted subsurface conditions, the site is interpreted to have a relatively low risk of liquefaction during a seismic event.	3	In general, the TSC within the site ranges from I to III. Topographic relief within the site is bedrock-controlled and not indicative of slope instability. Surficial soils are unconsolidated deposits that are saturated at lower elevations. where shallow slope instabilities were primarily observed. Given that soil thickness is thin, slope movement mechanisms are likely shallow slope creep and shallow debris slides and not large or deep-seated slope failures. No areas within or surrounding Site B have been interpreted to pose a significant hazard to the site. The site is located in a high seismic hazard region and all structures included in the designs will need to be designed to accommodate a 1:10,000 return period earthquake. Based on the interpreted subsurface conditions, the site is interpreted to have a relatively low risk of liquefaction during a seismic event.	3	In general, the TSC within the site ranges from I to III. Topographic relief within the site is bedrock-controlled and not indicative of slope instability. Surficial soils are unconsolidated deposits that are saturated at lower elevations. where shallow slope instabilities were primarily observed. Given that soil thickness is thin, slope movement mechanisms are likely shallow slope creep and shallow debris slides and not large or deep-seated slope failures. No areas within or surrounding Site B have been interpreted to pose a significant hazard to the site. The site is located in a high seismic hazard region and all structures included in the designs will need to be designed to accommodate a 1:10,000 return period earthquake. Based on the interpreted subsurface conditions, the site is interpreted to have a relatively low risk of liquefaction during a seismic event.
	Dam consequence of failure classification (preliminary)[4]	Preliminary dam consequence of failure classification based on the estimated loss or damage caused by a failure of a dam, and evaluates loss of life, injury, and general disruption of the lives of the population in the inundated area, environmental and cultural impacts, and damage to infrastructure and economic assets	3	2	Extreme (Class III) (based on an assumed sunny day failure scenario)	2	Extreme (Class III) (based on an assumed sunny day failure scenario)	2	Extreme (Class III) (based on an assumed sunny day failure scenario)	2	Extreme (Class III) (based on an assumed sunny day failure scenario)
Economics			**15**								
	Capital cost of reservoir site and supporting infrastructure	Class C Capital Cost Estimates (-15% / +30%) for reservoir sites, Class D Capital Cost Estimates (-30%/+50%) (for supporting infrastructure (e.g. access roads, water conveyance pipelines, intake)	7	2	Total installed cost (including contingency): **$49,096,000** Cost per m^3 of water storage: **$46.0**	2	Total installed cost (including contingency): **$53,120,000** Cost per m^3 of water storage: **$41.8**	5	Total installed cost (including contingency): **$16,415,000** Cost per m^3 of water storage: **$15.5**	5	Total installed cost (including contingency): **$12,812,000** Cost per m^3 of water storage: **$16.8**
	Lifecycle cost	Qualitative asset management cost	3	2	Reservoir and associated infrastructure, new site access road, fence, pumps, and water conveyance piping	3	Reservoir, new site access road, fence, pumps, additional water intake, and water conveyance piping. However, there is a potential benefit for this site associated with bypassing the existing pump station by having water gravity feed from the Chapman Creek WTP.	4	Reservoir, fence, upgraded access road, new site access road, gates, automation and controls system. Maintenance of control structure gates will require automation for overflow. Upkeep/restoration of creek downstream of dam and spillway will also require maintenance.	4	Reservoir, fence, upgraded access road, new site access road, gates, automation and controls system. Maintenance of control structure gates will require automation for overflow. Upkeep/restoration of creek downstream of dam and spillway will also require maintenance.
	Operating cost	Qualitative assessment of requirements for operations, maintenance, and surveillance	3	3	Operations assumed to be conducted mainly onsite. Maintenance of reservoir and other supporting site infrastructure, pumps, piping, road. Surveillance assumed to be comprised of visual monitoring in addition to instrumentation. Benefit of low elevation water supply that could be used for fire water.	4	Operations assumed to be conducted mainly onsite. Maintenance of reservoir and other supporting site infrastructure, pumps, piping, road, intake infrastructure. Surveillance assumed to be comprised of visual monitoring in addition to instrumentation. Benefit of low elevation water supply that could be used for fire water.	3	Operations assumed to be conducted using a combination of onsite and remote (automated) procedures (given the remote location). Maintenance of dam and other supporting site infrastructure, access road. Surveillance assumed to be comprised primarily of instrumentation, as well as visual monitoring as needed (not as frequent as for Sites A and B) The above requirements consider the greater distance for site access than for Sites A and B.	3	Operations assumed to be conducted using a combination of onsite and remote (automated) procedures (given the remote location). Maintenance of dam and other supporting site infrastructure, access road. Surveillance assumed to be comprised primarily of instrumentation, as well as visual monitoring as needed (not as frequent as for Sites A and B) The above requirements consider the greater distance for site access than for Sites A and B.
	Potential economic co-benefits (i.e. industry partnerships, hydroelectric potential)	Potential economic co-benefit opportunities (i.e. industry partnerships, hydroelectric potential, etc.)	2	4	Potential industry partnership opportunities, potential for hydroelectric power generation	5	Potential industry partnership opportunities, potential for hydroelectric power generation	1	None identified	1	None identified
Environmental Impacts			**52**								
	Species at risk (SAR) and species of concern (SOC)	Federal and provincial SAR and provincial SOC within a 10 km radius of site locations	10	2	**Federal Species at Risk (SAR):** Band-tailed pigeon - Special Concern Coastal tailed frog - Special Concern Northern goshawk (Laingi subspecies) - Threatened Northern red-legged frog - Special Concern Northern rubber boa - Special Concern Olive-sided flycatcher - Threatened **Provincial SAR:** Hutton's vireo - Red List Northern goshawk (Laingi subspecies) - Red List **Provincial Species of Concern:** Band-tailed pigeon (Blue List) Northern red-legged frog (Blue List) Olive-sided flycatcher (Blue List) Winter wren (Blue List)	2	**Federal SAR:** Band-tailed pigeon - Special Concern Coastal tailed frog - Special Concern Northern goshawk (Laingi subspecies) - Threatened Northern red-legged frog - Special Concern Northern rubber boa - Special Concern Olive-sided flycatcher - Threatened **Provincial SAR:** Hutton's vireo - Red List Northern goshawk (Laingi subspecies) - Red List **Provincial Species of Concern:** Band-tailed pigeon (Blue List) Northern red-legged frog (Blue List) Olive-sided flycatcher (Blue List) Winter wren (Blue List)	3	**Federal SAR:** Band-tailed pigeon - Special Concern Olive-sided flycatcher - Threatened **Provincial SAR:** None Identified **Provincial SOC:** Band-tailed pigeon (Blue List) Olive-sided flycatcher (Blue List) Winter wren (Blue List)	3	**Federal SAR:** Band-tailed pigeon - Special Concern Olive-sided flycatcher - Threatened **Provincial SAR:** None Identified **Provincial SOC:** Band-tailed pigeon (Blue List) Olive-sided flycatcher (Blue List) Winter wren (Blue List)

Evaluation Criteria				Options							
Criteria	Sub-Criteria	Description	Weighting	Option 1: Site A		Option 2: Site B		Option 3: Site C3		Option 4: Site C4	
				Ranking	Comments	Ranking	Comments	Ranking	Comments	Ranking	Comments
Environmental Impacts	Important habitat features	Special habitat zone, important habitats, and special access zones identified in area	10	2	**Special Habitat Zone:** Multiple areas of federally listed Critical Habitat for Marbled Murrelet within 10 km of site. Closest is within 500 m. **Important Habitats/Special Access Zones:** Sitka spruce / salmonberry Dry ecosystem - Red List (within 300 m)	2	**Special Habitat Zone:** Multiple areas of federally listed Critical Habitat for Marbled Murrelet within 10 km of site. Closest is within 200 m. **Important Habitats/Special Access Zones:** Sitka spruce / salmonberry Dry ecosystem - Red List (within 225 m)	3	**Special Habitat Zone:** Multiple areas of federally listed Critical Habitat for Marbled Murrelet within 10 km of site. Closest is approximately 110 m. **Important Habitats/Special Access Zones:** None identified	3	**Special Habitat Zone:** Multiple areas of federally listed Critical Habitat for Marbled Murrelet within 10 km of site. Closest is approximately 290 m. **Important Habitats/Special Access Zones:** None identified
	Wildlife presence and potential impact	Wildlife identified within 10 km radius of site locations and interpreted potential impact to wildlife	9	3	American robin, bald eagle, band-tailed pigeon, bobcat, black-headed grosbeak, black-throated gray warbler, brown-headed cowbird, Cassin's vireo, cedar waxwing, chestnut-backed chickadee, coastal tailed frog, common raven, dark-eyed junco, European starling, glaucous-winged gull, golden-crowned kinglet, hairy woodpecker, Hammond's flycatcher, harbour seal, Hutton's vireo, Johnson's hairstreak, MacGillivray's warbler, mule deer, northern alligator lizard, northern flicker, northern goshawk (Laingi subspecies), northern red-legged frog, northern rubber boa, northwestern crow, olive-sided flycatcher, orange-crowned warbler, pacific-slope flycatcher, pelagic cormorant, pine siskin, purple finch, red crossbill, red-breasted nuthatch, ruffed grouse, Rufous hummingbird, snow bramble, song sparrow, sooty grouse, spotted towhee, Steller's jay, Swainson's thrush, Townsend's warbler, turkey vulture, varied thrush, violet-green swallow, warbling vireo, western tanager, western wood-pewee, white-crowned sparrow, winter wren, yellow-rumped warbler Interpreted potential impact to wildlife is lower for this site than for Sites C3 and C4, based on the fact that human activity and disturbance (forestry) has taken place within and surrounding this site.	3	American robin, bald eagle, band-tailed pigeon, bobcat, black-headed grosbeak, black-throated gray warbler, brown-headed cowbird, Cassin's vireo, cedar waxwing, chestnut-backed chickadee, coastal tailed frog, common raven, dark-eyed junco, European starling, glaucous-winged gull, golden-crowned kinglet, hairy woodpecker, Hammond's flycatcher, harbour seal, Hutton's vireo, Johnson's hairstreak, MacGillivray's warbler, mule deer, northern alligator lizard, northern flicker, northern goshawk (Laingi subspecies), northern red-legged frog, northern rubber boa, northwestern crow, olive-sided flycatcher, orange-crowned warbler, pacific-slope flycatcher, pelagic cormorant, pine siskin, purple finch, red crossbill, red-breasted nuthatch, ruffed grouse, Rufous hummingbird, snow bramble, song sparrow, sooty grouse, spotted towhee, Steller's jay, Swainson's thrush, Townsend's warbler, turkey vulture, varied thrush, violet-green swallow, warbling vireo, western tanager, western wood-pewee, white-crowned sparrow, winter wren, yellow-rumped warbler Interpreted potential impact to wildlife is lower for this site than for Sites C3 and C4, based on the fact that human activity and disturbance (forestry) has taken place within and surrounding this site.	3	Species identified in desktop study include American robin, band-tailed pigeon, barred owl, black-headed grosbeak, black-throated gray warbler, brown-headed cowbird, Cassin's vireo, cedar waxwing, chestnut-backed chickadee, common raven, dark-eyed junco, golden-crowned kinglet, hairy woodpecker, Hammond's flycatcher, Johnson's hairstreak, MacGillivray's warbler, northern flicker, northwestern crow, olive-sided flycatcher, orange-crowned warbler, pacific-slope flycatcher, pine siskin, red-breasted nuthatch, ruffed grouse, Rufous hummingbird, spotted towhee, Steller's jay, Swainson's thrush, Townsend's warbler, varied thrush, violet-green swallow, warbling vireo, western tanager, white-crowned sparrow, willow flycatcher, Wilson's warbler, winter wren, yellow-rumped warbler Preliminary field identified species include elk (tracks, scat), bear (scat), pacific chorus frog (adults), northern red-legged frog (tadpole [potential]), northwestern salamanders (all life stages) Interpreted potential impact to wildlife is higher for this site than for Sites A and B, based on this site having had less impact and disturbance previously.	3	Species identified in desktop study include American robin, band-tailed pigeon, barred owl, black-headed grosbeak, black-throated gray warbler, brown-headed cowbird, Cassin's vireo, cedar waxwing, chestnut-backed chickadee, common raven, dark-eyed junco, golden-crowned kinglet, hairy woodpecker, Hammond's flycatcher, Johnson's hairstreak, MacGillivray's warbler, northern flicker, northwestern crow, olive-sided flycatcher, orange-crowned warbler, pacific-slope flycatcher, pine siskin, red-breasted nuthatch, ruffed grouse, Rufous hummingbird, spotted towhee, Steller's jay, Swainson's thrush, Townsend's warbler, varied thrush, violet-green swallow, warbling vireo, western tanager, white-crowned sparrow, willow flycatcher, Wilson's warbler, winter wren, yellow-rumped warbler Preliminary field identified species include elk (tracks, scat), bear (scat), pacific chorus frog (adults), northern red-legged frog (tadpole [potential]), northwestern salamanders (all life stages) Interpreted potential impact to wildlife is higher for this site than for Sites A and B, based on this site having had less impact and disturbance previously.
	Fish presence	Fish identified in water bodies downslope of reservoir site	4	3	Based on desktop review, no documented fish presence within the site boundary, as there appears to be no waterbody within the site boundary. However, waterbodies were identified to both the west (approximately 750 m) and east (approximately 325 m) of the site boundary. These waterbodies, including upstream and downstream extents have the documented presence of brook trout, chinook salmon, chum salmon, coho salmon, cutthroat trout, dolly varden, lamprey, pink salmon, rainbow trout, and sculpin.	3	Based on desktop review, no documented fish presence within the site boundary, as there appears to be no waterbody within the site boundary. However, waterbodies were identified to both the north (approximately 380 m) and southeast (approximately 280 m) of the site boundary. These waterbodies, including upstream and downstream extents have the documented presence of brook trout, chinook salmon, chum salmon, coho salmon, cutthroat trout, dolly varden, lamprey, pink salmon, rainbow trout, and sculpin.	2	Based on desktop review, no documented fish presence within the existing natural waterbody, located within the site boundary. This may be due to a lack of fishing effort on this waterbody. However, various species were identified within downstream waterbodies that provide surface flow to Chapman Creek, including brook trout, chinook salmon, chum salmon, coho salmon, cutthroat trout, dolly varden, pink salmon, rainbow trout. Migratory species are unlikely to be present in the existing waterbody (due to potential fish barriers), however, resident sportfish may be present and would require a fish survey to further investigate. At time of preliminary aquatics investigation, no fish were documented or observed. However, given that lakes were interpreted to be suitable fish habitat, further investigation will be required.	2	Based on desktop review, no documented fish presence within the existing natural waterbody, located within the site boundary. This may be due to a lack of fishing effort on this waterbody. However, various species were identified within downstream waterbodies that provide surface flow to Chapman Creek, including brook trout, chinook salmon, chum salmon, coho salmon, cutthroat trout, dolly varden, pink salmon, rainbow trout. Migratory species are unlikely to be present in the existing waterbody (due to potential fish barriers), however, resident sportfish may be present and would require a fish survey to further investigate At time of preliminary aquatics investigation, no fish were documented or observed. However, given that lakes were interpreted to be suitable fish habitat, further investigation will be required.
	Wetlands and surface water	Wetlands identified within footprint and proximity to mapped wetlands and proximity to surface water	10	4	No mapped wetlands identified within site area. Site is located 2.2 km from a mapped wetland. Hudson Creek (325 m east of site boundary) Chapman Creek (725 m west of site boundary)	4	No mapped wetlands identified within site area. Site is 1.8 km from a mapped wetland. Hudson Creek (280 m southeast of site boundary) Chapman Creek (380 m north of site boundary)	1	Based on desktop review, no mapped wetlands identified within site area. Site is 2.6 km from a mapped wetland. Based on preliminary field observations, wetlands are prevalent along and above the lake shoreline. Site is located on a natural unnamed lake. Chapman Creek (650 m east of site boundary). Multiple smaller waterbodies, including tributaries within 500 m. Downstream environmental impacts (i.e. erosion and sedimentation) on the creeks downstream of Site C3 (Tsawcome Creek, Chapman Creek) will need to be considered based on expected low and high flow conditions.	1	Based on desktop review, no mapped wetlands identified within site area. Site is 1.7 km from a mapped wetland. Based on preliminary field observations, wetlands are prevalent along and above the lake shoreline. Located on a natural unnamed lake. Chapman Creek (800 m east of site boundary). Multiple smaller waterbodies, including tributaries within 500 m. Unnamed lake (640 m north of site boundary). Downstream environmental impacts (i.e. erosion and sedimentation) on the creeks downstream of Site C4 (unnamed creek between Sites C3 and C4, Tsawcome Creek, Chapman Creek) will need to be considered based on expected low and high flow conditions.
	Water quality for Chapman Water System	Potential for improved raw water quality	9	4	Water stored in reservoir is protected from large rain events or landslides that cause poor water quality in Chapman Creek.	5	Water stored in reservoir is protected from large rain events or landslides that cause poor water quality in Chapman Creek. Intake installed upstream of development will likely provide higher quality of raw water.	3	No improvement over existing water quality.	3	No improvement over existing water quality.

Evaluation Criteria				Options							
Criteria	Sub-Criteria	Description	Weighting	Option 1: Site A		Option 2: Site B		Option 3: Site C3		Option 4: Site C4	
				Ranking	Comments	Ranking	Comments	Ranking	Comments	Ranking	Comments
Regulatory and Stakeholder Sensitivity			7								
	Regulatory requirements	Identified permits and authorizations required at this stage of project definition	5	3	**Identified permits/authorizations**: Development permit, Geotechnical development permit, Water license (Section 9), Licensing under BC Dam Safety Regulation, License of Occupation (Section 39), Conduct of non-farm use with the ALR, Vancouver Coastal Health notification, License to Cut, Environmental Assessment Certificate, Waterworks Construction Permit, Operating Permit, Fisheries and Oceans Canada request for review **Potential**: approval under the Canadian Environmental Assessment Act, Building permit, new drinking water source assessment, approval under the Navigation Protection Act, approval by Transport Canada, approval by NAV Canada, approval under Section 10 of the Water Sustainability Act	3	**Identified permits/authorizations**: Development permit, Geotechnical development permit, Water license (Section 9), Licensing under BC Dam Safety Regulation, License of Occupation (Section 39), Conduct of non-farm use with the ALR, Vancouver Coastal Health notification, License to Cut, Environmental Assessment Certificate, Waterworks Construction Permit, Operating Permit, Fisheries and Oceans Canada request for review, Riparian Development Permit **Potential**: approval under the Canadian Environmental Assessment Act, Building permit, new drinking water source assessment, approval under the Navigation Protection Act, approval by Transport Canada, approval by NAV Canada, approval under Section 10 of the Water Sustainability Act	1	**Identified permits/authorizations**: Geotechnical development permit, Water license (Section 9), Licensing under BC Dam Safety Regulation, License of Occupation (Section 39), Vancouver Coastal Health notification, License to Cut, Environmental Assessment Certificate, Waterworks Construction Permit, Operating Permit, Fisheries and Oceans Canada request for review, Riparian Development Permit **Potential**: Fisheries and Oceans Canada authorization, approval under the Canadian Environmental Assessment Act, Building permit, new drinking water source assessment, approval under the Navigation Protection Act, approval by Transport Canada, approval by NAV Canada, approval under Section 10 of the Water Sustainability Act	1	**Identified permits/authorizations**: Geotechnical development permit, Water license (Section 9), Licensing under BC Dam Safety Regulation, License of Occupation (Section 39), Vancouver Coastal Health notification, License to Cut, Environmental Assessment Certificate, Waterworks Construction Permit, Operating Permit, Fisheries and Oceans Canada request for review, Riparian Development Permit **Potential**: Fisheries and Oceans Canada authorization, approval under the Canadian Environmental Assessment Act, Building permit, new drinking water source assessment, approval under the Navigation Protection Act, approval by Transport Canada, approval by NAV Canada, approval under Section 10 of the Water Sustainability Act
	Key potential regulatory challenges	Identification of regulatory requirements that may pose significant challenges	2	3	No significant challenges identified	3	Licence to Cut (under the Forest Act)	1	Licence to Cut (under the Forest Act), Fisheries and Oceans Canada authorization, Environmental Assessment Certificate	1	Licence to Cut (LTC) (under the Forest Act), Fisheries and Oceans Canada authorization, Environmental Assessment Certificate
	General community favourability	Interpreted expected support from community stakeholders	1	4	Site is located in area previously heavily impacted by forestry	4	Site is located in area previously heavily impacted by forestry	2	Site is located in largely unimpacted area, and located near Tetrahedron Park	2	Site is located in largely unimpacted area, and located near Tetrahedron Park
Total Score			**100**	**70**		**78**		**71**		**68**	
Unweighted Ranking				**3**		**1**		**2**		**4**	
Total Weighted Score				**281**		**310**		**278**		**271**	
Weighted Ranking				**2**		**1**		**3**		**4**	

NOTES:

1. Suitability of onsite materials for use as fill material is based on desktop review of regional-scale geological maps and one-day site reconnaissance only. An intrusive geotechnical investigation is recommended to be completed at the site locations during future design stages to confirm material suitability, and is not included in this scope of work.
2. Bedrock depths should be confirmed during an intrusive geotechnical investigation during future design stages (not included in the currently scope of work).
3. Identified potential geohazards are based on desktop review of available information and one-day site reconnaissance only. A detailed visual geohazards site assessment and intrusive geotechnical investigation are recommended to be completed at the site locations during future design stages, and are not included in this scope of work.
4. Preliminary dam consequence of failure classification is intended as high level only and is based on the conceptual design. Analyses to fully evaluate is required, and is outside of the scope of work for this project.
5. MCA criteria and site option descriptions are based on design criteria and assumptions included in the Phase 3 Design Summary Report (VP19-SCR-01-00-RPT-CI-DesignSummary_Rev1) and Phase 3 Rev B drawings (VP19-SCR-01-00-DWG-CI-100-104, VP19-SCR-01-00-DWG-CI-200-204, VP19-SCR-01-00-DWG-CI-300-305, VP19-SCR-01-00-DWG-CI-400-405))
6. Criteria weightings for the base case and sensitivity analysis cases, as well as site option rankings, were initially developed in Phase 2 (refer to Phase 2 Feasibility Study Report - VP18-SCR-01-00-RPT-CI-Feasibility_Study-Rev0). Criteria weightings and site option rankings were refined during Phase 3.
7. Sources of input data include:
   - Phase 2 Detailed Desktop Study Report (VP18-SCR-01-00-RPT-CI-Desktop_Study_Rev0)
   - Phase 2 Feasibility Study Report (VP18-SCR-01-00-RPT-CI-Feasibility_Study-Rev0)
   - Terrain Assessment Report (VP19-SCR-01-00-RPT-CI-Terrain_Assessment_Rev0)
   - Preliminary Aquatics Assessment Report (VP19-SCR-01-00-RPT-WR-Aquatic_Assessments-Rev0)
   - Regulatory Roadmap (VP19-SCR-01-00-TAB-RG-Roadmap_Rev2)
   - Site B POD Assessment (VP19-SCR-01-00-RPT-WR-ChapmanCreek_Intake_Eval-Rev0)
   - Environmental Scoping Assessment (VP19-SCR-01-00-RPT-EN-Env_Scoping_Rev1)
   - Consequence of Failure Classification Reports (VP19-SCR-01-00-RPT-CI-Conseq_Fail_Class_SiteA-Rev0, VP19-SCR-01-00-RPT-CI-Conseq_Fail_Class_SiteB-Rev0, VP19-SCR-01-00-RPT-CI-Conseq_Fail_Class_SiteC3-Rev0, VP19-SCR-01-00-RPT-CI-Conseq_Fail_Class_SiteC4-Rev0)
   - Phase 3 Design Summary Report (VP19-SCR-01-00-RPT-CI-DesignSummary_Rev1)
   - Phase 3 Rev B Conceptual Drawings (VP19-SCR-01-00-DWG-CI-100-104, VP19-SCR-01-00-DWG-CI-200-204, VP19-SCR-01-00-DWG-CI-300-305, VP19-SCR-01-00-DWG-CI-400-405)
   - Phase 3 Cost Estimates and Basis of Estimate (VP19-SCR-01-00-EST-CI-BOE_Phase 3_Rev1)

Table 6 - Multi-Criteria Analysis Matrix: Regulatory and Stakeholder Focused Case

Project Name: Raw Water Reservoir Feasibility Study
Client Name: Sunshine Coast Regional District
Project Manager: AJ MacDonald

Project Number: VP19-SCR-01-00
Date: November 14, 2019
Rev #: 1

Weighting Sensitivity Case Regulatory and Stakeholder Focused Case

Ranking System (Qualitative)

Significant Disadvantage	1
Moderate Disadvantage	2
Null	3
Moderate Advantage	4
Significant Advantage	5

Evaluation Criteria				Options							
Criteria	Sub-Criteria	Description	Weighting	Option 1: Site A		Option 2: Site B		Option 3: Site C3		Option 4: Site C4	
				Ranking	Comments	Ranking	Comments	Ranking	Comments	Ranking	Comments
Technical Feasibility			25								
	Total operational storage volume (m^3)	Total operational storage volume in the reservoir, assuming 2 m freeboard (between maximum water level and dam crest elevation)	3	4	1,066,400	5	1,270,000	4	1,056,700 (excluding volume of existing water body at site) Based on hydrogeological modelling, 90% annual exceedance flow is approximately 3,900,000	2	764,500 (excluding volume of existing water body at site) Based on hydrogeological modelling, 90% annual exceedance flow is approximately 970,000
	Scalability	Ability to expand to achieve larger storage capacity, while maintaining maximum dam height, H, and maximum reservoir volume, V, such that $H^2 \times \sqrt{V} < 200$, where H is measured as the difference in elevation between the minimum water level elevation (reservoir base) and the maximum dam crest elevation, so as not to trigger the dam height thresholds for 'large dams' as defined by the International Commission on Large Dams (ICOLD)	2	2	No potential for lateral or vertical expansion without breaching thresholds for 'large dams' as defined by ICOLD. Notwithstanding the ICOLD thresholds, there is limited potential for lateral expansion to the east (constrained by Hudson Creek and the existing, unnamed road east of the site). No expansion potential to the south (due to the steep terrain and potential terrain instability), north (Fortis gas pipeline), or west (road and Chapman Creek). Limited lateral expansion potential given ICOLD thresholds for 'large dams'. Limited potential to increase reservoir volume by raising the dam height, given the steeply sloping terrain.	4	No potential for lateral or vertical expansion without breaching thresholds for 'large dams' as defined by ICOLD. Notwithstanding the ICOLD thresholds, there is potential to increase reservoir volume by expanding laterally to the west. In this case, expansion would encroach on Sunshine Coast Rod and Gun Club (SCRGC) range. There is also potential to expand the reservoir by increasing the dam height.	2	No potential for lateral or vertical expansion without breaching thresholds for 'large dams' as defined by ICOLD. Notwithstanding the ICOLD thresholds, there is limited potential for lateral expansion given terrain constraints. There is potential to increase reservoir volume by increasing the dam height.	2	No potential for lateral or vertical expansion without breaching thresholds for 'large dams' as defined by ICOLD. Notwithstanding the ICOLD thresholds, there is limited potential for lateral expansion given terrain constraints. There is potential to increase reservoir volume by increasing the dam height.
	Total site area and approximate clearing and grubbing area (ha)	Total area to be developed (approximate area of reservoir with allowance for material stockpiles, operational area, etc.), approximate area required to be cleared and grubbed	1	2	Total site area: 47.4 Clearing and grubbing: 47.4	2	Total site area: 45.2 Clearing and grubbing: 45.2	4	Total site area: 23.3 Clearing and grubbing (approximate): 2 (excluding clearing and grubbing required for access road)	4	Total site area: 26.6 Clearing and grubbing (approximate): 2 (excluding clearing and grubbing required for access road)
	Overburden excavation, bedrock excavation, earthworks fill volume, excess excavation stockpile volume, topsoil and subsoil stripping volumes (m^3)	Approximate earthworks quantities based on conceptual designs, including overburden excavation volume, bedrock excavation volume, and fill volumes required at the site to achieve the storage volume, and topsoil and subsoil stripping volumes	3	2	Overburden excavation: 883,200 Bedrock excavation: 271,300 Embankment, access road, and operations pad fill: 966,000 Bedrock to stockpile: 188,500 Topsoil stripping (assumed 100 mm thick): 43,300 Subsoil stripping (assumed 100 mm thick): 39,900 *Stockpiling bedrock only, all overburden is utilized as fill material	2	Overburden excavation: 725,293 Bedrock excavation: 267,418 Embankment, access road, and operations pad fill: 736,243 Bedrock to stockpile: 256,468 Topsoil stripping (assumed 100 mm thick): 36,780 Subsoil stripping (assumed 100 mm thick): 39,970 *Stockpiling bedrock only, all overburden is utilized as fill material	5	Overburden excavation: 15,174 Bedrock excavation: N/A Fill: 3,034 Overburden stockpile(s): 12,140 Topsoil stripping (assumed 100 mm thick): 3,231 Subsoil stripping (assumed 100 mm thick): 1,615	5	Overburden excavation: 9,322 Bedrock excavation: N/A Fill: 3,034 Overburden stockpile(s): 6,288 Topsoil stripping (assumed 100 mm thick): 3,087 Subsoil stripping (assumed 100 mm thick): 1,543
	Offsite construction material required (m^3)[1]	Requirement for offsite construction material (if onsite material is not suitable or sufficient in volume)	2	2	Yes, concrete will be required. Embankment dam will be constructed of onsite, excavated materials including both overburden and processed bedrock, and a concrete membrane will be used to create an impervious barrier on the upstream face of the embankment dam. Concrete volume required for the membrane is greater than the concrete volume required for dams at Sites C3 and C4.	2	Yes, concrete will be required. Embankment dam will be constructed of onsite, excavated materials including both overburden and processed bedrock, and a concrete membrane will be used to create an impervious barrier on the upstream face of the embankment dam. Concrete volume required for the membrane is greater than the concrete volume required for dams at Sites C3 and C4.	3	Yes, concrete will be required. A concrete gravity dam will be constructed. Concrete volume required for the dam is less than the volume required for the concrete membranes at Sites A and B.	3	Yes, concrete will be required. A concrete gravity dam will be constructed. Concrete volume required for the dam is less than the volume required for the concrete membranes at Sites A and B.
	Site access	Site proximity to existing road, length of new access road required to connect the site to an existing road, length of existing road that is likely to require upgrading prior to construction (if applicable)	2	5	Site is located within close proximity of the Sechelt-Airport FSR to the west. This road may require upgrades (approximate length is 3,500 m), however this is unlikely due to the road being currently well travelled by logging trucks and other heavy equipment. A 120 m long new access road would be required to access the site from the Sechelt-Airport Forestry Service Road (FSR).	5	Site is located within close proximity of the Sechelt-Airport FSR to the west. This road may require upgrades (approximate length is 4,500 m), however this is unlikely due to the road being currently well travelled by logging trucks and other heavy equipment. A 150 m long new access road would be required to access the site from the Sechelt-Airport FSR.	1	Site is located approximately 1 km from an existing, decommissioned road to the northwest (Option 1), and approximately 5 km from an unnamed decommissioned road to the southwest (Option 2). The existing roads would require upgrades, and new access roads would be required to gain direct access to the site from either option. Access Road Option 1: approximately 9 km of existing, decommissioned road (accessed via Grey Creek Road) and approximately 1 km of new access road Access Road Option 2: approximately 14 km of existing, decommissioned road (accessed via Grey Creek Road) and approximately 5 km of new access road	1	Site is located approximately 1 km from an existing, decommissioned road to the northwest (Option 1), and approximately 5 km from an unnamed decommissioned road to the southwest (Option 2). The existing roads would require upgrades, and new access roads would be required to gain direct access to the site from either option. Access Road Option 1: approximately 9 km of existing, decommissioned road (accessed via Grey Creek Road) and approximately 1 km of new access road Access Road Option 2: approximately 14 km of existing, decommissioned road (accessed via Grey Creek Road) and approximately 5 km of new access road

Evaluation Criteria				Options							
Criteria	Sub-Criteria	Description	Weighting	Option 1: Site A		Option 2: Site B		Option 3: Site C3		Option 4: Site C4	
				Ranking	Comments	Ranking	Comments	Ranking	Comments	Ranking	Comments
Technical Feasibility	Proximity to third party infrastructure	Site proximity to and spatial constraints posed by third party infrastructure and dispositions (e.g. utility and road rights-of-way (ROWs), land tenures, private land ownership, etc.)	1	2	A Fortis BC ROW is located immediately north of the site boundary. A BC Hydro ROW is located approximately 500 m south of the site boundary. No ROW crossings would be required to access the site off of the Sechelt-Airport FSR. The water conveyance pipeline to and from reservoir will be required to cross the Fortis BC ROW.	2	A Fortis BC ROW is located immediately south of the site boundary. No ROW crossings would be required to access the site off of the Sechelt-Airport FSR. No ROW crossings would be required for the water conveyance pipelines to and from the site. The SCRGC access road is located immediately north of the site boundary, and the SCRGC facility is located immediately east of the site boundary. The SCRGC also holds a land tenure that spans a portion of the site area.	4	No pipeline crossings would be required to access the site from existing roads. Existing access road to be evaluated for potential crossings required during recommissioning.	4	No pipeline crossings would be required to access the site from existing roads. Existing access road to be evaluated for potential crossings required during recommissioning.
	Water conveyance method from source to reservoir site	Infrastructure (existing and new) required to transport water from the source to the reservoir	1	2	The existing Chapman intake and raw water pipeline will be utilized to convey water to the site. Incoming water will be conveyed to the site from an assumed tie-point on the existing Chapman raw water pipeline at approximately El. 155 m via an approximately 1,700 m long HDPE pipe (bidirectional pipe that also conveys water from the reservoir back to the tie-point). Pumps will be required to convey water from the tie-point to the site.	2	A new intake on Chapman Creek and a new water conveyance pipeline will be used to convey water from Chapman Creek to the site. Incoming water will be conveyed to the reservoir from a new water intake at approximately El. 300 m, via an approximately 3900 m long HDPE pipeline. The water will gravity flow from the intake to the reservoir (no pumps required).	4	No infrastructure required (conveyance via overland surface water capture) Based on results from Hydrological Study, there is potential for substantially more water to be captured than can be held by reservoir.	4	No infrastructure required (conveyance via overland surface water capture) Based on results from Hydrological Study, there is potential for there to not be enough overland flow to fill reservoir.
	Conveyance method from reservoir site to Chapman Creek WTP	Infrastructure (existing and new) required to transport water from the reservoir to the Chapman Creek WTP	1	2	The existing Chapman raw water pipeline will be utilized to convey water from the reservoir to the Chapman Creek WTP. Outflowing water will be conveyed from the site to an assumed tie-point on the existing Chapman raw water pipeline at approximately El. 155 m via an approximately 1,700 m long HDPE pipe (bidirectional pipe that also conveys water to the site from the tie-point). From the tie-point, water will be conveyed to the Chapman Creek WTP via the existing Chapman raw water pipeline. Pumps will be required to convey water from the site to the tie-point.	3	The existing Chapman raw water pipeline will be utilized to convey water from the reservoir to the Chapman Creek WTP. Outgoing water will be conveyed to an assumed tie-point on the existing Chapman raw water pipeline at approximately El. 155 m via an approximately 500 m long HDPE pipe. Pumps will be required to convey water out of the reservoir at the site, from where it will gravity flow to the tie-point.	4	Water would be conveyed to Chapman Creek via Tsawcome Creek. Water would then be conveyed from Chapman Creek to the Chapman Creek WTP via the existing Chapman intake and raw water pipeline. If water will be conveyed overland from reservoir to Chapman Creek, there is potential to lose water due to evaporation and infiltration. Release of water will likely require rehabilitation and erosion control along Tsawcome Creek.	3	Water would be conveyed to Chapman Creek via an unnamed creek that flows between Sites C3 and C4, through the Site C3 lake basin, and Tsawcome Creek. Water would then be conveyed from Chapman Creek to the Chapman Creek WTP via the existing Chapman intake and raw water pipeline. If water will be conveyed overland from reservoir to Chapman Creek, there is potential to lose water due to evaporation and infiltration. Release of water from Site C4 will need to provide enough flow to overflow natural basin at Site C3 before flowing to Tsawcome Creek. Release of water will likely require rehabilitation and erosion control along the unnamed creek between Sites C3 and C4, and along Tsawcome Creek.
	Subsurface conditions[1,2]	Characteristics and estimated thickness of surficial deposits, depth to bedrock, potential for use of surficial soils as construction materials, estimated groundwater depth)	1	4	Surficial soils across the site are interpreted to comprise a thin layer of coarse-grained marine sediment deposits (sand, gravel, and cobbles, with variable amounts of silt) overlying discontinuous coarse grained Morainal deposits (sand with variable amounts of gravel and silt), overlying bedrock. It is assumed that bedrock at the site comprises massive to slightly fractured, high strength, low permeability, intrusive granodioritic rocks. The bedrock contact is interpreted to range from 2 mbgs to 10 mbgs and is interpreted to be undulating. For the purposes of design, bedrock depth is assumed to range from 2 mbgs at the north end of the site to 5 mbgs at the south end of the site. The surficial soils and bedrock are expected to be suitable for reuse as construction materials for the embankment dam, operations pads, roads, and site access point, provided that the required processing is conducted to provide granular material suitable for construction of the site infrastructure. Approximately 100 mm of topsoil and 100 mm of subsoil is assumed. Groundwater is assumed at approximately 1 mbgs.	3	Surficial soils across the site are interpreted to comprise a thin layer of coarse-grained marine sediment deposits (sand, gravel, and cobbles, with variable amounts of silt) overlying discontinuous coarse grained Morainal deposits (sand with variable amounts of gravel and silt), overlying bedrock. It is assumed that bedrock at the site comprises massive to slightly fractured, high strength, low permeability, intrusive granodioritic rocks. The bedrock contact is interpreted to range from 1 mbgs to 5 mbgs and is interpreted to be undulating. For the purposes of design, bedrock depth is assumed at 3 mbgs. The surficial soils and bedrock are expected to be suitable for reuse as construction materials for the embankment dam, operations pads, roads, and site access point, provided that the required processing is conducted to provide granular material suitable for construction of the site infrastructure. Approximately 100 mm of topsoil and 100 mm of subsoil is assumed. Groundwater is assumed at approximately 1 mbgs.	3	Surficial soils across the site are interpreted to comprise a veneer (0 m to 1 m thick) of colluvium (sands and gravels with variable amounts of silt) overlying bedrock on steep bedrock-controlled slopes, and veneers to blankets (1 m to 3 m thick) of coarse grained till overlying undulating bedrock within the lake basin. It is assumed that bedrock at the site comprises massive to slightly fractured, high strength, low permeability, intrusive granodioritic rocks. The bedrock contact is interpreted to range from at surface (0 mbgs) on higher slopes and up to 4 mbgs near the valley slope toes and base. For the purposes of design, a bedrock contact at approximately 2 mbgs is assumed. The surficial soils and bedrock at Site C3 are not expected to be suitable for reuse as construction materials for the dam, operations pads, roads, and site access point. Approximately 400 mm of topsoil and 200 mm of subsoil is assumed. Groundwater is assumed at approximately 1 mbgs on valley slopes and at surface along the lake basin.	3	Surficial soils across the site are interpreted to comprise a veneer (0 m to 1 m thick) of colluvium (sands and gravels with variable amounts of silt) overlying bedrock on steep bedrock-controlled slopes, and veneers to blankets (1 m to 3 m thick) of coarse grained till overlying undulating bedrock within the lake basin. It is assumed that bedrock at the site comprises massive to slightly fractured, high strength, low permeability, intrusive granodioritic rocks. The bedrock contact is interpreted to range from at surface (0 mbgs) on higher slopes and up to 4 mbgs near the valley slope toes and base. For the purposes of design, a bedrock contact at approximately 2 mbgs is assumed. The surficial soils and bedrock at Site C3 are not expected to be suitable for reuse as construction materials for the dam, operations pads, roads, and site access point. Approximately 400 mm of topsoil and 200 mm of subsoil is assumed. Groundwater is assumed at approximately 1 mbgs on valley slopes and at surface along the lake basin.

Evaluation Criteria				Options							
Criteria	Sub-Criteria	Description	Weighting	Option 1: Site A		Option 2: Site B		Option 3: Site C3		Option 4: Site C4	
				Ranking	Comments	Ranking	Comments	Ranking	Comments	Ranking	Comments
Technical Feasibility	Terrain instability, geohazards, seismotectonic conditions[3]	Site characteristics including terrain instability, geohazards, seismotectonic conditions	5	2	The terrain stability classification (TSC) within the site was classed as II, indicating a very low likelihood of instability occurring as a result of forest harvesting. Within and surrounding Site A, instability in the form of shallow translational or rotational surficial soil landslides was observed to be generally active along the lower Chapman Creek valley slopes, the southwest aspect slope south of Site A, gully walls, and on localized steep areas. No evidence of avulsion (debris flows) was identified. Of significance at Site A, the westernmost portion of the southwest aspect slope immediately south of the site has a TSC of IV. Given its proximity to Site A, the terrain instability within this area has the potential to impact development at Site A and is considered a geohazard. No other areas within or surrounding Site A have been interpreted to pose a significant hazard to the site. The site is located in a high seismic hazard region and all structures included in the designs will need to be designed to accommodate a 1:10,000 return period earthquake. Based on the interpreted subsurface conditions, the site is interpreted to have a relatively low risk of liquefaction during a seismic event.	3	In general, the TSC within the site is II, indicating a very low likelihood of instability occurring as a result of forest harvesting. Within and surrounding Site B, the terrain is generally stable, with localized areas of slope instability along valley slopes and on localized steep areas. No evidence of previous slope movement was observed within or within the immediate proximity of Site B; however, slope instability was identified within the Chapman Creek valley, as well as within the Vashon Deposits overlying steep bedrock-controlled terrain to the east of Hudson Creek. No evidence of avulsion (debris flows) was identified. Topographic relief within the western portion of the site is bedrock-controlled and is stable. No areas within or surrounding Site B have been interpreted to pose a significant hazard to the site. The site is located in a high seismic hazard region and all structures included in the designs will need to be designed to accommodate a 1:10,000 return period earthquake. Based on the interpreted subsurface conditions, the site is interpreted to have a relatively low risk of liquefaction during a seismic event.	3	In general, the TSC within the site ranges from I to III. Topographic relief within the site is bedrock-controlled and not indicative of slope instability. Surficial soils are unconsolidated deposits that are saturated at lower elevations. where shallow slope instabilities were primarily observed. Given that soil thickness is thin, slope movement mechanisms are likely shallow slope creep and shallow debris slides and not large or deep-seated slope failures. No areas within or surrounding Site B have been interpreted to pose a significant hazard to the site. The site is located in a high seismic hazard region and all structures included in the designs will need to be designed to accommodate a 1:10,000 return period earthquake. Based on the interpreted subsurface conditions, the site is interpreted to have a relatively low risk of liquefaction during a seismic event.	3	In general, the TSC within the site ranges from I to III. Topographic relief within the site is bedrock-controlled and not indicative of slope instability. Surficial soils are unconsolidated deposits that are saturated at lower elevations. where shallow slope instabilities were primarily observed. Given that soil thickness is thin, slope movement mechanisms are likely shallow slope creep and shallow debris slides and not large or deep-seated slope failures. No areas within or surrounding Site B have been interpreted to pose a significant hazard to the site. The site is located in a high seismic hazard region and all structures included in the designs will need to be designed to accommodate a 1:10,000 return period earthquake. Based on the interpreted subsurface conditions, the site is interpreted to have a relatively low risk of liquefaction during a seismic event.
	Dam consequence of failure classification (preliminary)[4]	Preliminary dam consequence of failure classification based on the estimated loss or damage caused by a failure of a dam, and evaluates loss of life, injury, and general disruption of the lives of the population in the inundated area, environmental and cultural impacts, and damage to infrastructure and economic assets	3	2	Extreme (Class III) (based on an assumed sunny day failure scenario)	2	Extreme (Class III) (based on an assumed sunny day failure scenario)	2	Extreme (Class III) (based on an assumed sunny day failure scenario)	2	Extreme (Class III) (based on an assumed sunny day failure scenario)
Economics			**15**								
	Capital cost of reservoir site and supporting infrastructure	Class C Capital Cost Estimates (-15% / +30%) for reservoir sites, Class D Capital Cost Estimates (-30%/+50%) (for supporting infrastructure (e.g. access roads, water conveyance pipelines, intake)	7	2	Total installed cost (including contingency): **$49,096,000** Cost per m^3 of water storage: **$46.0**	2	Total installed cost (including contingency): **$53,120,000** Cost per m^3 of water storage: **$41.8**	5	Total installed cost (including contingency): **$16,415,000** Cost per m^3 of water storage: **$15.5**	5	Total installed cost (including contingency): **$12,812,000** Cost per m^3 of water storage: **$16.8**
	Lifecycle cost	Qualitative asset management cost	3	2	Reservoir and associated infrastructure, new site access road, fence, pumps, and water conveyance piping	3	Reservoir, new site access road, fence, pumps, additional water intake, and water conveyance piping. However, there is a potential benefit for this site associated with bypassing the existing pump station by having water gravity feed from the Chapman Creek WTP.	4	Reservoir, fence, upgraded access road, new site access road, gates, automation and controls system. Maintenance of control structure gates will require automation for overflow. Upkeep/restoration of creek downstream of dam and spillway will also require maintenance.	4	Reservoir, fence, upgraded access road, new site access road, gates, automation and controls system. Maintenance of control structure gates will require automation for overflow. Upkeep/restoration of creek downstream of dam and spillway will also require maintenance.
	Operating cost	Qualitative assessment of requirements for operations, maintenance, and surveillance	3	3	Operations assumed to be conducted mainly onsite. Maintenance of reservoir and other supporting site infrastructure, pumps, piping, road. Surveillance assumed to be comprised of visual monitoring in addition to instrumentation. Benefit of low elevation water supply that could be used for fire water.	4	Operations assumed to be conducted mainly onsite. Maintenance of reservoir and other supporting site infrastructure, pumps, piping, road, intake infrastructure. Surveillance assumed to be comprised of visual monitoring in addition to instrumentation. Benefit of low elevation water supply that could be used for fire water.	3	Operations assumed to be conducted using a combination of onsite and remote (automated) procedures (given the remote location). Maintenance of dam and other supporting site infrastructure, access road. Surveillance assumed to be comprised primarily of instrumentation, as well as visual monitoring as needed (not as frequent as for Sites A and B) The above requirements consider the greater distance for site access than for Sites A and B.	3	Operations assumed to be conducted using a combination of onsite and remote (automated) procedures (given the remote location). Maintenance of dam and other supporting site infrastructure, access road. Surveillance assumed to be comprised primarily of instrumentation, as well as visual monitoring as needed (not as frequent as for Sites A and B) The above requirements consider the greater distance for site access than for Sites A and B.
	Potential economic co-benefits (i.e. industry partnerships, hydroelectric potential)	Potential economic co-benefit opportunities (i.e. industry partnerships, hydroelectric potential, etc.)	2	4	Potential industry partnership opportunities, potential for hydroelectric power generation	5	Potential industry partnership opportunities, potential for hydroelectric power generation	1	None identified	1	None identified
Environmental Impacts			**11**								
	Species at risk (SAR) and species of concern (SOC)	Federal and provincial SAR and provincial SOC within a 10 km radius of site locations	3	2	**Federal Species at Risk (SAR):** Band-tailed pigeon - Special Concern Coastal tailed frog - Special Concern Northern goshawk (Laingi subspecies) - Threatened Northern red-legged frog - Special Concern Northern rubber boa - Special Concern Olive-sided flycatcher - Threatened **Provincial SAR:** Hutton's vireo - Red List Northern goshawk (Laingi subspecies) - Red List **Provincial Species of Concern:** Band-tailed pigeon (Blue List) Northern red-legged frog (Blue List) Olive-sided flycatcher (Blue List) Winter wren (Blue List)	2	**Federal SAR:** Band-tailed pigeon - Special Concern Coastal tailed frog - Special Concern Northern goshawk (Laingi subspecies) - Threatened Northern red-legged frog - Special Concern Northern rubber boa - Special Concern Olive-sided flycatcher - Threatened **Provincial SAR:** Hutton's vireo - Red List Northern goshawk (Laingi subspecies) - Red List **Provincial Species of Concern:** Band-tailed pigeon (Blue List) Northern red-legged frog (Blue List) Olive-sided flycatcher (Blue List) Winter wren (Blue List)	3	**Federal SAR:** Band-tailed pigeon - Special Concern Olive-sided flycatcher - Threatened **Provincial SAR:** None Identified **Provincial SOC:** Band-tailed pigeon (Blue List) Olive-sided flycatcher (Blue List) Winter wren (Blue List)	3	**Federal SAR:** Band-tailed pigeon - Special Concern Olive-sided flycatcher - Threatened **Provincial SAR:** None Identified **Provincial SOC:** Band-tailed pigeon (Blue List) Olive-sided flycatcher (Blue List) Winter wren (Blue List)

Evaluation Criteria				Options							
Criteria	Sub-Criteria	Description	Weighting	Option 1: Site A		Option 2: Site B		Option 3: Site C3		Option 4: Site C4	
				Ranking	Comments	Ranking	Comments	Ranking	Comments	Ranking	Comments
Environmental Impacts	Important habitat features	Special habitat zone, important habitats, and special access zones identified in area	3	2	**Special Habitat Zone:** Multiple areas of federally listed Critical Habitat for Marbled Murrelet within 10 km of site. Closest is within 500 m. **Important Habitats/Special Access Zones:** Sitka spruce / salmonberry Dry ecosystem - Red List (within 300 m)	2	**Special Habitat Zone:** Multiple areas of federally listed Critical Habitat for Marbled Murrelet within 10 km of site. Closest is within 200 m. **Important Habitats/Special Access Zones:** Sitka spruce / salmonberry Dry ecosystem - Red List (within 225 m)	3	**Special Habitat Zone:** Multiple areas of federally listed Critical Habitat for Marbled Murrelet within 10 km of site. Closest is approximately 110 m. **Important Habitats/Special Access Zones:** None identified	3	**Special Habitat Zone:** Multiple areas of federally listed Critical Habitat for Marbled Murrelet within 10 km of site. Closest is approximately 290 m. **Important Habitats/Special Access Zones:** None identified
	Wildlife presence and potential impact	Wildlife identified within 10 km radius of site locations and interpreted potential impact to wildlife	1	3	American robin, bald eagle, band-tailed pigeon, bobcat, black-headed grosbeak, black-throated gray warbler, brown-headed cowbird, Cassin's vireo, cedar waxwing, chestnut-backed chickadee, coastal tailed frog, common raven, dark-eyed junco, European starling, glaucous-winged gull, golden-crowned kinglet, hairy woodpecker, Hammond's flycatcher, harbour seal, Hutton's vireo, Johnson's hairstreak, MacGillivray's warbler, mule deer, northern alligator lizard, northern flicker, northern goshawk (Laingi subspecies), northern red-legged frog, northern rubber boa, northwestern crow, olive-sided flycatcher, orange-crowned warbler, pacific-slope flycatcher, pelagic cormorant, pine siskin, purple finch, red crossbill, red-breasted nuthatch, ruffed grouse, Rufous hummingbird, snow bramble, song sparrow, sooty grouse, spotted towhee, Steller's jay, Swainson's thrush, Townsend's warbler, turkey vulture, varied thrush, violet-green swallow, warbling vireo, western tanager, western wood-pewee, white-crowned sparrow, winter wren, yellow-rumped warbler Interpreted potential impact to wildlife is lower for this site than for Sites C3 and C4, based on the fact that human activity and disturbance (forestry) has taken place within and surrounding this site.	3	American robin, bald eagle, band-tailed pigeon, bobcat, black-headed grosbeak, black-throated gray warbler, brown-headed cowbird, Cassin's vireo, cedar waxwing, chestnut-backed chickadee, coastal tailed frog, common raven, dark-eyed junco, European starling, glaucous-winged gull, golden-crowned kinglet, hairy woodpecker, Hammond's flycatcher, harbour seal, Hutton's vireo, Johnson's hairstreak, MacGillivray's warbler, mule deer, northern alligator lizard, northern flicker, northern goshawk (Laingi subspecies), northern red-legged frog, northern rubber boa, northwestern crow, olive-sided flycatcher, orange-crowned warbler, pacific-slope flycatcher, pelagic cormorant, pine siskin, purple finch, red crossbill, red-breasted nuthatch, ruffed grouse, Rufous hummingbird, snow bramble, song sparrow, sooty grouse, spotted towhee, Steller's jay, Swainson's thrush, Townsend's warbler, turkey vulture, varied thrush, violet-green swallow, warbling vireo, western tanager, western wood-pewee, white-crowned sparrow, winter wren, yellow-rumped warbler Interpreted potential impact to wildlife is lower for this site than for Sites C3 and C4, based on the fact that human activity and disturbance (forestry) has taken place within and surrounding this site.	3	Species identified in desktop study include American robin, band-tailed pigeon, barred owl, black-headed grosbeak, black-throated gray warbler, brown-headed cowbird, Cassin's vireo, cedar waxwing, chestnut-backed chickadee, common raven, dark-eyed junco, golden-crowned kinglet, hairy woodpecker, Hammond's flycatcher, Johnson's hairstreak, MacGillivray's warbler, northern flicker, northwestern crow, olive-sided flycatcher, orange-crowned warbler, pacific-slope flycatcher, pine siskin, red-breasted nuthatch, ruffed grouse, Rufous hummingbird, spotted towhee, Steller's jay, Swainson's thrush, Townsend's warbler, varied thrush, violet-green swallow, warbling vireo, western tanager, white-crowned sparrow, willow flycatcher, Wilson's warbler, winter wren, yellow-rumped warbler Preliminary field identified species include elk (tracks, scat), bear (scat), pacific chorus frog (adults), northern red-legged frog (tadpole [potential]), northwestern salamanders (all life stages) Interpreted potential impact to wildlife is higher for this site than for Sites A and B, based on this site having had less impact and disturbance previously.	3	Species identified in desktop study include American robin, band-tailed pigeon, barred owl, black-headed grosbeak, black-throated gray warbler, brown-headed cowbird, Cassin's vireo, cedar waxwing, chestnut-backed chickadee, common raven, dark-eyed junco, golden-crowned kinglet, hairy woodpecker, Hammond's flycatcher, Johnson's hairstreak, MacGillivray's warbler, northern flicker, northwestern crow, olive-sided flycatcher, orange-crowned warbler, pacific-slope flycatcher, pine siskin, red-breasted nuthatch, ruffed grouse, Rufous hummingbird, spotted towhee, Steller's jay, Swainson's thrush, Townsend's warbler, varied thrush, violet-green swallow, warbling vireo, western tanager, white-crowned sparrow, willow flycatcher, Wilson's warbler, winter wren, yellow-rumped warbler Preliminary field identified species include elk (tracks, scat), bear (scat), pacific chorus frog (adults), northern red-legged frog (tadpole [potential]), northwestern salamanders (all life stages) Interpreted potential impact to wildlife is higher for this site than for Sites A and B, based on this site having had less impact and disturbance previously.
	Fish presence	Fish identified in water bodies downslope of reservoir site	1	3	Based on desktop review, no documented fish presence within the site boundary, as there appears to be no waterbody within the site boundary. However, waterbodies were identified to both the west (approximately 750 m) and east (approximately 325 m) of the site boundary. These waterbodies, including upstream and downstream extents have the documented presence of brook trout, chinook salmon, chum salmon, coho salmon, cutthroat trout, dolly varden, lamprey, pink salmon, rainbow trout, and sculpin.	3	Based on desktop review, no documented fish presence within the site boundary, as there appears to be no waterbody within the site boundary. However, waterbodies were identified to both the north (approximately 380 m) and southeast (approximately 280 m) of the site boundary. These waterbodies, including upstream and downstream extents have the documented presence of brook trout, chinook salmon, chum salmon, coho salmon, cutthroat trout, dolly varden, lamprey, pink salmon, rainbow trout, and sculpin.	2	Based on desktop review, no documented fish presence within the existing natural waterbody, located within the site boundary. This may be due to a lack of fishing effort on this waterbody. However, various species were identified within downstream waterbodies that provide surface flow to Chapman Creek, including brook trout, chinook salmon, chum salmon, coho salmon, cutthroat trout, dolly varden, pink salmon, rainbow trout. Migratory species are unlikely to be present in the existing waterbody (due to potential fish barriers), however, resident sportfish may be present and would require a fish survey to further investigate. At time of preliminary aquatics investigation, no fish were documented or observed. However, given that lakes were interpreted to be suitable fish habitat, further investigation will be required.	2	Based on desktop review, no documented fish presence within the existing natural waterbody, located within the site boundary. This may be due to a lack of fishing effort on this waterbody. However, various species were identified within downstream waterbodies that provide surface flow to Chapman Creek, including brook trout, chinook salmon, chum salmon, coho salmon, cutthroat trout, dolly varden, pink salmon, rainbow trout. Migratory species are unlikely to be present in the existing waterbody (due to potential fish barriers), however, resident sportfish may be present and would require a fish survey to further investigate At time of preliminary aquatics investigation, no fish were documented or observed. However, given that lakes were interpreted to be suitable fish habitat, further investigation will be required.
	Wetlands and surface water	Wetlands identified within footprint and proximity to mapped wetlands and proximity to surface water	2	4	No mapped wetlands identified within site area. Site is located 2.2 km from a mapped wetland. Hudson Creek (325 m east of site boundary) Chapman Creek (725 m west of site boundary)	4	No mapped wetlands identified within site area. Site is 1.8 km from a mapped wetland. Hudson Creek (280 m southeast of site boundary) Chapman Creek (380 m north of site boundary)	1	Based on desktop review, no mapped wetlands identified within site area. Site is 2.6 km from a mapped wetland. Based on preliminary field observations, wetlands are prevalent along and above the lake shoreline. Site is located on a natural unnamed lake. Chapman Creek (650 m east of site boundary). Multiple smaller waterbodies, including tributaries within 500 m. Downstream environmental impacts (i.e. erosion and sedimentation) on the creeks downstream of Site C3 (Tsawcome Creek, Chapman Creek) will need to be considered based on expected low and high flow conditions.	1	Based on desktop review, no mapped wetlands identified within site area. Site is 1.7 km from a mapped wetland. Based on preliminary field observations, wetlands are prevalent along and above the lake shoreline. Located on a natural unnamed lake. Chapman Creek (800 m east of site boundary). Multiple smaller waterbodies, including tributaries within 500 m. Unnamed lake (640 m north of site boundary). Downstream environmental impacts (i.e. erosion and sedimentation) on the creeks downstream of Site C4 (unnamed creek between Sites C3 and C4, Tsawcome Creek, Chapman Creek) will need to be considered based on expected low and high flow conditions.
	Water quality for Chapman Water System	Potential for improved raw water quality	1	4	Water stored in reservoir is protected from large rain events or landslides that cause poor water quality in Chapman Creek.	5	Water stored in reservoir is protected from large rain events or landslides that cause poor water quality in Chapman Creek. Intake installed upstream of development will likely provide higher quality of raw water.	3	No improvement over existing water quality.	3	No improvement over existing water quality.

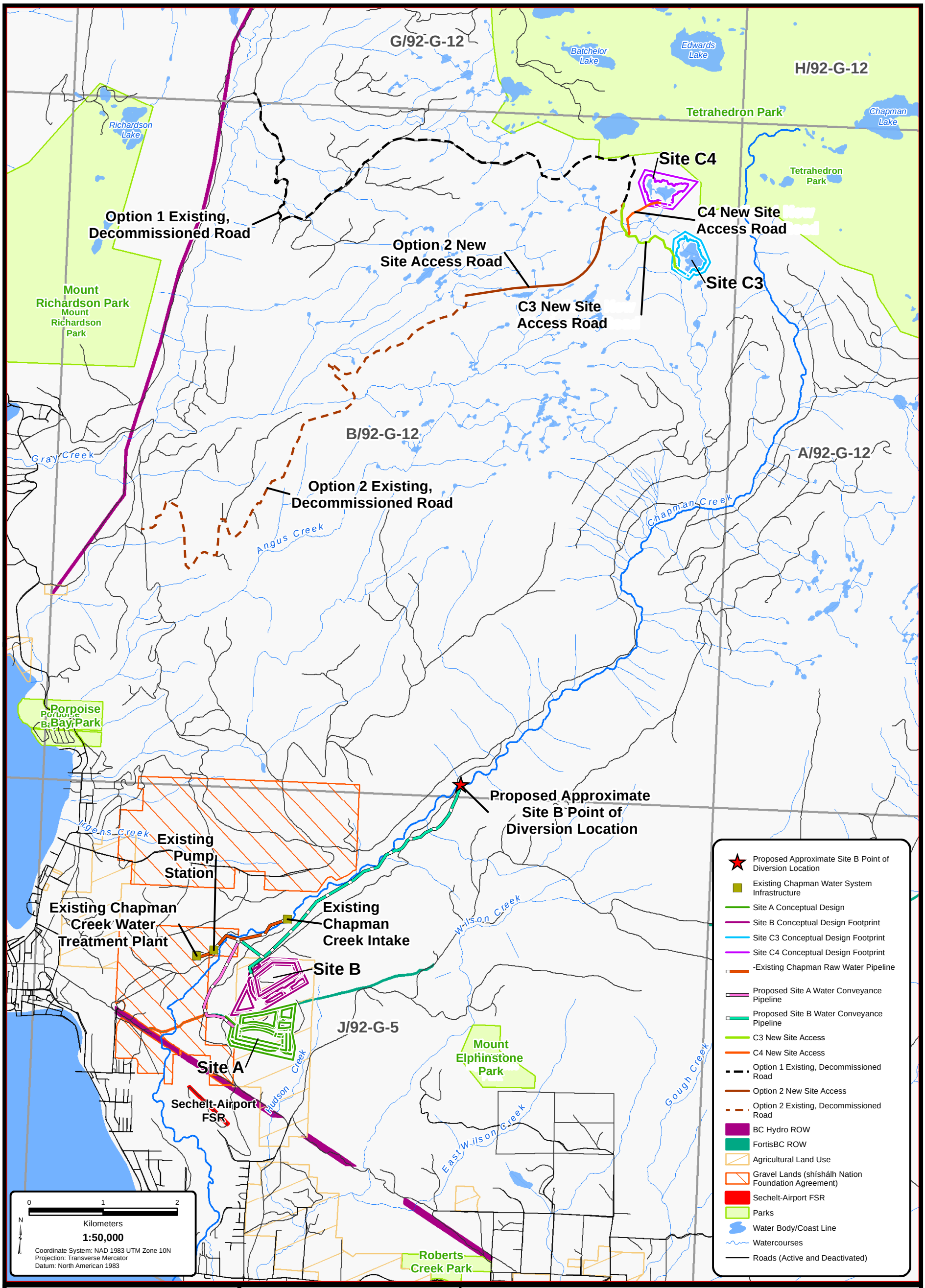
Evaluation Criteria				Options							
Criteria	Sub-Criteria	Description	Weighting	Option 1: Site A		Option 2: Site B		Option 3: Site C3		Option 4: Site C4	
				Ranking	Comments	Ranking	Comments	Ranking	Comments	Ranking	Comments
Regulatory and Stakeholder Sensitivity			**37**								
	Regulatory requirements	Identified permits and authorizations required at this stage of project definition	20	3	**Identified permits/authorizations**: Development permit, Geotechnical development permit, Water license (Section 9), Licensing under BC Dam Safety Regulation, License of Occupation (Section 39), Conduct of non-farm use with the ALR, Vancouver Coastal Health notification, License to Cut, Environmental Assessment Certificate, Waterworks Construction Permit, Operating Permit, Fisheries and Oceans Canada request for review **Potential**: approval under the Canadian Environmental Assessment Act, Building permit, new drinking water source assessment, approval under the Navigation Protection Act, approval by Transport Canada, approval by NAV Canada, approval under Section 10 of the Water Sustainability Act	3	**Identified permits/authorizations**: Development permit, Geotechnical development permit, Water license (Section 9), Licensing under BC Dam Safety Regulation, License of Occupation (Section 39), Conduct of non-farm use with the ALR, Vancouver Coastal Health notification, License to Cut, Environmental Assessment Certificate, Waterworks Construction Permit, Operating Permit, Fisheries and Oceans Canada request for review, Riparian Development Permit **Potential**: approval under the Canadian Environmental Assessment Act, Building permit, new drinking water source assessment, approval under the Navigation Protection Act, approval by Transport Canada, approval by NAV Canada, approval under Section 10 of the Water Sustainability Act	1	**Identified permits/authorizations**: Geotechnical development permit, Water license (Section 9), Licensing under BC Dam Safety Regulation, License of Occupation (Section 39), Vancouver Coastal Health notification, License to Cut, Environmental Assessment Certificate, Waterworks Construction Permit, Operating Permit, Fisheries and Oceans Canada request for review, Riparian Development Permit **Potential**: Fisheries and Oceans Canada authorization, approval under the Canadian Environmental Assessment Act, Building permit, new drinking water source assessment, approval under the Navigation Protection Act, approval by Transport Canada, approval by NAV Canada, approval under Section 10 of the Water Sustainability Act	1	**Identified permits/authorizations**: Geotechnical development permit, Water license (Section 9), Licensing under BC Dam Safety Regulation, License of Occupation (Section 39), Vancouver Coastal Health notification, License to Cut, Environmental Assessment Certificate, Waterworks Construction Permit, Operating Permit, Fisheries and Oceans Canada request for review, Riparian Development Permit **Potential**: Fisheries and Oceans Canada authorization, approval under the Canadian Environmental Assessment Act, Building permit, new drinking water source assessment, approval under the Navigation Protection Act, approval by Transport Canada, approval by NAV Canada, approval under Section 10 of the Water Sustainability Act
	Key potential regulatory challenges	Identification of regulatory requirements that may pose significant challenges	17	3	No significant challenges identified	3	Licence to Cut (under the Forest Act)	1	Licence to Cut (under the Forest Act), Fisheries and Oceans Canada authorization, Environmental Assessment Certificate	1	Licence to Cut (LTC) (under the Forest Act), Fisheries and Oceans Canada authorization, Environmental Assessment Certificate
	General community favourability	Interpreted expected support from community stakeholders	12	4	Site is located in area previously heavily impacted by forestry	4	Site is located in area previously heavily impacted by forestry	2	Site is located in largely unimpacted area, and located near Tetrahedron Park	2	Site is located in largely unimpacted area, and located near Tetrahedron Park
Total Score			**100**	**70**		**78**		**71**		**68**	
Unweighted Ranking				**3**		**1**		**2**		**4**	
Total Weighted Score				**290**		**311**		**226**		**219**	
Weighted Ranking				**2**		**1**		**3**		**4**	

NOTES:

1. Suitability of onsite materials for use as fill material is based on desktop review of regional-scale geological maps and one-day site reconnaissance only. An intrusive geotechnical investigation is recommended to be completed at the site locations during future design stages to confirm material suitability, and is not included in this scope of work.
2. Bedrock depths should be confirmed during an intrusive geotechnical investigation during future design stages (not included in the currently scope of work).
3. Identified potential geohazards are based on desktop review of available information and one-day site reconnaissance only. A detailed visual geohazards site assessment and intrusive geotechnical investigation are recommended to be completed at the site locations during future design stages, and are not included in this scope of work.
4. Preliminary dam consequence of failure classification is intended as high level only and is based on the conceptual design. Analyses to fully evaluate is required, and is outside of the scope of work for this project.
5. MCA criteria and site option descriptions are based on design criteria and assumptions included in the Phase 3 Design Summary Report (VP19-SCR-01-00-RPT-CI-DesignSummary_Rev1) and Phase 3 Rev B drawings (VP19-SCR-01-00-DWG-CI-100-104, VP19-SCR-01-00-DWG-CI-200-204, VP19-SCR-01-00-DWG-CI-300-305, VP19-SCR-01-00-DWG-CI-400-405))
6. Criteria weightings for the base case and sensitivity analysis cases, as well as site option rankings, were initially developed in Phase 2 (refer to Phase 2 Feasibility Study Report - VP18-SCR-01-00-RPT-CI-Feasibility_Study-Rev0). Criteria weightings and site option rankings were refined during Phase 3.
7. Sources of input data include:
   - Phase 2 Detailed Desktop Study Report (VP18-SCR-01-00-RPT-CI-Desktop_Study_Rev0)
   - Phase 2 Feasibility Study Report (VP18-SCR-01-00-RPT-CI-Feasibility_Study-Rev0)
   - Terrain Assessment Report (VP19-SCR-01-00-RPT-CI-Terrain_Assessment_Rev0)
   - Preliminary Aquatics Assessment Report (VP19-SCR-01-00-RPT-WR-Aquatic_Assessments-Rev0)
   - Regulatory Roadmap (VP19-SCR-01-00-TAB-RG-Roadmap_Rev2)
   - Site B POD Assessment (VP19-SCR-01-00-RPT-WR-ChapmanCreek_Intake_Eval-Rev0)
   - Environmental Scoping Assessment (VP19-SCR-01-00-RPT-EN-Env_Scoping_Rev1)
   - Consequence of Failure Classification Reports (VP19-SCR-01-00-RPT-CI-Conseq_Fail_Class_SiteA-Rev0, VP19-SCR-01-00-RPT-CI-Conseq_Fail_Class_SiteB-Rev0, VP19-SCR-01-00-RPT-CI-Conseq_Fail_Class_SiteC3-Rev0, VP19-SCR-01-00-RPT-CI-Conseq_Fail_Class_SiteC4-Rev0)
   - Phase 3 Design Summary Report (VP19-SCR-01-00-RPT-CI-DesignSummary_Rev1)
   - Phase 3 Rev B Conceptual Drawings (VP19-SCR-01-00-DWG-CI-100-104, VP19-SCR-01-00-DWG-CI-200-204, VP19-SCR-01-00-DWG-CI-300-305, VP19-SCR-01-00-DWG-CI-400-405)
   - Phase 3 Cost Estimates and Basis of Estimate (VP19-SCR-01-00-EST-CI-BOE_Phase 3_Rev1)

INTEGRATED SUSTAINABILITY

Figures



BRITISH COLUMBIA

PREPARED BY:
INTEGRATED SUSTAINABILITY

CLIENT:
SUNSHINE COAST REGIONAL DISTRICT

RAW WATER RESERVOIR FEASIBILITY STUDY - PHASE 3
DESIGN SUMMARY REPORT
SITE LOCATION MAP

DRAWN BY:	CHECKED BY:	APPROVED BY:
K.MATEUSH	H.MASSONG	A.SPERSKE

PROJECT NO.	FIGURE NO.	REVISION:
VP19-SCR-01-00	1	1

NOTES: 15-NOV-19
Source: Crown Data, Streams, Roads, Coast Line and Parks data provided by Government of BC. Site Locations current as of May, 2019. SCRD Electoral Areas and Gravel Lands provided by the SCRD.
Refer to drawings VP19-SCR-01-00-DWG-CI-104, VP19-SCR-01-00-DWG-CI-204, VP19-SCR-01-00-DWG-CI-304 and VP19-SCR-01-00-DWG-CI-404 from the Raw Water Reservoir Feasibility Study.

Document Path: N:\Projects\SCR\VP19-SCR-01-00\MXD\DesignSummary\VP19-SCR-01-00Sitelocation-Fig1-Rev1-.mxd.

SUNSHINE COAST REGIONAL DISTRICT

RAW WATER RESERVOIR
FEASIBILITY STUDY
SITE A

ISSUED AS FINAL
29 OCTOBER 2019

INTEGRATED SUSTAINABILITY

DRAWING LIST				
No.	REV.	DATE	ISSUE	TITLE
VP19-SCR-01-00-DWG-CI-101	B	2019-10-29	ISSUED AS FINAL	EXISTING CONDITIONS PLAN
VP19-SCR-01-00-DWG-CI-102	B	2019-10-29	ISSUED AS FINAL	DESIGN PLAN
VP19-SCR-01-00-DWG-CI-103	B	2019-10-29	ISSUED AS FINAL	DESIGN PROFILES
VP19-SCR-01-00-DWG-CI-104	B	2019-10-29	ISSUED AS FINAL	SUPPORTING INFRASTRUCTURE

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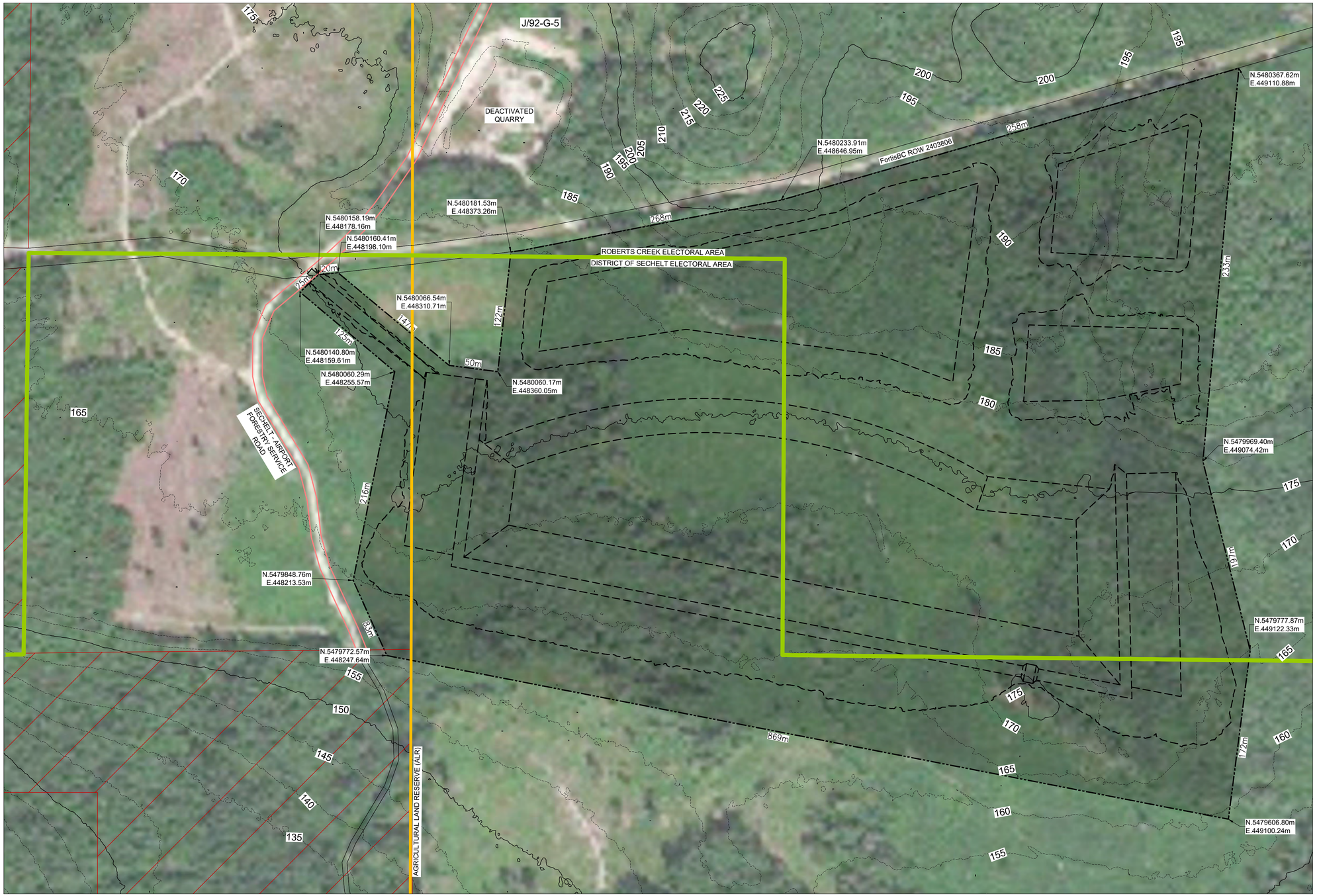

GENERAL NOTES:

1. LIDAR SOURCE: GOVERNMENT OF BRITISH COLUMBIA (GEOBC, MINISTRY OF FORESTS, LANDS AND NATURAL RESOURCE OPERATIONS AND RURAL DEVELOPMENT); RECEIVED 2019-08-23.
2. AREA FEATURES SOURCE: SUNSHINE COAST REGIONAL DISTRICT; RECEIVED 2019-01-15.
3. AERIAL IMAGE FROM BING, 2019.
4. SITE IS LOCATED WITHIN AGRICULTURAL LAND RESERVE (ALR).
5. ALL ELEVATIONS ARE MEASURED IN METERS. ALL DIMENSIONS ARE SHOWN IN METERS, UNLESS NOTED OTHERWISE.
6. OG = ORIGINAL GROUND.
7. SITE IS LOCATED WITHIN ELECTORAL AREA D: ROBERTS CREEK AND DISTRICT OF SECHELT.
8. SITE IS LOCATED WITHIN J/92-G-5.
9. CURRENT DESIGN PLANS ARE SCOPING - LEVEL BASED ON THE SITE CHARACTERIZATION COMPLETED TO DATE. DESIGN IS TO BE PROGRESSED AND CONFIRMED BASED ON DETAILED SITE CHARACTERIZATION AND CONSTRAINTS.

LEGEND:

- SITE BOUNDARY
- SITE AREA (47.38ha)
- OG MAJOR CONTOUR (LiDAR) (25.0m INTERVAL)
- OG MINOR CONTOUR (LiDAR) (5.0m INTERVAL)
- GRAVEL LANDS (SHÍSHÁLH NATION FOUNDATION AGREEMENT)
- AGRICULTURAL LAND RESERVE (ALR) (NOTE 4)
- DESIGN BREAKLIINE
- SCRD ELECTORAL AREA BOUNDARY
- DIGITIZED ROAD (FROM BING MAP)

0 20 40 60 80 100m
SCALE 1 : 2,000
UTM NAD83 ZONE 10

NOT FOR CONSTRUCTION

REV	DESCRIPTION	BY	DATE (YYYY-MM-DD)	CHK	APP	PE
		DW		HM		
B	ISSUED AS FINAL	DH	2019-10-29	HM	AJS	AJS
A	ISSUED FOR REVIEW	DH	2019-10-04	HM	AJS	AJS

REFERENCE DOCUMENTS

PROFESSIONAL ENGINEER A.J. SPERSKE 29 OCT 2019

PREPARED BY
INTEGRATED SUSTAINABILITY

CLIENT
SUNSHINE COAST REGIONAL DISTRICT

SUNSHINE COAST REGIONAL DISTRICT
RAW WATER RESERVOIR FEASIBILITY STUDY
SITE A
EXISTING CONDITIONS PLAN

DRAWN BY	CHECKED BY	ENGINEERED BY
D. HELYAR	H. MASSONG	A. SPERSKE

SCALE	PROJ NO	DRAWING NO	REV
1:2,000	VP19-SCR-01-00	VP19-SCR-01-00-DWG-CI-101	B

SCALE APPLIES IF PRINTED ON SIZE "D" (22"X34") PAPER

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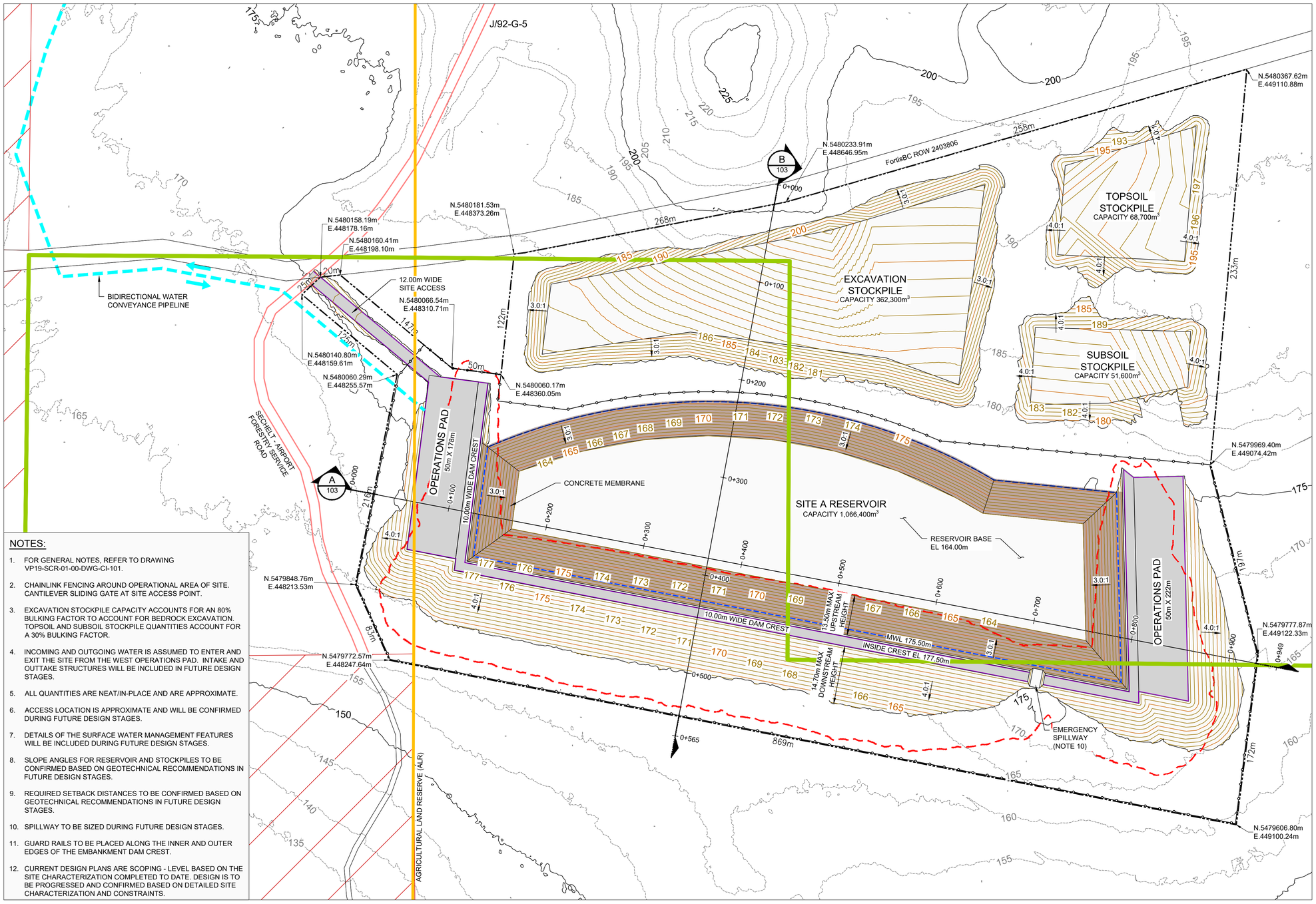

NOTES:

1. FOR GENERAL NOTES, REFER TO DRAWING VP19-SCR-01-00-DWG-CI-101.
2. CHAINLINK FENCING AROUND OPERATIONAL AREA OF SITE. CANTILEVER SLIDING GATE AT SITE ACCESS POINT.
3. EXCAVATION STOCKPILE CAPACITY ACCOUNTS FOR AN 80% BULKING FACTOR TO ACCOUNT FOR BEDROCK EXCAVATION. TOPSOIL AND SUBSOIL STOCKPILE QUANTITIES ACCOUNT FOR A 30% BULKING FACTOR.
4. INCOMING AND OUTGOING WATER IS ASSUMED TO ENTER AND EXIT THE SITE FROM THE WEST OPERATIONS PAD. INTAKE AND OUTTAKE STRUCTURES WILL BE INCLUDED IN FUTURE DESIGN STAGES.
5. ALL QUANTITIES ARE NEAT/IN-PLACE AND ARE APPROXIMATE.
6. ACCESS LOCATION IS APPROXIMATE AND WILL BE CONFIRMED DURING FUTURE DESIGN STAGES.
7. DETAILS OF THE SURFACE WATER MANAGEMENT FEATURES WILL BE INCLUDED DURING FUTURE DESIGN STAGES.
8. SLOPE ANGLES FOR RESERVOIR AND STOCKPILES TO BE CONFIRMED BASED ON GEOTECHNICAL RECOMMENDATIONS IN FUTURE DESIGN STAGES.
9. REQUIRED SETBACK DISTANCES TO BE CONFIRMED BASED ON GEOTECHNICAL RECOMMENDATIONS IN FUTURE DESIGN STAGES.
10. SPILLWAY TO BE SIZED DURING FUTURE DESIGN STAGES.
11. GUARD RAILS TO BE PLACED ALONG THE INNER AND OUTER EDGES OF THE EMBANKMENT DAM CREST.
12. CURRENT DESIGN PLANS ARE SCOPING - LEVEL BASED ON THE SITE CHARACTERIZATION COMPLETED TO DATE. DESIGN IS TO BE PROGRESSED AND CONFIRMED BASED ON DETAILED SITE CHARACTERIZATION AND CONSTRAINTS.

LEGEND:

- SITE BOUNDARY
- OG MAJOR CONTOUR (LiDAR) (25.0m INTERVAL)
- OG MINOR CONTOUR (LiDAR) (5.0m INTERVAL)
- GRAVEL LANDS (SHÍSHÁLH NATION FOUNDATION AGREEMENT)
- AGRICULTURAL LAND RESERVE (ALR)
- SCRD ELECTORAL AREA BOUNDARY
- DESIGN MAJOR CONTOUR (5.0m INTERVAL)
- DESIGN MINOR CONTOUR (1.0m INTERVAL)
- CONCRETE MEMBRANE
- DESIGN MWL
- EXCAVATION LIMITS
- CHAINLINK FENCE (NOTE 2)
- TRAFFICABLE SURFACE
- GUARD RAIL
- SITE A WATER CONVEYANCE PIPELINE
- DIGITIZED ROAD (FROM BING MAP)

EARTHWORK QUANTITIES

SITE AREA	47.38 ha
TOPSOIL TO STOCKPILE (ASSUMED 100mm)	43,300 m³
SUBSOIL TO STOCKPILE (ASSUMED 100mm)	39,900 m³
BEDROCK TO STOCKPILE	188,500 m³
OVERBURDEN EXCAVATION	883,200 m³
BEDROCK EXCAVATION	271,300 m³
EMBANKMENT, ACCESS, AND PAD FILL	966,000 m³

TRAFFICABLE SURFACE QUANTITIES

ACCESS ROAD

25mm MINUS TRAFFIC SURFACING CRUSHED GRAVEL	144 m³
80mm MINUS ROAD BASE CRUSHED GRAVEL	576 m³

OPERATIONS PADS

25mm MINUS TRAFFIC SURFACING CRUSHED GRAVEL	1,500 m³
80mm MINUS ROAD BASE CRUSHED GRAVEL	6,000 m³

EMBANKMENT

25mm MINUS TRAFFIC SURFACING CRUSHED GRAVEL	820 m³
80mm MINUS ROAD BASE CRUSHED GRAVEL	3,270 m³

CONCRETE QUANTITIES

CONCRETE MEMBRANE (500mm THICK)	29,980 m³

GENERAL QUANTITIES

CHAINLINK FENCE LENGTH (INCLUDES LENGTH OF GATE)	2,413 m
CANTILEVER SLIDING GATE	1 QTY
PERSONNEL GATE	1 QTY
GUARD RAILS	2,714 m

0 20 40 60 80 100m
SCALE 1 : 2,000
UTM NAD83 ZONE 10

NOT FOR CONSTRUCTION

REFERENCE DOCUMENTS		REV	DESCRIPTION	BY	DATE (YYYY-MM-DD)	CHK	APP	PE
				DH		HM	AJS	AJS
VP18-SCR-01-00-DWG-CI-103	DESIGN PROFILES	B	ISSUED AS FINAL	DH	2019-10-29	HM	AJS	AJS
VP18-SCR-01-00-DWG-CI-101	EXISTING CONDITIONS PLAN	A	ISSUED FOR REVIEW	DH	2019-10-04	HM	AJS	AJS

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA A. J. SPERSKE # 37 ENGINEERING
29 OCT 2019

PREPARED BY
INTEGRATED SUSTAINABILITY

CLIENT
SUNSHINE COAST REGIONAL DISTRICT

SUNSHINE COAST REGIONAL DISTRICT
RAW WATER RESERVOIR FEASIBILITY STUDY
SITE A
DESIGN PLAN

DRAWN BY	CHECKED BY	ENGINEERED BY
D. HELYAR	H. MASSONG	A. SPERSKE

SCALE	PROJ NO	DRAWING NO	REV
1:2,000	VP19-SCR-01-00	VP19-SCR-01-00-DWG-CI-102	B

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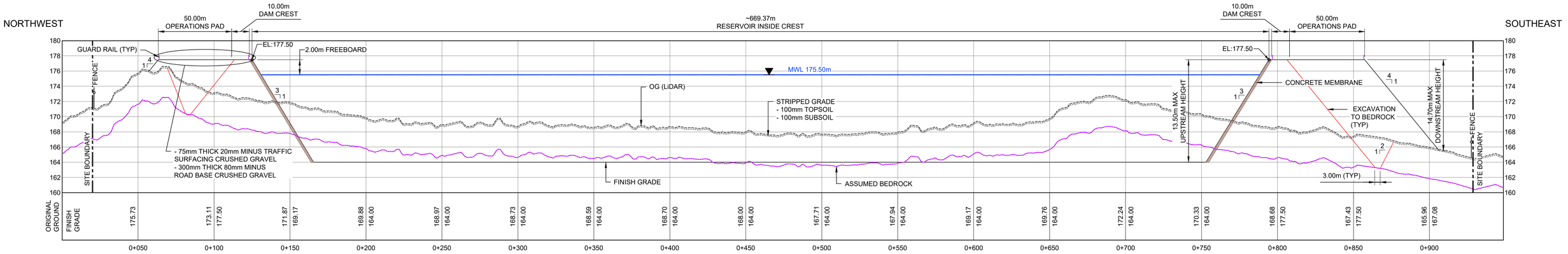
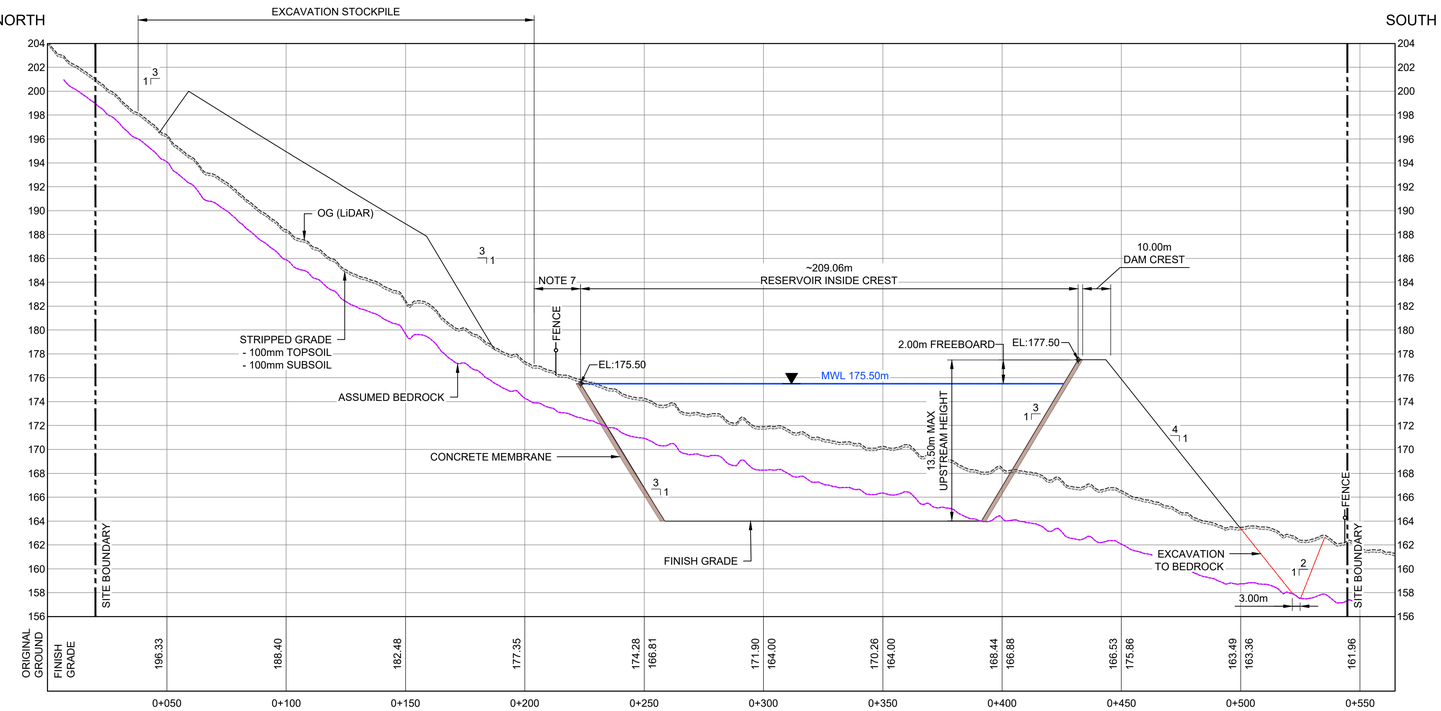


A 102 NORTHWEST - SOUTHEAST PROFILE
VERTICAL 1:250
HORIZONTAL 1:1,250



B 102 NORTH - SOUTH PROFILE
VERTICAL 1:250
HORIZONTAL 1:1,250

NOTES:

1. FOR GENERAL NOTES, REFER TO DRAWING VP19-SCR-01-00-DWG-CI-101.
2. INTAKE AND OUTTAKE STRUCTURES WILL BE INCLUDED DURING FUTURE DESIGN STAGES.
3. DESIGN OF SEEPAGE MANAGEMENT STRUCTURES (I.E. DRAINS, FILTERS, ETC.) WITHIN THE EMBANKMENT DAM AND WITHIN THE FOUNDATION TO BE COMPLETED DURING FUTURE DESIGN STAGES.
4. FOUNDATION TREATMENT AND GROUTING DESIGN TO BE COMPLETED DURING FUTURE DESIGN STAGES.
5. DETAILS OF THE SURFACE WATER MANAGEMENT FEATURES WILL BE INCLUDED DURING FUTURE DESIGN STAGES.
6. SLOPE ANGLES FOR RESERVOIR AND STOCKPILES TO BE CONFIRMED BASED ON GEOTECHNICAL RECOMMENDATIONS IN FUTURE DESIGN STAGES.
7. REQUIRED SETBACK DISTANCES TO BE CONFIRMED BASED ON GEOTECHNICAL RECOMMENDATIONS IN FUTURE DESIGN STAGES.
8. CURRENT DESIGN PLANS ARE SCOPING - LEVEL BASED ON THE SITE CHARACTERIZATION COMPLETED TO DATE. DESIGN IS TO BE PROGRESSED AND CONFIRMED BASED ON DETAILED SITE CHARACTERIZATION AND CONSTRAINTS.

VER. 1 : 250
0 2 4 6 8 10m
0 10 20 30 40 50m
HOR. 1 : 1,250

NOT FOR CONSTRUCTION

REFERENCE DOCUMENTS		REV	DESCRIPTION	BY	DATE (YYYY-MM-DD)	CHK	APP	PE
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VP18-SCR-01-00-DWG-CI-101	EXISTING CONDITIONS PLAN	A	ISSUED FOR REVIEW	DH	2019-10-04	HM	AJS	AJS

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA A. J. SPERSKE 29 OCT 2019

PREPARED BY
INTEGRATED SUSTAINABILITY

CLIENT
SUNSHINE COAST REGIONAL DISTRICT

SUNSHINE COAST REGIONAL DISTRICT
RAW WATER RESERVOIR FEASIBILITY STUDY
SITE A
DESIGN PROFILES

DRAWN BY	CHECKED BY	ENGINEERED BY
D. HELYAR	H. MASSONG	A. SPERSKE

SCALE	PROJ NO	DRAWING NO	REV
AS NOTED	VP19-SCR-01-00	VP19-SCR-01-00-DWG-CI-103	B

SCALE APPLIES IF PRINTED ON SIZE 'D' (22"X34") PAPER

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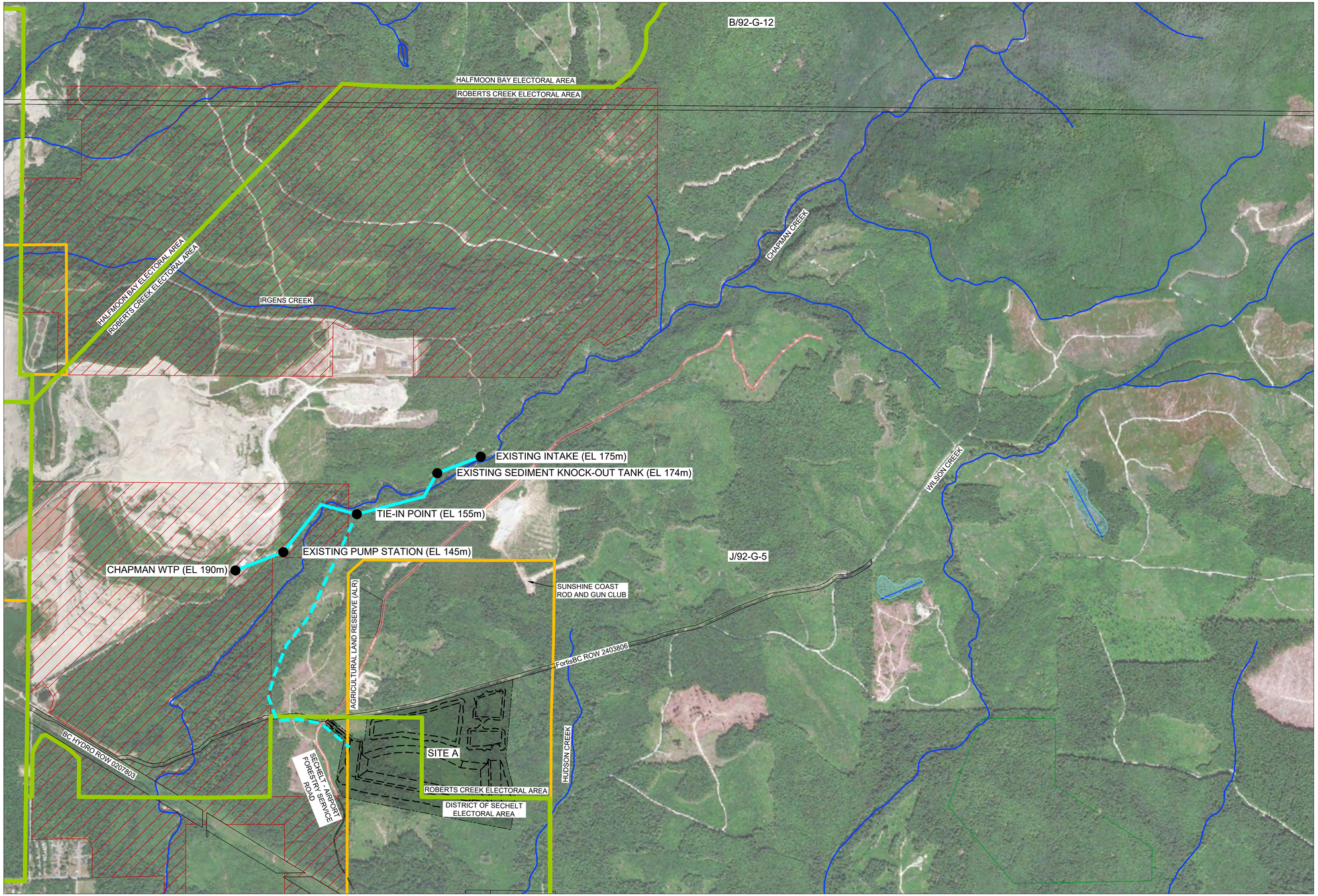

NOTES:

1. FOR GENERAL NOTES, REFER TO DRAWING VP19-SCR-01-00-DWG-CI-101.
2. LOCATIONS OF EXISTING CHAPMAN WATER SYSTEM INFRASTRUCTURE ARE APPROXIMATE.
3. LOCATION OF TIE-IN TO EXISTING CHAPMAN WATER CONVEYANCE PIPELINE IS APPROXIMATE.
4. SITE A WATER CONVEYANCE PIPELINE ALIGNMENT IS APPROXIMATE, AND WILL BE CONFIRMED DURING FUTURE DESIGN STAGES.
5. ALL ELEVATIONS OF EXISTING CHAPMAN WATER SYSTEM INFRASTRUCTURE ARE APPROXIMATE.
6. CURRENT DESIGN PLANS ARE SCOPING - LEVEL BASED ON THE SITE CHARACTERIZATION COMPLETED TO DATE. DESIGN IS TO BE PROGRESSED AND CONFIRMED BASED ON DETAILED SITE CHARACTERIZATION AND CONSTRAINTS.

LEGEND:

- SITE BOUNDARY
- SITE AREA (47.38ha)
- AGRICULTURAL LAND RESERVE (ALR)
- WATERCOURSE
- DESIGN BREAKLIINE
- EXISTING CHAPMAN RAW WATER PIPELINE
- PROPOSED SITE A WATER CONVEYANCE PIPELINE
- GRAVEL LANDS (SHÍSHÁLH NATION FOUNDATION AGREEMENT)
- SCRD ELECTORAL AREA BOUNDARY
- DIGITIZED ROAD (FROM BING MAP)

0 100 200 300 400 500m
SCALE 1 : 10,000
UTM NAD83 ZONE 10

NOT FOR CONSTRUCTION

REFERENCE DOCUMENTS	REV	DESCRIPTION	BY	DATE (YYYY-MM-DD)	CHK	APP	PE
	B	ISSUED AS FINAL	DH	2019-10-29	HM	AJS	AJS
	A	ISSUED FOR REVIEW	DH	2019-10-04	HM	AJS	AJS

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA A. J. SPERSKE # 37 ENGINEERING 29 OCT 2019

PREPARED BY
INTEGRATED SUSTAINABILITY

CLIENT
SUNSHINE COAST REGIONAL DISTRICT

SUNSHINE COAST REGIONAL DISTRICT
RAW WATER RESERVOIR FEASIBILITY STUDY
SITE A
SUPPORTING INFRASTRUCTURE

DRAWN BY	CHECKED BY	ENGINEERED BY
D. HELYAR	H. MASSONG	A. SPERSKE

SCALE	PROJ NO	DRAWING NO	REV
1:10,000	VP19-SCR-01-00	VP19-SCR-01-00-DWG-CI-104	B

SCALE APPLIES IF PRINTED ON SIZE 'D' (22"X34") PAPER

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SUNSHINE COAST REGIONAL DISTRICT

RAW WATER RESERVOIR
FEASIBILITY STUDY
SITE B

ISSUED AS FINAL
29 OCTOBER 2019

INTEGRATED SUSTAINABILITY

DRAWING LIST				
No.	REV.	DATE	ISSUE	TITLE
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VP19-SCR-01-00-DWG-CI-202	B	2019-10-29	ISSUED AS FINAL	DESIGN PLAN
VP19-SCR-01-00-DWG-CI-203	B	2019-10-29	ISSUED AS FINAL	DESIGN PROFILES
VP19-SCR-01-00-DWG-CI-204	B	2019-10-29	ISSUED AS FINAL	SUPPORTING INFRASTRUCTURE

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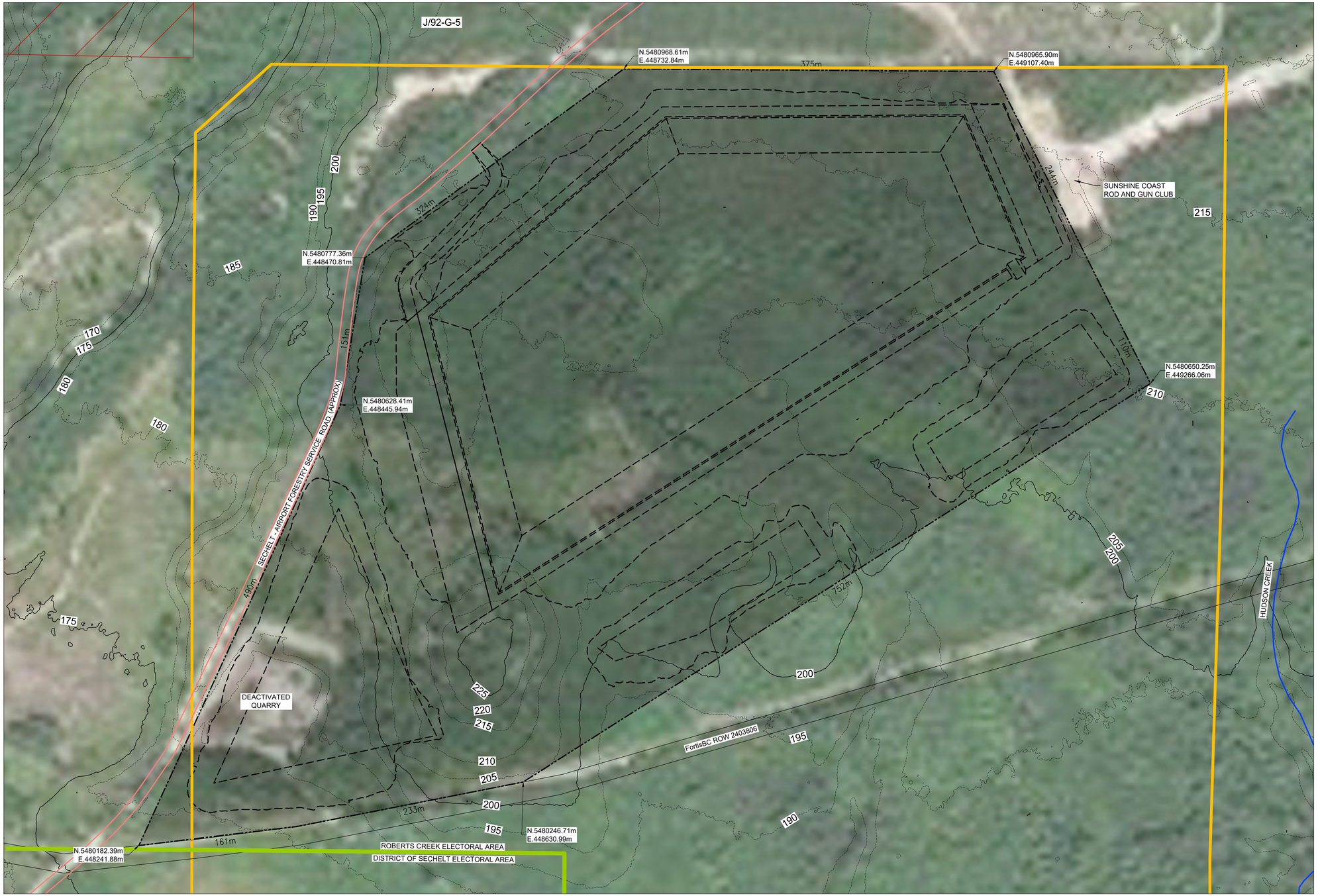

GENERAL NOTES:

1. LIDAR SOURCE: GOVERNMENT OF BRITISH COLUMBIA (GEOBC, MINISTRY OF FORESTS, LANDS AND NATURAL RESOURCE OPERATIONS AND RURAL DEVELOPMENT); RECEIVED 2019-08-23.
2. AREA FEATURES SOURCE: SUNSHINE COAST REGIONAL DISTRICT; RECEIVED 2019-01-15.
3. AERIAL IMAGE FROM BING, 2019.
4. SITE IS LOCATED WITHIN AGRICULTURAL LAND RESERVE (ALR).
5. ALL ELEVATIONS ARE MEASURED IN METERS. ALL DIMENSIONS ARE SHOWN IN METERS, UNLESS NOTED OTHERWISE.
6. OG = ORIGINAL GROUND.
7. SITE IS LOCATED WITHIN ELECTORAL AREA D: ROBERTS CREEK
8. SITE IS LOCATED WITHIN J/92-G-5.
9. CURRENT DESIGN PLANS ARE SCOPING - LEVEL BASED ON THE SITE CHARACTERIZATION COMPLETED TO DATE. DESIGN IS TO BE PROGRESSED AND CONFIRMED BASED ON DETAILED SITE CHARACTERIZATION AND CONSTRAINTS.

LEGEND:

- SITE BOUNDARY
- SITE AREA (45.24ha)
- OG MAJOR CONTOUR (LiDAR) (25.0m INTERVAL)
- OG MINOR CONTOUR (LiDAR) (5.0m INTERVAL)
- GRAVEL LANDS (SHÍSHÁLH NATION FOUNDATION AGREEMENT)
- AGRICULTURAL LAND RESERVE (ALR) (NOTE 4)
- WATERCOURSE
- DESIGN BREAKLIINE
- SCRD ELECTORAL AREA BOUNDARY
- DIGITIZED ROAD (FROM BING MAP)

0 20 40 60 80 100m
SCALE 1 : 2,000
UTM NAD83 ZONE 10

NOT FOR CONSTRUCTION

REFERENCE DOCUMENTS	REV	DESCRIPTION	BY	DATE (YYYY-MM-DD)	CHK	APP	PE
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	B	ISSUED AS FINAL	DH	2019-10-29	HM	AJS	AJS
	A	ISSUED FOR REVIEW	DH	2019-09-27	HM	AJS	AJS

PROFESSIONAL ENGINEER A.J. SPERSKE 29.OCT.2019

PREPARED BY
INTEGRATED SUSTAINABILITY

CLIENT
SUNSHINE COAST REGIONAL DISTRICT

SUNSHINE COAST REGIONAL DISTRICT
RAW WATER RESERVOIR FEASIBILITY STUDY
SITE B
EXISTING CONDITIONS PLAN

DRAWN BY	CHECKED BY	ENGINEERED BY
D. HELYAR	H. MASSONG	A. SPERSKE

SCALE	PROJ NO	DRAWING NO	REV
1:2,000	VP19-SCR-01-00	VP19-SCR-01-00-DWG-CI-201	B

SCALE APPLIES IF PRINTED ON SIZE "D" (22"X34") PAPER

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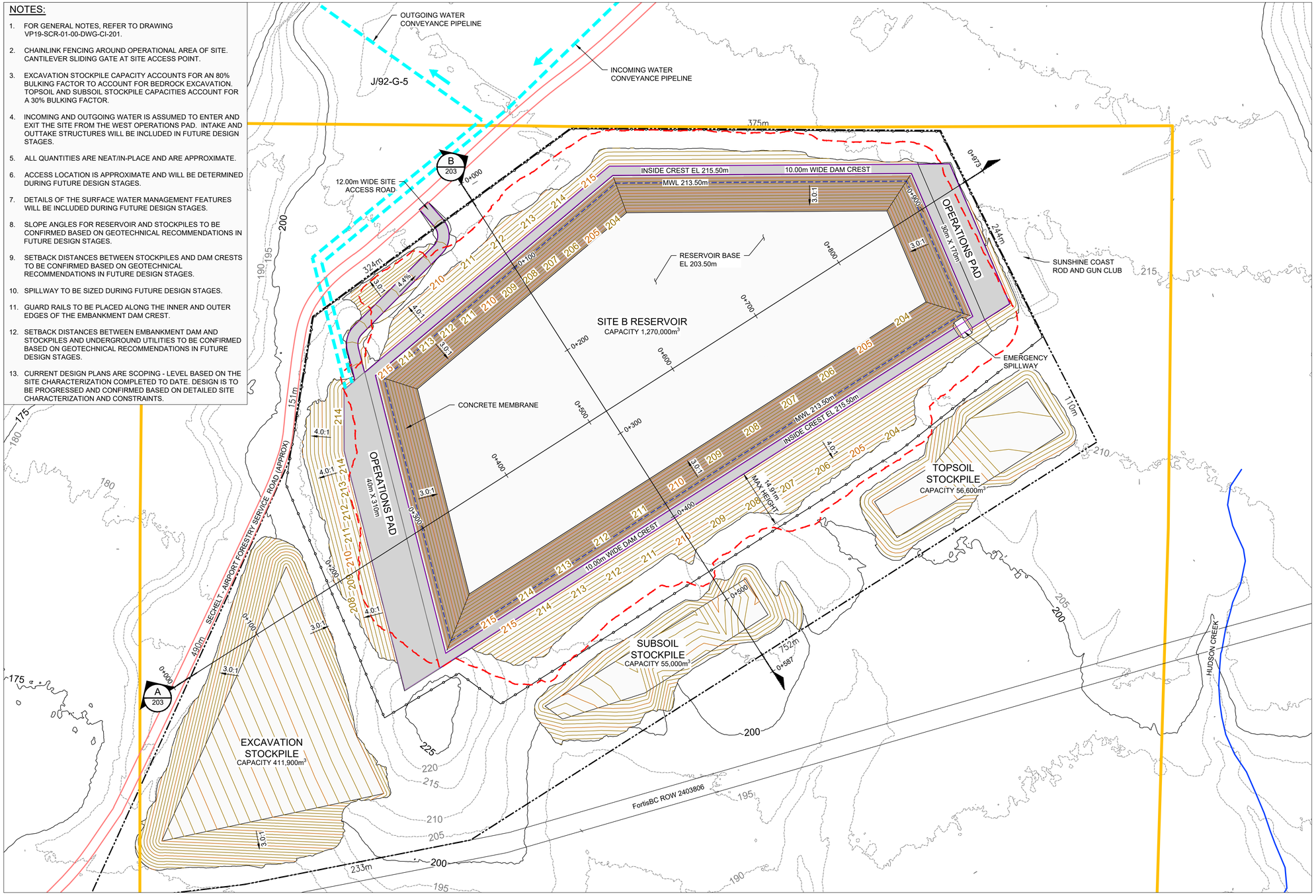
NOTES:

1. FOR GENERAL NOTES, REFER TO DRAWING VP19-SCR-01-00-DWG-CI-201.
2. CHAINLINK FENCING AROUND OPERATIONAL AREA OF SITE. CANTILEVER SLIDING GATE AT SITE ACCESS POINT.
3. EXCAVATION STOCKPILE CAPACITY ACCOUNTS FOR AN 80% BULKING FACTOR TO ACCOUNT FOR BEDROCK EXCAVATION. TOPSOIL AND SUBSOIL STOCKPILE CAPACITIES ACCOUNT FOR A 30% BULKING FACTOR.
4. INCOMING AND OUTGOING WATER IS ASSUMED TO ENTER AND EXIT THE SITE FROM THE WEST OPERATIONS PAD. INTAKE AND OUTTAKE STRUCTURES WILL BE INCLUDED IN FUTURE DESIGN STAGES.
5. ALL QUANTITIES ARE NEAT/IN-PLACE AND ARE APPROXIMATE.
6. ACCESS LOCATION IS APPROXIMATE AND WILL BE DETERMINED DURING FUTURE DESIGN STAGES.
7. DETAILS OF THE SURFACE WATER MANAGEMENT FEATURES WILL BE INCLUDED DURING FUTURE DESIGN STAGES.
8. SLOPE ANGLES FOR RESERVOIR AND STOCKPILES TO BE CONFIRMED BASED ON GEOTECHNICAL RECOMMENDATIONS IN FUTURE DESIGN STAGES.
9. SETBACK DISTANCES BETWEEN STOCKPILES AND DAM CRESTS TO BE CONFIRMED BASED ON GEOTECHNICAL RECOMMENDATIONS IN FUTURE DESIGN STAGES.
10. SPILLWAY TO BE SIZED DURING FUTURE DESIGN STAGES.
11. GUARD RAILS TO BE PLACED ALONG THE INNER AND OUTER EDGES OF THE EMBANKMENT DAM CREST.
12. SETBACK DISTANCES BETWEEN EMBANKMENT DAM AND STOCKPILES AND UNDERGROUND UTILITIES TO BE CONFIRMED BASED ON GEOTECHNICAL RECOMMENDATIONS IN FUTURE DESIGN STAGES.
13. CURRENT DESIGN PLANS ARE SCOPING - LEVEL BASED ON THE SITE CHARACTERIZATION COMPLETED TO DATE. DESIGN IS TO BE PROGRESSED AND CONFIRMED BASED ON DETAILED SITE CHARACTERIZATION AND CONSTRAINTS.



LEGEND:

- SITE BOUNDARY
- OG MAJOR CONTOUR (LiDAR) (25.0m INTERVAL)
- OG MINOR CONTOUR (LiDAR) (5.0m INTERVAL)
- GRAVEL LANDS (SHÍSHÁLH NATION FOUNDATION AGREEMENT)
- AGRICULTURAL LAND RESERVE (ALR)
- WATERCOURSE
- DESIGN MAJOR CONTOUR (5.0m INTERVAL)
- DESIGN MINOR CONTOUR (1.0m INTERVAL)
- CONCRETE MEMBRANE
- DESIGN MWL
- EXCAVATION LIMITS
- CHAINLINK FENCE (NOTE 2)
- TRAFFICABLE SURFACE
- GUARD RAIL
- SITE B WATER CONVEYANCE PIPELINE
- DIGITIZED ROAD (FROM BING MAP)

EARTHWORK QUANTITIES

SITE AREA	45.24 ha
TOPSOIL TO STOCKPILE (ASSUMED 100mm)	36,780 m³
SUBSOIL TO STOCKPILE (ASSUMED 100mm)	39,970 m³
BEDROCK TO STOCKPILE	256,468 m³
OVERBURDEN EXCAVATION	725,293 m³
BEDROCK EXCAVATION	267,418 m³
EMBANKMENT, ACCESS, AND PAD FILL	736,243 m³
PREPARED SUBGRADE	33,004 m³

TRAFFICABLE SURFACE QUANTITIES

ACCESS ROAD	
25mm MINUS TRAFFIC SURFACING CRUSHED GRAVEL	196 m³
80mm MINUS ROAD BASE CRUSHED GRAVEL	782 m³
OPERATIONS PADS	
25mm MINUS TRAFFIC SURFACING CRUSHED GRAVEL	1,259 m³
80mm MINUS ROAD BASE CRUSHED GRAVEL	5,036 m³
EMBANKMENT	
25mm MINUS TRAFFIC SURFACING CRUSHED GRAVEL	1,290 m³
80mm MINUS ROAD BASE CRUSHED GRAVEL	5,162 m³

CONCRETE QUANTITIES

CONCRETE MEMBRANE (500mm THICK)	30,630 m³

GENERAL QUANTITIES

FENCE LENGTH (INCLUDES LENGTH OF GATE)	2,745 m
CANTILEVER SLIDING GATE	1 QTY
PERSONNEL GATE	1 QTY
GUARD RAILS	4,385 m

SCALE 1 : 2,000
UTM NAD83 ZONE 10

NOT FOR CONSTRUCTION

REFERENCE DOCUMENTS		REV	DESCRIPTION	BY	DATE (YYYY-MM-DD)	CHK	APP	PE
				DH		HM	AJS	AJS
VP18-SCR-01-00-DWG-CI-203	DESIGN PROFILES	B	ISSUED AS FINAL	DH	2019-10-29	HM	AJS	AJS
VP18-SCR-01-00-DWG-CI-201	EXISTING CONDITIONS PLAN	A	ISSUED FOR REVIEW	DH	2019-09-27	HM	AJS	AJS

PROFESSIONAL ENGINEER — A. J. SPERSKE — 29 OCT 2019

PREPARED BY: INTEGRATED SUSTAINABILITY

CLIENT: SUNSHINE COAST REGIONAL DISTRICT

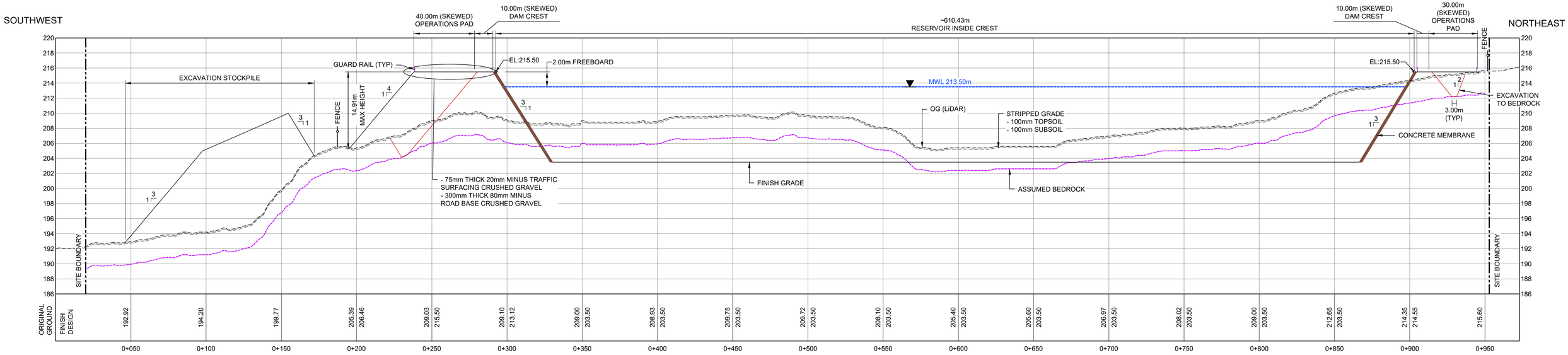
SUNSHINE COAST REGIONAL DISTRICT
RAW WATER RESERVOIR FEASIBILITY STUDY
SITE B
DESIGN PLAN

DRAWN BY	CHECKED BY	ENGINEERED BY
D. HELYAR	H. MASSONG	A. SPERSKE

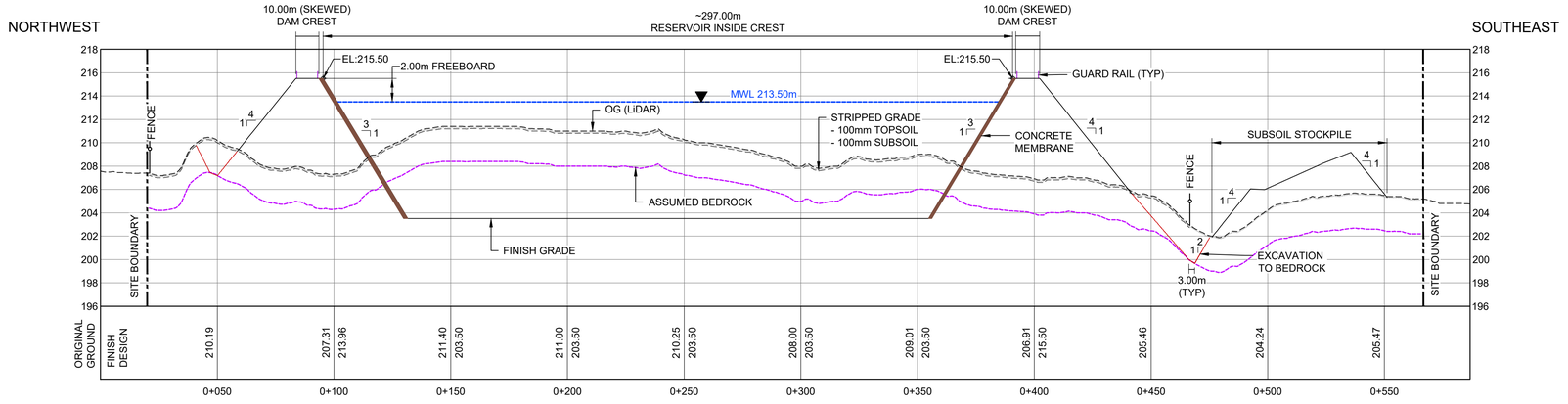
SCALE	PROJ NO	DRAWING NO	REV
1:2,000	VP19-SCR-01-00	VP19-SCR-01-00-DWG-CI-202	B

SCALE APPLIES IF PRINTED ON SIZE 'D' (22"X34") PAPER

PLOTTED: 2019-10-30 8:59 AM, FILENAME: W:\Sunshine Coast Regional District\VP19-SCR-01-00\58 Civil-Earthworks\C3D\Production Drawings\VP19-SCR-01-00-DWG-CI-201-204.dwg, BY: CHERYL DORNAN



A 002 SOUTHWEST - NORTHEAST PROFILE
VERTICAL 1:250
HORIZONTAL 1:1,250



B 002 NORTHWEST - SOUTHEAST PROFILE
VERTICAL 1:250
HORIZONTAL 1:1,250

NOTES:

1. FOR GENERAL NOTES, REFER TO DRAWING VP19-SCR-01-00-DWG-CI-201.
2. INTAKE AND OUTTAKE STRUCTURES WILL BE INCLUDED DURING FUTURE DESIGN STAGES.
3. DESIGN OF SEEPAGE MANAGEMENT STRUCTURES (I.E. DRAINS, FILTERS, ETC.) WITHIN THE EMBANKMENT DAM AND WITHIN THE FOUNDATION TO BE COMPLETED DURING FUTURE DESIGN STAGES.
4. FOUNDATION TREATMENT AND GROUTING DESIGN TO BE COMPLETED DURING FUTURE DESIGN STAGES.
5. DETAILS OF THE SURFACE WATER MANAGEMENT FEATURES WILL BE INCLUDED DURING FUTURE DESIGN STAGES.
6. SLOPE ANGLES FOR RESERVOIR AND STOCKPILES TO BE CONFIRMED BASED ON GEOTECHNICAL RECOMMENDATIONS IN FUTURE DESIGN STAGES.
7. SETBACK DISTANCES BETWEEN STOCKPILES AND DAM CRESTS TO BE CONFIRMED BASED ON GEOTECHNICAL RECOMMENDATIONS IN FUTURE DESIGN STAGES.
8. CURRENT DESIGN PLANS ARE SCOPING - LEVEL BASED ON THE SITE CHARACTERIZATION COMPLETED TO DATE. DESIGN IS TO BE PROGRESSED AND CONFIRMED BASED ON DETAILED SITE CHARACTERIZATION AND CONSTRAINTS.

VER. 1 : 250
0 2 4 6 8 10m
0 10 20 30 40 50m
HOR. 1 : 1,250

NOT FOR CONSTRUCTION

REFERENCE DOCUMENTS		REV	DESCRIPTION	BY	DATE (YYYY-MM-DD)	CHK	APP	PE
				DH		HM	AJS	AJS
VP18-SCR-01-00-DWG-CI-202	DESIGN PLAN	B	ISSUED AS FINAL	DH	2019-10-29	HM	AJS	AJS
VP18-SCR-01-00-DWG-CI-201	EXISTING CONDITIONS PLAN	A	ISSUED FOR REVIEW	DH	2019-09-27	HM	AJS	AJS

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA A. J. SPERSKE # 37 29 OCT 2019

PREPARED BY
INTEGRATED SUSTAINABILITY

CLIENT
SUNSHINE COAST REGIONAL DISTRICT

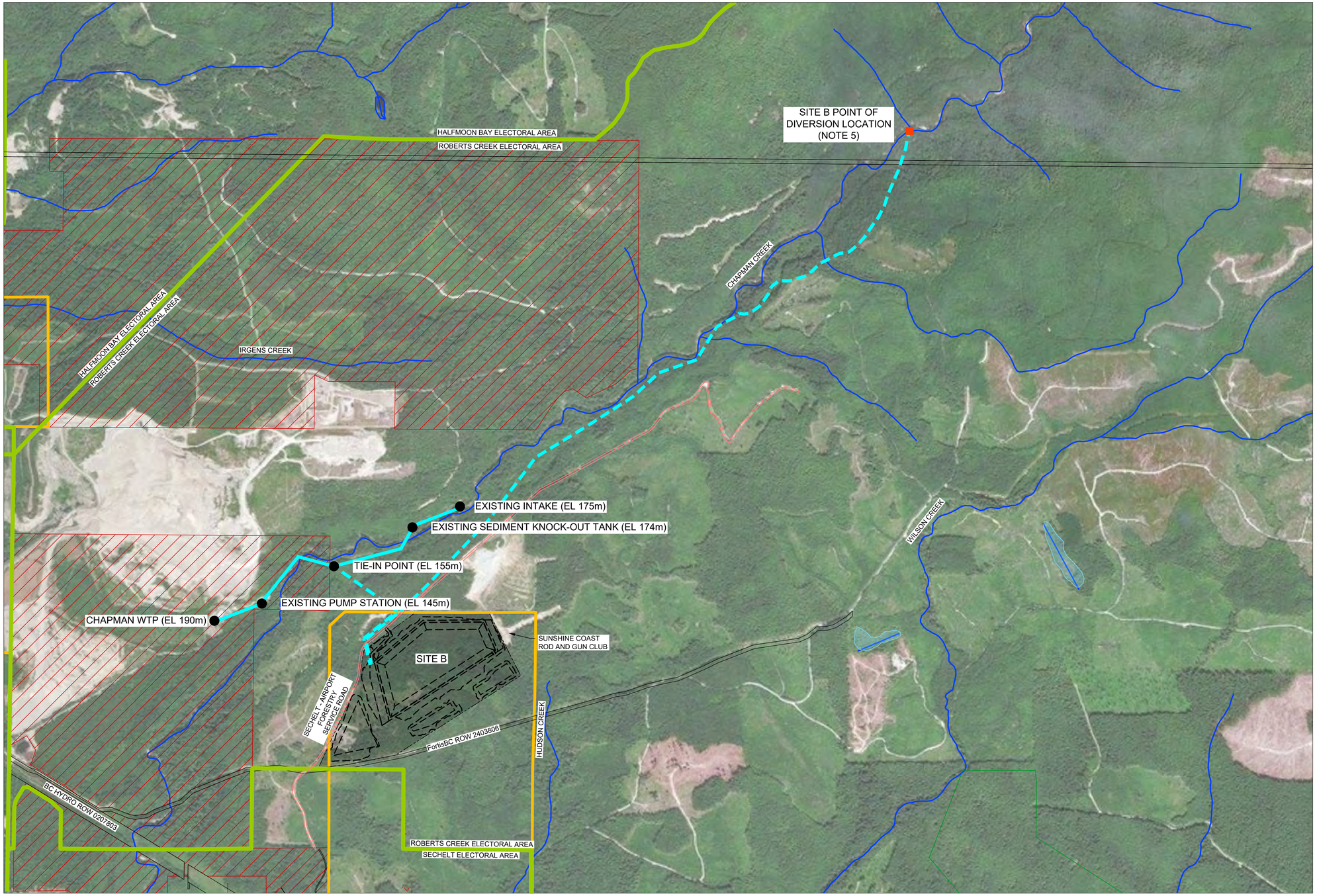
SUNSHINE COAST REGIONAL DISTRICT
RAW WATER RESERVOIR FEASIBILITY STUDY
SITE B
DESIGN PROFILES

DRAWN BY	CHECKED BY	ENGINEERED BY
D. HELYAR	H. MASSONG	A. SPERSKE

SCALE	PROJ NO	DRAWING NO	REV
AS NOTED	VP19-SCR-01-00	VP19-SCR-01-00-DWG-CI-203	B

SCALE APPLIES IF PRINTED ON SIZE 'D' (22"X34") PAPER

PLOTTED: 2019-10-30 9:19 AM, FILENAME: W:\Sunshine Coast Regional District\VP19-SCR-01-00\58 Civil-Earthworks\C3D\Production Drawings\VP19-SCR-01-00-DWG-CI-201-204.dwg, BY: CHERYL DORNAN



GENERAL NOTES:

1. FOR GENERAL NOTES, REFER TO DRAWING VP19-SCR-01-00-DWG-CI-201.
2. LOCATIONS OF EXISTING CHAPMAN WATER SYSTEM INFRASTRUCTURE ARE APPROXIMATE.
3. LOCATION OF TIE-IN TO EXISTING CHAPMAN WATER CONVEYANCE PIPELINE IS APPROXIMATE.
4. SITE B WATER CONVEYANCE .PIPELINE ALIGNMENT IS APPROXIMATE, AND SHOULD BE CONFIRMED DURING FUTURE DESIGN STAGES.
5. SITE B POINT OF DIVERSION LOCATION IS APPROXIMATE, AND BASED ON THE LOCATION IDENTIFIED AS 'SITE B POD SITE 2' AT APPROXIMATE ELEVATION 300m. THE SITE B POINT OF DIVERSION LOCATION SHOULD BE CONFIRMED DURING FUTURE DESIGN STAGES. INTAKE DESIGN FOR THE SELECTED POINT OF DIVERSION LOCATION TO BE INCLUDED IN FUTURE DESIGN STAGES.
6. ALL ELEVATIONS OF EXISTING CHAPMAN WATER SYSTEM INFRASTRUCTURE ARE APPROXIMATE.
7. CURRENT DESIGN PLANS ARE SCOPING - LEVEL BASED ON THE SITE CHARACTERIZATION COMPLETED TO DATE. DESIGN IS TO BE PROGRESSED AND CONFIRMED BASED ON DETAILED SITE CHARACTERIZATION AND CONSTRAINTS.

LEGEND:

- SITE BOUNDARY
- SITE AREA (43.36ha)
- AGRICULTURAL LAND RESERVE (ALR) (NOTE 4)
- WATERCOURSE
- DESIGN BREAKLIINE
- APPROXIMATE SITE B POINT OF DIVERSION LOCATION
- EXISTING CHAPMAN RAW WATER PIPELINE
- PROPOSED SITE B WATER CONVEYANCE PIPELINE
- GRAVEL LANDS (SHÍSHÁLH NATION FOUNDATION AGREEMENT)
- SCRD ELECTORAL AREA BOUNDARY
- DIGITIZED ROAD (FROM BING MAP)

0 100 200 300 400 500m
SCALE 1 : 10,000
UTM NAD83 ZONE 10

NOT FOR CONSTRUCTION

REFERENCE DOCUMENTS		REV	DESCRIPTION	BY	DATE (YYYY-MM-DD)	CHK	APP	PE
				DH		HM	AJS	AJS
VP18-SCR-01-00-DWG-CI-201	EXISTING CONDITIONS PLAN	B	ISSUED AS FINAL	DH	2019-10-29	HM	AJS	AJS
		A	ISSUED FOR REVIEW	DH	2019-09-27	HM	AJS	AJS

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA A. J. SPERSKE # 29 OCT 2019

PREPARED BY: INTEGRATED SUSTAINABILITY

CLIENT: SUNSHINE COAST REGIONAL DISTRICT

SUNSHINE COAST REGIONAL DISTRICT
RAW WATER RESERVOIR FEASIBILITY STUDY
SITE B
SUPPORTING INFRASTRUCTURE

DRAWN BY	CHECKED BY	ENGINEERED BY
D. HELYAR	H. MASSONG	A. SPERSKE

SCALE	PROJ NO	DRAWING NO	REV
1:10,000	VP19-SCR-01-00	VP19-SCR-01-00-DWG-CI-204	B

SCALE APPLIES IF PRINTED ON SIZE 'D' (22"X34") PAPER

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SUNSHINE COAST REGIONAL DISTRICT

RAW WATER RESERVOIR
FEASIBILITY STUDY
SITE C3

ISSUED AS FINAL
29 OCTOBER 2019

INTEGRATED SUSTAINABILITY

DRAWING LIST				
No.	REV.	DATE	ISSUE	TITLE
VP19-SCR-01-00-DWG-CI-301	B	2019-10-29	ISSUED AS FINAL	EXISTING CONDITIONS PLAN
VP19-SCR-01-00-DWG-CI-302	B	2019-10-29	ISSUED AS FINAL	DESIGN PLAN
VP19-SCR-01-00-DWG-CI-303	B	2019-10-29	ISSUED AS FINAL	DESIGN PROFILES
VP19-SCR-01-00-DWG-CI-304	B	2019-10-29	ISSUED AS FINAL	SUPPORTING INFRASTRUCTURE - PLANS
VP19-SCR-01-00-DWG-CI-305	B	2019-10-29	ISSUED AS FINAL	SUPPORTING INFRASTRUCTURE - PROFILES

PLOTTED: 2019-10-28 2:44 PM, FILENAME: W:\Sunshine Coast Regional District\VP19-SCR-01-00\58 Civil-Earthworks\C3D\Production Drawings\VP19-SCR-01-00-DWG-CI-300.dwg, BY: DAVE HELYAR

GENERAL NOTES:

1. LIDAR SOURCE: GOVERNMENT OF BRITISH COLUMBIA (GEOBC, MINISTRY OF FORESTS, LANDS AND NATURAL RESOURCE OPERATIONS AND RURAL DEVELOPMENT); RECEIVED 2019-08-23.
2. AREA FEATURES SOURCE: SUNSHINE COAST REGIONAL DISTRICT; RECEIVED 2019-01-15.
3. AERIAL IMAGE FROM BING, 2019.
4. ALL ELEVATIONS ARE MEASURED IN METERS. ALL DIMENSIONS ARE SHOWN IN METERS, UNLESS NOTED OTHERWISE.
5. OG = ORIGINAL GROUND.
6. SITE IS LOCATED WITHIN ELECTORAL AREA D: ROBERTS CREEK.
7. SITE IS LOCATED WITHIN B/92-G-12.
8. WATERCOURSES (SOURCE: SUNSHINE COAST REGIONAL DISTRICT; RECEIVED 2019-01-15) LOCATIONS ARE APPROXIMATE.
9. EXISTING LAKE PERIMETER FROM LIDAR COLLECTED IN JUNE 2019.
10. CURRENT DESIGN PLANS ARE SCOPING - LEVEL BASED ON THE SITE CHARACTERIZATION COMPLETED TO DATE. DESIGN IS TO BE PROGRESSED AND CONFIRMED BASED ON DETAILED SITE CHARACTERIZATION AND CONSTRAINTS.

LEGEND:

- SITE BOUNDARY
- SITE AREA (23.27ha)
- OG MAJOR CONTOUR (LiDAR) (25.0m INTERVAL)
- OG MINOR CONTOUR (LiDAR) (5.0m INTERVAL)
- WATERCOURSE (NOTE 8, 10)
- DESIGN BREAKLIINE

0 25 50 75m
SCALE 1 : 1,500
UTM NAD83 ZONE 10

NOT FOR CONSTRUCTION

REFERENCE DOCUMENTS	REV	DESCRIPTION	BY	DATE (YYYY-MM-DD)	CHK	APP	PE
			DH		HM	AJS	AJS
	B	ISSUED AS FINAL	DH	2019-10-29	HM	AJS	AJS
	A	ISSUED FOR REVIEW	DH	2019-10-11	HM	AJS	AJS

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA — A. J. SPERSKE — 29 OCT 2019

PREPARED BY
INTEGRATED SUSTAINABILITY

CLIENT
SUNSHINE COAST REGIONAL DISTRICT

SUNSHINE COAST REGIONAL DISTRICT
RAW WATER RESERVOIR FEASIBILITY STUDY
SITE C3
EXISTING CONDITIONS PLAN

DRAWN BY	CHECKED BY	ENGINEERED BY
D. HELYAR	H. MASSONG	A. SPERSKE

SCALE	PROJ NO	DRAWING NO	REV
1:1,500	VP19-SCR-01-00	VP19-SCR-01-00-DWG-CI-301	B

SCALE APPLIES IF PRINTED ON SIZE 'D' (22"X34") PAPER

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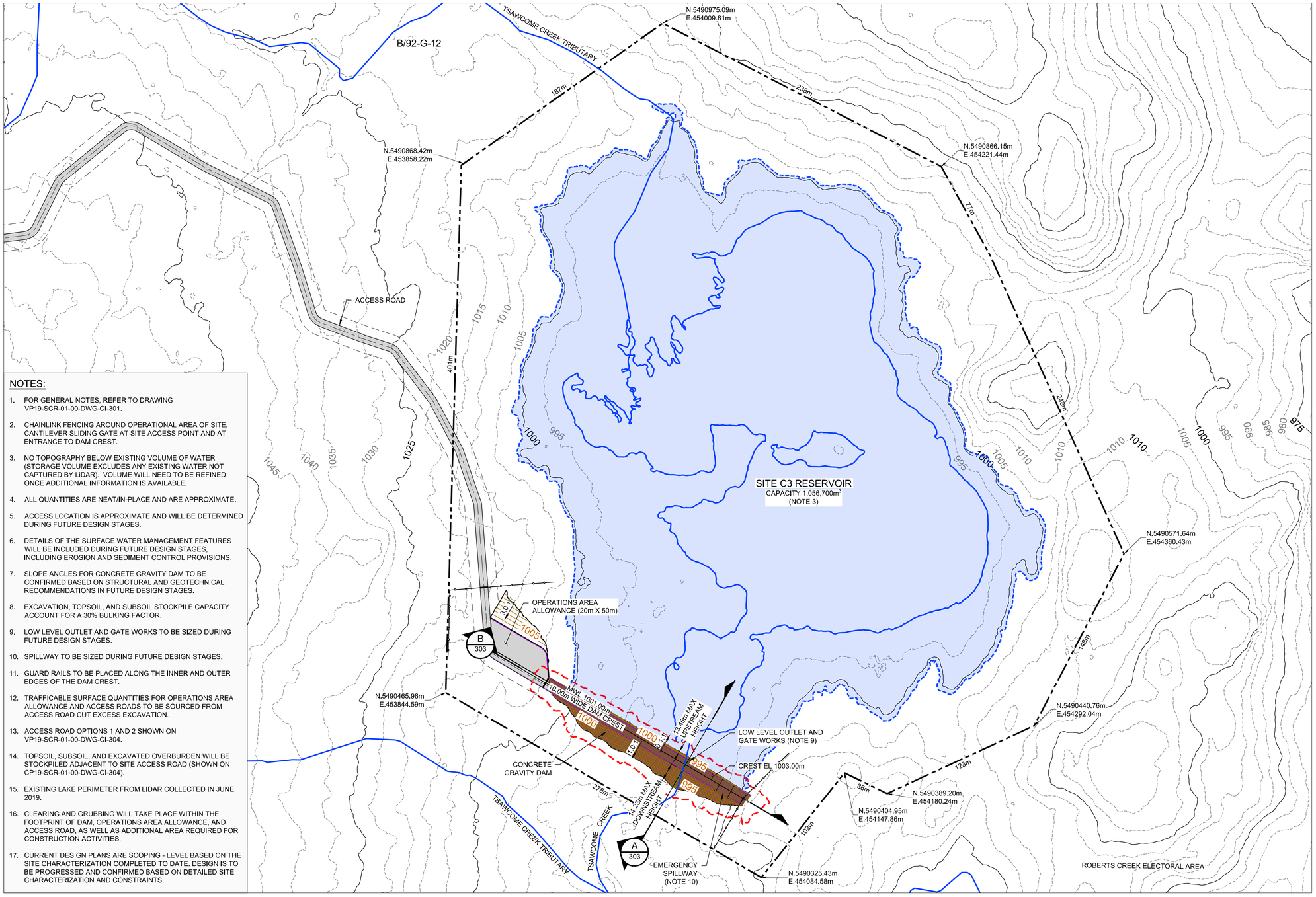

NOTES:

1. FOR GENERAL NOTES, REFER TO DRAWING VP19-SCR-01-00-DWG-CI-301.
2. CHAINLINK FENCING AROUND OPERATIONAL AREA OF SITE. CANTILEVER SLIDING GATE AT SITE ACCESS POINT AND AT ENTRANCE TO DAM CREST.
3. NO TOPOGRAPHY BELOW EXISTING VOLUME OF WATER (STORAGE VOLUME EXCLUDES ANY EXISTING WATER NOT CAPTURED BY LiDAR). VOLUME WILL NEED TO BE REFINED ONCE ADDITIONAL INFORMATION IS AVAILABLE.
4. ALL QUANTITIES ARE NEAT/IN-PLACE AND ARE APPROXIMATE.
5. ACCESS LOCATION IS APPROXIMATE AND WILL BE DETERMINED DURING FUTURE DESIGN STAGES.
6. DETAILS OF THE SURFACE WATER MANAGEMENT FEATURES WILL BE INCLUDED DURING FUTURE DESIGN STAGES, INCLUDING EROSION AND SEDIMENT CONTROL PROVISIONS.
7. SLOPE ANGLES FOR CONCRETE GRAVITY DAM TO BE CONFIRMED BASED ON STRUCTURAL AND GEOTECHNICAL RECOMMENDATIONS IN FUTURE DESIGN STAGES.
8. EXCAVATION, TOPSOIL, AND SUBSOIL STOCKPILE CAPACITY ACCOUNT FOR A 30% BULKING FACTOR.
9. LOW LEVEL OUTLET AND GATE WORKS TO BE SIZED DURING FUTURE DESIGN STAGES.
10. SPILLWAY TO BE SIZED DURING FUTURE DESIGN STAGES.
11. GUARD RAILS TO BE PLACED ALONG THE INNER AND OUTER EDGES OF THE DAM CREST.
12. TRAFFICABLE SURFACE QUANTITIES FOR OPERATIONS AREA ALLOWANCE AND ACCESS ROADS TO BE SOURCED FROM ACCESS ROAD CUT EXCESS EXCAVATION.
13. ACCESS ROAD OPTIONS 1 AND 2 SHOWN ON VP19-SCR-01-00-DWG-CI-304.
14. TOPSOIL, SUBSOIL, AND EXCAVATED OVERBURDEN WILL BE STOCKPILED ADJACENT TO SITE ACCESS ROAD (SHOWN ON CP19-SCR-01-00-DWG-CI-304).
15. EXISTING LAKE PERIMETER FROM LIDAR COLLECTED IN JUNE 2019.
16. CLEARING AND GRUBBING WILL TAKE PLACE WITHIN THE FOOTPRINT OF DAM, OPERATIONS AREA ALLOWANCE, AND ACCESS ROAD, AS WELL AS ADDITIONAL AREA REQUIRED FOR CONSTRUCTION ACTIVITIES.
17. CURRENT DESIGN PLANS ARE SCOPING - LEVEL BASED ON THE SITE CHARACTERIZATION COMPLETED TO DATE. DESIGN IS TO BE PROGRESSED AND CONFIRMED BASED ON DETAILED SITE CHARACTERIZATION AND CONSTRAINTS.

LEGEND:

- SITE BOUNDARY
- OG MAJOR CONTOUR (LiDAR) (25.0m INTERVAL)
- OG MINOR CONTOUR (LiDAR) (5.0m INTERVAL)
- WATERCOURSE (APPROX)
- DESIGN MAJOR CONTOUR (5.0m INTERVAL)
- DESIGN MINOR CONTOUR (1.0m INTERVAL)
- CONCRETE
- DESIGN MWL
- EXCAVATION LIMITS
- CHAINLINK FENCE (NOTE 2)
- TRAFFICABLE SURFACE
- GUARD RAIL

EARTHWORK QUANTITIES

SITE AREA	23.27 ha
TOPSOIL STRIPPING (ASSUMED 400mm) (NOTE 14)	3,231 m³
SUBSOIL STRIPPING (ASSUMED 200mm) (NOTE 14)	1,615 m³
OVERBURDEN EXCAVATION (NOTE 14)	15,174 m³
OVERCUT FILL	3,034 m³
PREPARED SUBGRADE	0 m³

TRAFFICABLE SURFACE QUANTITIES (NOTE 12)

OPERATIONS AREA ALLOWANCE

25mm MINUS TRAFFIC SURFACING CRUSHED GRAVEL	75 m³
80mm MINUS ROAD BASE CRUSHED GRAVEL	297 m³

CONCRETE QUANTITIES

CONCRETE DAM	28,339 m³

GENERAL QUANTITIES

FENCE LENGTH	216 m
CANTILEVER SLIDING GATE	2 QTY
PERSONNEL GATE	3 QTY
GUARD RAILS	447 m
1.0m Ø PIPE w/ GATE WORKS AND PLATFORM	30 m

ACCESS ROAD QUANTITIES (NOTE 12)

OPTION 1 (NOTE 13)

25mm MINUS TRAFFIC SURFACING CRUSHED GRAVEL	686 m³
80mm MINUS ROAD BASE CRUSHED GRAVEL	2,741 m³
TOPSOIL STRIPPING (ASSUMED 100mm)	3,046 m³
SUBSOIL STRIPPING (ASSUMED 100mm)	3,046 m³

OPTION 2 (NOTE 13)

25mm MINUS TRAFFIC SURFACING CRUSHED GRAVEL	1,771 m³
80mm MINUS ROAD BASE CRUSHED GRAVEL	7,081 m³
TOPSOIL STRIPPING (ASSUMED 100mm)	7,868 m³
SUBSOIL STRIPPING (ASSUMED 100mm)	7,868 m³

0 25 50 75m
SCALE 1 : 1,500
UTM NAD83 ZONE 10

NOT FOR CONSTRUCTION

REFERENCE DOCUMENTS	REV	DESCRIPTION	BY	DATE (YYYY-MM-DD)	CHK	APP	PE
VP19-SCR-01-00-DWG-CI-304	SUPPORTING INFRASTRUCTURE - PLANS		DH		HM	AJS	AJS
VP19-SCR-01-00-DWG-CI-303	DESIGN PROFILES	B	ISSUED AS FINAL	DH	2019-10-29	HM	AJS	AJS
VP19-SCR-01-00-DWG-CI-301	EXISTING CONDITIONS PLAN	A	ISSUED FOR REVIEW	DH	2019-10-11	HM	AJS	AJS

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA A.J. SPERSKE # 29 OCT 2019

PREPARED BY
INTEGRATED SUSTAINABILITY

CLIENT
SUNSHINE COAST REGIONAL DISTRICT

SUNSHINE COAST REGIONAL DISTRICT
RAW WATER RESERVOIR FEASIBILITY STUDY
SITE C3
DESIGN PLAN

DRAWN BY	CHECKED BY	ENGINEERED BY
D. HELYAR	H. MASSONG	A. SPERSKE

SCALE	PROJ NO	DRAWING NO	REV
1:1,500	VP19-SCR-01-00	VP19-SCR-01-00-DWG-CI-302	B

SCALE APPLIES IF PRINTED ON SIZE "D" (22"X34") PAPER

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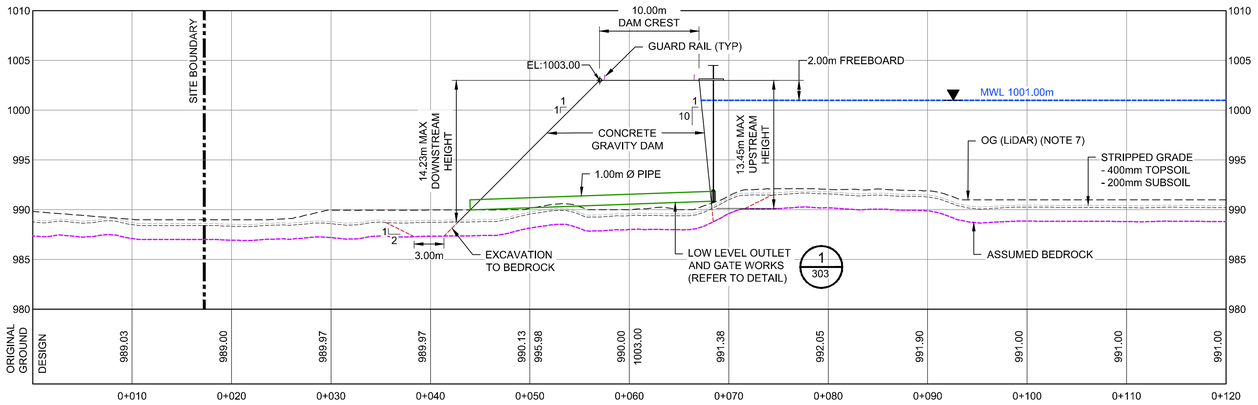
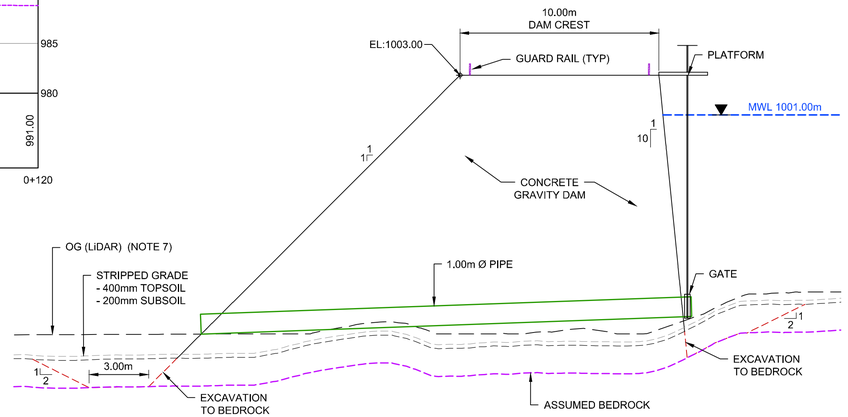


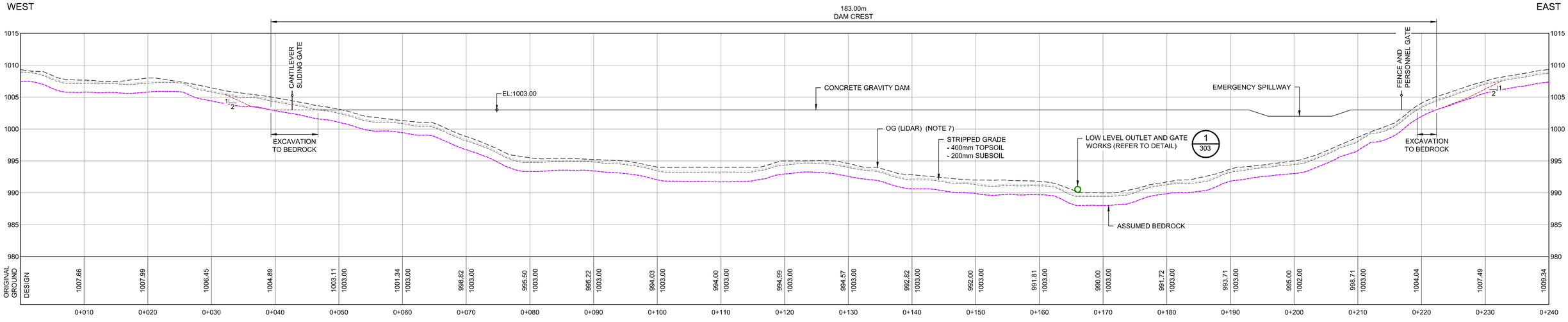
A 302 SOUTH-NORTH PROFILE
1:300



1 303 LOW LEVEL OUTLET AND GATE WORKS
1:150

NOTES:

1. FOR GENERAL NOTES, REFER TO DRAWING VP19-SCR-01-00-DWG-CI-301.
2. DESIGN OF SEEPAGE MANAGEMENT STRUCTURES (I.E. DRAINS, FILTERS, ETC.) WITHIN THE FOUNDATION TO BE COMPLETED DURING FUTURE DESIGN STAGES.
3. FOUNDATION TREATMENT AND GROUTING DESIGN TO BE COMPLETED DURING FUTURE DESIGN STAGES.
4. DETAILS OF THE SURFACE WATER MANAGEMENT FEATURES WILL BE INCLUDED DURING FUTURE DESIGN STAGES.
5. SLOPE ANGLES FOR CONCRETE GRAVITY DAM TO BE CONFIRMED BASED ON STRUCTURAL AND GEOTECHNICAL RECOMMENDATIONS IN FUTURE DESIGN STAGES.
6. LOW LEVEL OUTLET AND GATE WORKS TO BE SIZED DURING FUTURE DESIGN PHASES. LOW LEVEL OUTLET PIPE MAY BE EXTENDED TO MAXIMIZE WATER OUTFLOW FROM LAKE.
7. LIDAR SURFACE DOES NOT INCLUDE SURFACE OF EXISTING LAKE BOTTOM AND INSTEAD FOLLOWS EXISTING LAKE SURFACE.
8. CURRENT DESIGN PLANS ARE SCOPING - LEVEL BASED ON THE SITE CHARACTERIZATION COMPLETED TO DATE. DESIGN IS TO BE PROGRESSED AND CONFIRMED BASED ON DETAILED SITE CHARACTERIZATION AND CONSTRAINTS.



B 302 WEST - EAST PROFILE
1:300

0 5 10 15m
SCALE 1 : 300

NOT FOR CONSTRUCTION

				DH		HM		
VP19-SCR-01-00-DWG-CI-302	DESIGN PLAN	B	ISSUED AS FINAL	DH	2019-10-29	HM	AJS	AJS
VP19-SCR-01-00-DWG-CI-301	EXISTING CONDITIONS PLAN	A	ISSUED FOR REVIEW	DH	2019-10-11	HM	AJS	AJS
REFERENCE DOCUMENTS		REV	DESCRIPTION	BY	DATE (YYYY-MM-DD)	CHK	APP	PE

PROFESSIONAL ENGINEER A. J. SPERSKE # 37 PROVINCE OF BRITISH COLUMBIA 29 OCT 2019

PREPARED BY
INTEGRATED SUSTAINABILITY

CLIENT
SUNSHINE COAST REGIONAL DISTRICT

SUNSHINE COAST REGIONAL DISTRICT
RAW WATER RESERVOIR FEASIBILITY STUDY
SITE C3
DESIGN PROFILES

DRAWN BY	CHECKED BY	ENGINEERED BY
D. HELYAR	H. MASSONG	A. SPERSKE

SCALE	PROJ NO	DRAWING NO	REV
AS NOTED	VP19-SCR-01-00	VP19-SCR-01-00-DWG-CI-303	B

SCALE APPLIES IF PRINTED ON SIZE "D" (22"X34") PAPER

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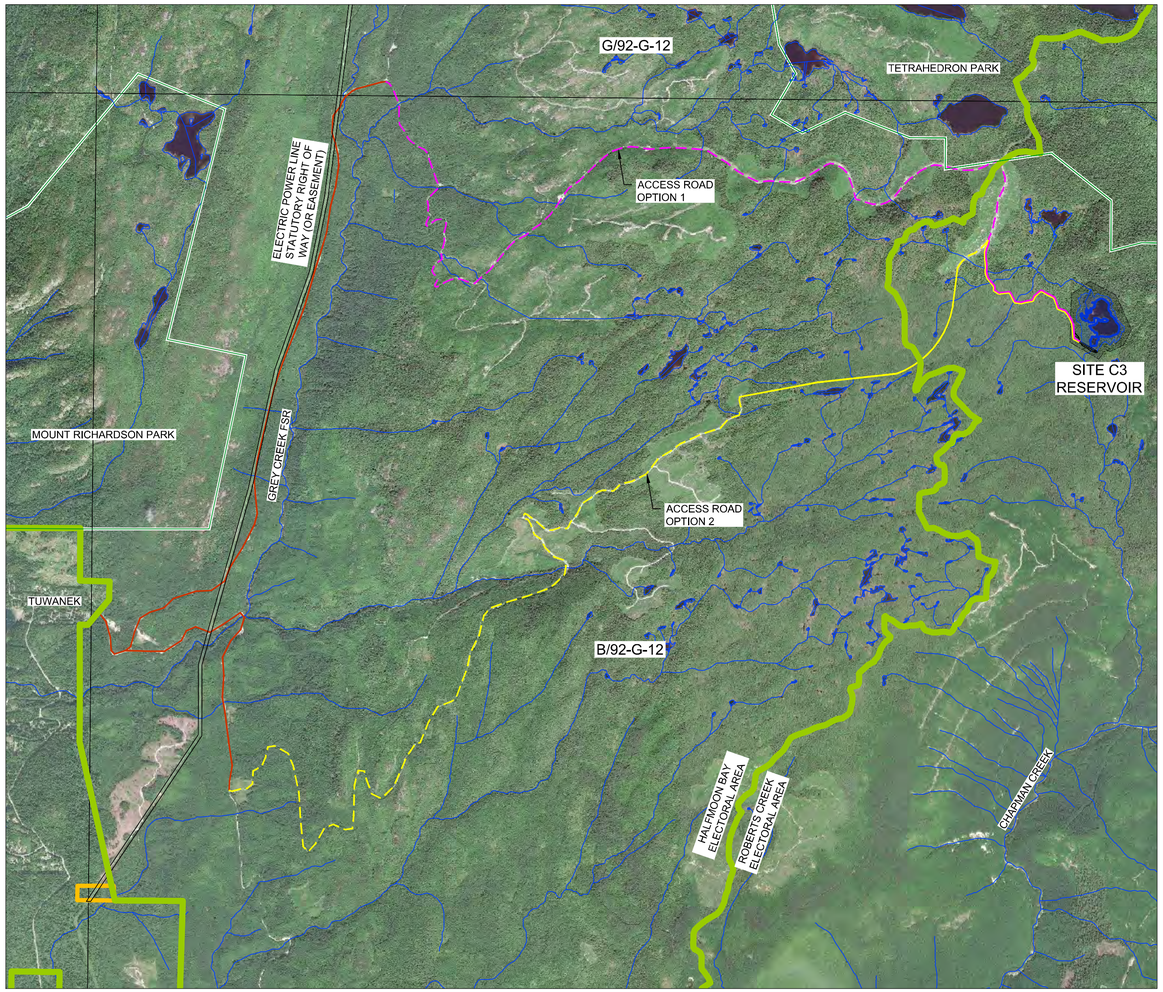
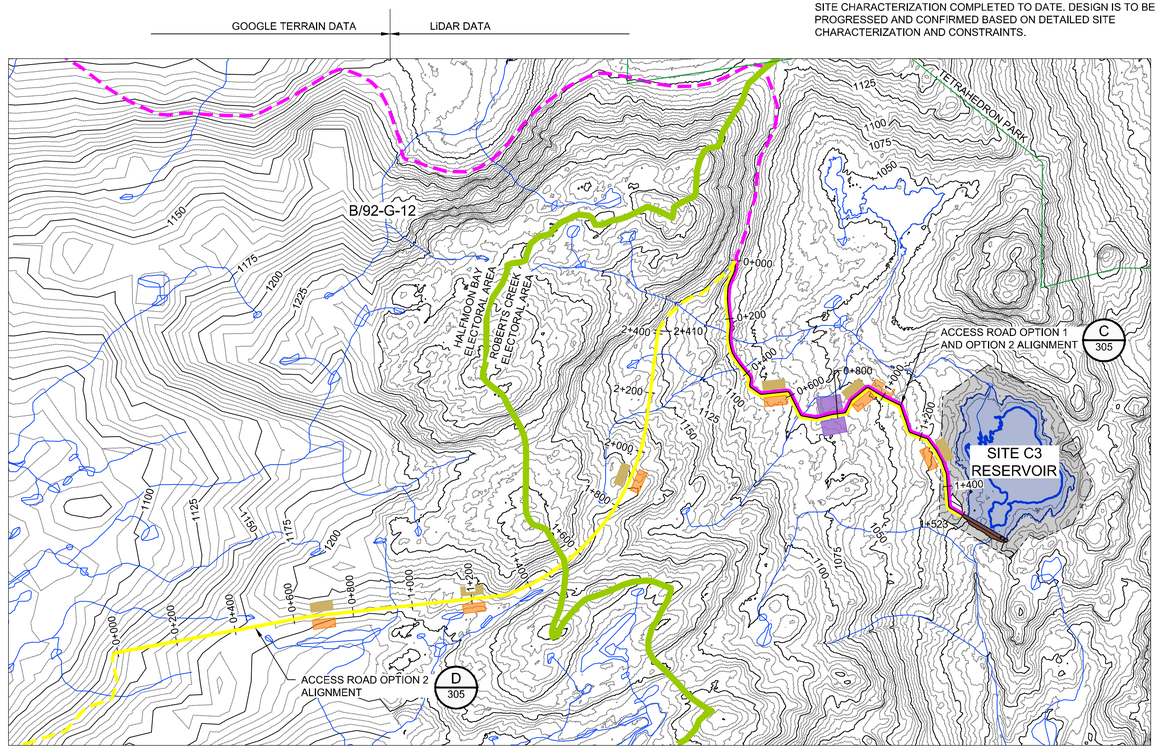


AERIAL VIEW OF ACCESS ROAD OPTIONS FOR SITE C3
1:25,000

0 250 500 750 1000m
SCALE 1 : 25,000

NOTES:

1. FOR GENERAL NOTES, REFER TO DRAWING VP19-SCR-01-00-DWG-CI-301.
2. ORIGINAL GROUND (OG) CONSISTS OF LiDAR AND GOOGLE TERRAIN TOPOGRAPHY.
3. ACCESS ROAD DESIGN DETAILS WILL BE INCLUDED DURING FUTURE DESIGN STAGES.
4. DETAILS OF THE SURFACE WATER MANAGEMENT FEATURES WILL BE INCLUDED DURING FUTURE DESIGN STAGES.
5. STOCKPILE LOCATIONS ARE APPROXIMATE AND WILL BE CONFIRMED DURING FUTURE DESIGN STAGES.
6. EXISTING, DECOMMISSIONED ROAD WOULD REQUIRE UPGRADES TO UTILIZE FOR SITE ACCESS.
7. CURRENT DESIGN PLANS ARE SCOPING - LEVEL BASED ON THE SITE CHARACTERIZATION COMPLETED TO DATE. DESIGN IS TO BE PROGRESSED AND CONFIRMED BASED ON DETAILED SITE CHARACTERIZATION AND CONSTRAINTS.



SITE C3 ACCESS ROAD OPTIONS - ALIGNMENTS
1:10,000

0 100 200 300 400 500m
SCALE 1 : 10,000

LEGEND:

SITE BOUNDARY		EXISTING (ACTIVE) ROAD	
SITE AREA		OPTION 1 NEW SITE ACCESS ROAD	
OG MAJOR CONTOUR (25.0m INTERVAL) (NOTE 2)		OPTION 1 EXISTING, DECOMMISSIONED ROAD (NOTE 6)	
OG MINOR CONTOUR (5.0m INTERVAL) (NOTE 2)		OPTION 2 NEW SITE ACCESS ROAD	
WATERCOURSE (APPROX)		OPTION 2 EXISTING, DECOMMISSIONED ROAD (NOTE 6)	
PARK BOUNDARY		TOPSOIL STOCKPILE (NOTE 5)	
SCRD ELECTORAL AREA BOUNDARY		SUBSOIL STOCKPILE (NOTE 5)	
DESIGN MWL		OVERBURDEN STOCKPILE (NOTE 5)	

NOT FOR CONSTRUCTION

REFERENCE DOCUMENTS		REV	DESCRIPTION	BY	DATE (YYYY-MM-DD)	CHK	APP	PE
				DH		HM	AJS	AJS
VP19-SCR-01-00-DWG-CI-305	SUPPORTING INFRASTRUCTURE - PROFILES	B	ISSUED AS FINAL	DH	2019-10-29	HM	AJS	AJS
VP19-SCR-01-00-DWG-CI-301	EXISTING CONDITIONS PLAN	A	ISSUED FOR REVIEW	DH	2019-10-11	HM	AJS	AJS

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA A.J. SPERSKE 29 OCT 2019

PREPARED BY
INTEGRATED SUSTAINABILITY

CLIENT
SUNSHINE COAST REGIONAL DISTRICT

SUNSHINE COAST REGIONAL DISTRICT
RAW WATER RESERVOIR FEASIBILITY STUDY
SITE C3
SUPPORTING INFRASTRUCTURE - PLANS

DRAWN BY	CHECKED BY	ENGINEERED BY
D. HELYAR	H. MASSONG	A. SPERSKE

SCALE	PROJ NO	DRAWING NO	REV
AS NOTED	VP19-SCR-01-00	VP19-SCR-01-00-DWG-CI-304	B

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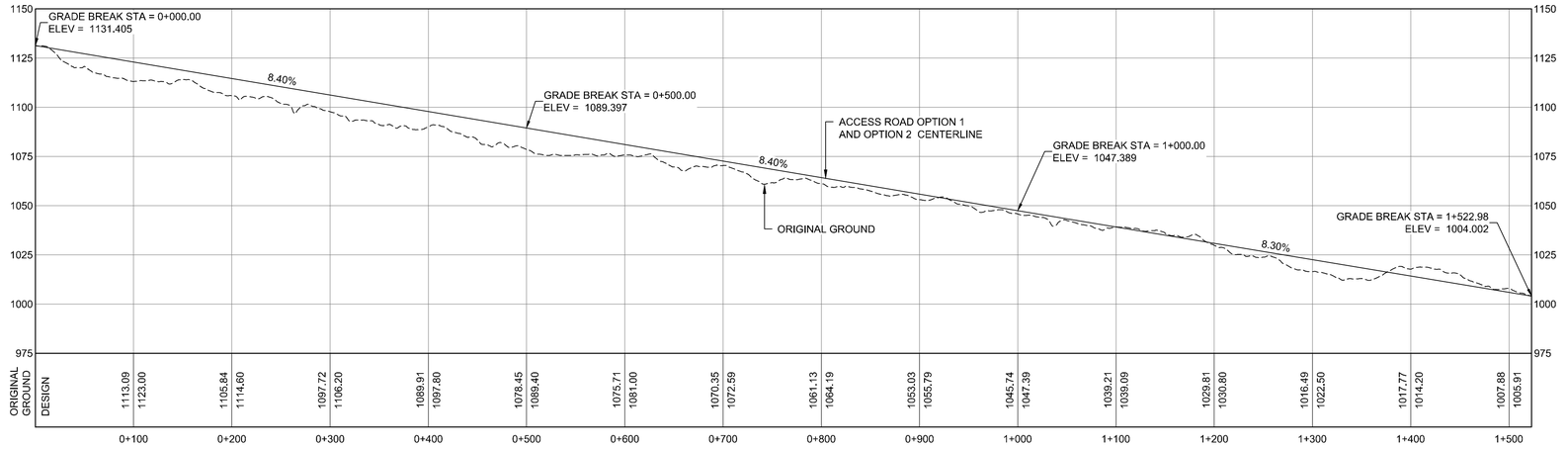
NORTHWEST

SOUTHEAST



C 304 ACCESS ROAD OPTION 1 AND OPTION 2 ALIGNMENT PROFILE

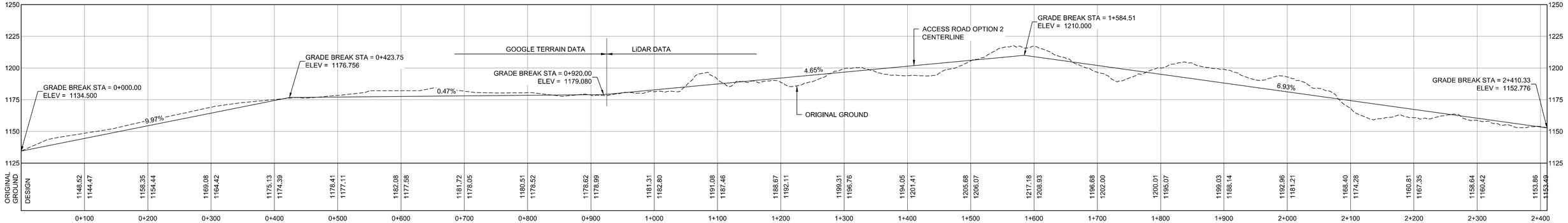
VER. 1:1,500
HOR. 1:3,000

NOTES:

1. FOR GENERAL NOTES, REFER TO DRAWING VP19-SCR-01-00-DWG-CI-301.
2. ACCESS ROAD DESIGN DETAILS WILL BE INCLUDED DURING FUTURE DESIGN STAGES.
3. CURRENT DESIGN PLANS ARE SCOPING - LEVEL BASED ON THE SITE CHARACTERIZATION COMPLETED TO DATE. DESIGN IS TO BE PROGRESSED AND CONFIRMED BASED ON DETAILED SITE CHARACTERIZATION AND CONSTRAINTS.

SOUTHWEST

NORTHEAST



D 304 ACCESS ROAD OPTION 2 ALIGNMENT PROFILE

VER. 1:1,500
HOR. 1:3,000

VER. 1 : 1,500
0 25 50 75m
HOR. 1 : 3,000
0 25 50 75 100 125 150m

NOT FOR CONSTRUCTION

REFERENCE DOCUMENTS		REV	DESCRIPTION	BY	DATE (YYYY-MM-DD)	CHK	APP	PE
				DH		HM	AJS	AJS
VP19-SCR-01-00-DWG-CI-304	SUPPORTING INFRASTRUCTURE - PLANS	B	ISSUED AS FINAL	DH	2019-10-29	HM	AJS	AJS
VP19-SCR-01-00-DWG-CI-301	EXISTING CONDITIONS PLAN	A	ISSUED FOR REVIEW	DH	2019-11	HM	AJS	AJS

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA A.J. SPERSKE 29 OCT 2019

PREPARED BY
INTEGRATED SUSTAINABILITY

CLIENT
SUNSHINE COAST REGIONAL DISTRICT

SUNSHINE COAST REGIONAL DISTRICT
RAW WATER RESERVOIR FEASIBILITY STUDY
SITE C3
SUPPORTING INFRASTRUCTURE - PROFILES

DRAWN BY	CHECKED BY	ENGINEERED BY
D. HELYAR	H. MASSONG	A. SPERSKE

SCALE	PROJ NO	DRAWING NO	REV
AS NOTED	VP19-SCR-01-00	VP19-SCR-01-00-DWG-CI-305	B

SCALE APPLIES IF PRINTED ON SIZE "D" (22"X34") PAPER

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SUNSHINE COAST REGIONAL DISTRICT

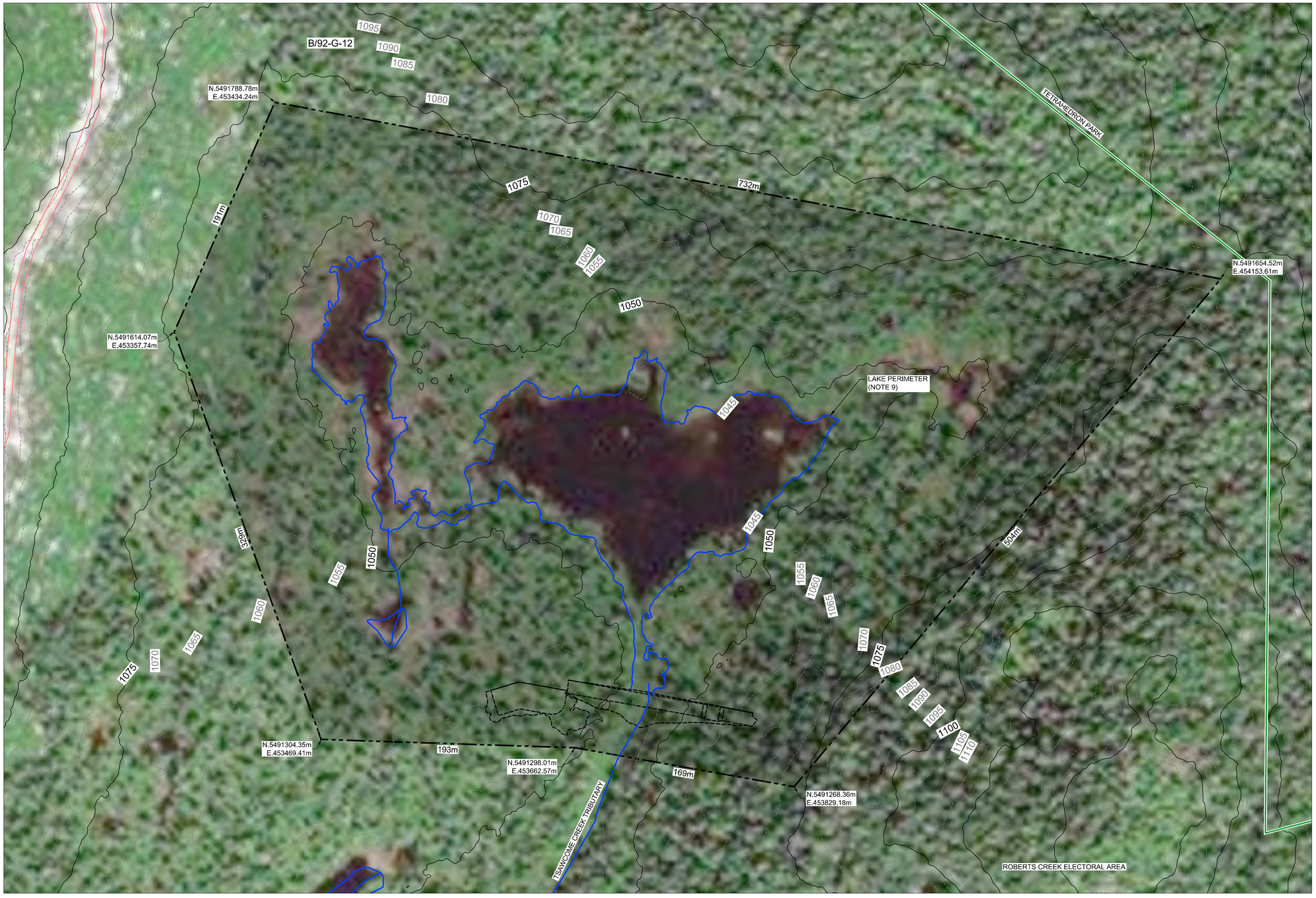
RAW WATER RESERVOIR
FEASIBILITY STUDY
SITE C4

ISSUED AS FINAL
29 OCTOBER 2019

INTEGRATED SUSTAINABILITY

DRAWING LIST				
No.	REV.	DATE	ISSUE	TITLE
VP19-SCR-01-00-DWG-CI-401	B	2019-10-29	ISSUED AS FINAL	EXISTING CONDITIONS PLAN
VP19-SCR-01-00-DWG-CI-402	B	2019-10-29	ISSUED AS FINAL	DESIGN PLAN
VP19-SCR-01-00-DWG-CI-403	B	2019-10-29	ISSUED AS FINAL	DESIGN PROFILES
VP19-SCR-01-00-DWG-CI-404	B	2019-10-29	ISSUED AS FINAL	SUPPORTING INFRASTRUCTURE - PLANS
VP19-SCR-01-00-DWG-CI-405	B	2019-10-29	ISSUED AS FINAL	SUPPORTING INFRASTRUCTURE - PROFILES

PLOTTED: 2019-10-28 3:10 PM, FILENAME: W:\Sunshine Coast Regional District\VP19-SCR-01-00\58 Civil-Earthworks\C3D\Production Drawings\VP19-SCR-01-00-DWG-CI-400.dwg, BY: DAVE HELYAR



GENERAL NOTES:

1. LIDAR SOURCE: GOVERNMENT OF BRITISH COLUMBIA (GEOBC, MINISTRY OF FORESTS, LANDS AND NATURAL RESOURCE OPERATIONS AND RURAL DEVELOPMENT); RECEIVED 2019-08-23.
2. AREA FEATURES SOURCE: SUNSHINE COAST REGIONAL DISTRICT; RECEIVED 2019-01-15.
3. AERIAL IMAGE FROM BING, 2019.
4. ALL ELEVATIONS ARE MEASURED IN METERS. ALL DIMENSIONS ARE SHOWN IN METERS, UNLESS NOTED OTHERWISE.
5. OG = ORIGINAL GROUND.
6. SITE IS LOCATED WITHIN ELECTORAL AREA D: ROBERTS CREEK.
7. SITE IS LOCATED WITHIN B/92-G-12.
8. WATERCOURSES (SOURCE: SUNSHINE COAST REGIONAL DISTRICT; RECEIVED 2019-10-15) LOCATIONS ARE APPROXIMATE.
9. EXISTING LAKE PERIMETER FROM LIDAR COLLECTED IN JUNE 2019.
10. CURRENT DESIGN PLANS ARE SCOPING - LEVEL BASED ON THE SITE CHARACTERIZATION COMPLETED TO DATE. DESIGN IS TO BE PROGRESSED AND CONFIRMED BASED ON DETAILED SITE CHARACTERIZATION AND CONSTRAINTS.

LEGEND:

- SITE BOUNDARY
- SITE AREA (26.64ha)
- OG MAJOR CONTOUR (LiDAR) (25.0m INTERVAL)
- OG MINOR CONTOUR (LiDAR) (5.0m INTERVAL)
- WATERCOURSE (NOTE 8, 10)
- PARK BOUNDARY
- EXISTING DEACTIVATED ROAD (FROM BING MAP)
- DESIGN BREAKLIINE

0 25 50 75m
SCALE 1 : 1,500
UTM NAD83 ZONE 10

NOT FOR CONSTRUCTION

REV	DESCRIPTION	BY	DATE (YYYY-MM-DD)	CHK	APP	PE
		DH		HM	AJS	AJS
B	ISSUED AS FINAL	DH	2019-10-29	HM	AJS	AJS
A	ISSUED FOR REVIEW	DH	2019-10-18	HM	AJS	AJS

REFERENCE DOCUMENTS

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA A.J. SPERSKE 29 OCT 2019

PREPARED BY
INTEGRATED SUSTAINABILITY

CLIENT
SUNSHINE COAST REGIONAL DISTRICT

SUNSHINE COAST REGIONAL DISTRICT
RAW WATER RESERVOIR FEASIBILITY STUDY
SITE C4
EXISTING CONDITIONS PLAN

DRAWN BY	CHECKED BY	ENGINEERED BY
D. HELYAR	H. MASSONG	A. SPERSKE

SCALE	PROJ NO	DRAWING NO	REV
1:1,500	VP19-SCR-01-00	VP19-SCR-01-00-DWG-CI-401	B

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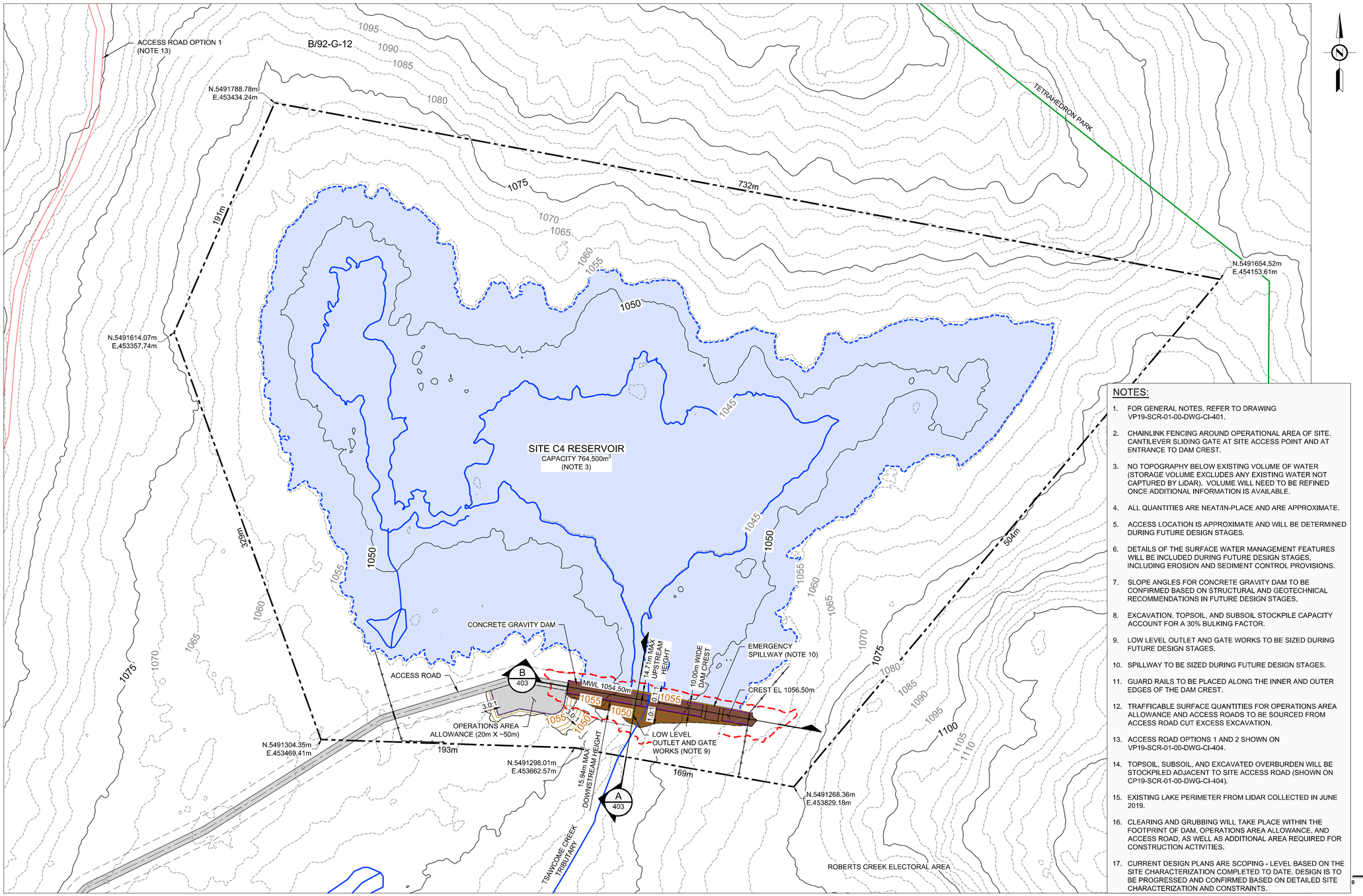

LEGEND:

- SITE BOUNDARY
- OG MAJOR CONTOUR (LiDAR) (25.0m INTERVAL)
- OG MINOR CONTOUR (LiDAR) (5.0m INTERVAL)
- WATERCOURSE (APPROX)
- PARK BOUNDARY
- EXISTING DEACTIVATED ROAD (FROM BING MAP)
- DESIGN MAJOR CONTOUR (5.0m INTERVAL)
- DESIGN MINOR CONTOUR (1.0m INTERVAL)
- CONCRETE
- DESIGN MWL
- EXCAVATION LIMITS
- CHAINLINK FENCE (NOTE 2)
- TRAFFICABLE SURFACE
- GUARD RAIL

EARTHWORK QUANTITIES

SITE AREA	26.64 ha
TOPSOIL STRIPPING (ASSUMED 400mm) (NOTE 14)	3,087 m^3
SUBSOIL STRIPPING (ASSUMED 200mm) (NOTE 14)	1,543 m^3
OVERBURDEN EXCAVATION (NOTE 14)	9,322 m^3
OVERCUT FILL	3,034 m^3
PREPARED SUBGRADE	182 m^3

TRAFFICABLE SURFACE QUANTITIES (NOTE 12)

OPERATIONS AREA ALLOWANCE

25mm MINUS TRAFFIC SURFACING CRUSHED GRAVEL	81 m^3
80mm MINUS ROAD BASE CRUSHED GRAVEL	323 m^3

CONCRETE QUANTITIES

CONCRETE DAM	19,596 m^3

GENERAL QUANTITIES

FENCE LENGTH	200 m
CANTILEVER SLIDING GATE	2 QTY
PERSONNEL GATE	3 QTY
GUARD RAILS	331 m
1.0m Ø PIPE w/ GATE WORKS AND PLATFORM (NOTE 9)	30 m

ACCESS ROAD QUANTITIES (NOTE 12)

OPTION 1 (NOTE 13)

25mm MINUS TRAFFIC SURFACING CRUSHED GRAVEL	555 m^3
80mm MINUS ROAD BASE CRUSHED GRAVEL	2,221 m^3
TOPSOIL STRIPPING (ASSUMED 100mm)	2,468 m^3
SUBSOIL STRIPPING (ASSUMED 100mm)	2,468 m^3

OPTION 2 (NOTE 13)

25mm MINUS TRAFFIC SURFACING CRUSHED GRAVEL	1,640 m^3
80mm MINUS ROAD BASE CRUSHED GRAVEL	6,561 m^3
TOPSOIL STRIPPING (ASSUMED 100mm)	7,290 m^3
SUBSOIL STRIPPING (ASSUMED 100mm)	7,290 m^3

NOTES:

1. FOR GENERAL NOTES, REFER TO DRAWING VP19-SCR-01-00-DWG-CI-401.
2. CHAINLINK FENCING AROUND OPERATIONAL AREA OF SITE. CANTILEVER SLIDING GATE AT SITE ACCESS POINT AND AT ENTRANCE TO DAM CREST.
3. NO TOPOGRAPHY BELOW EXISTING VOLUME OF WATER (STORAGE VOLUME EXCLUDES ANY EXISTING WATER NOT CAPTURED BY LiDAR). VOLUME WILL NEED TO BE REFINED ONCE ADDITIONAL INFORMATION IS AVAILABLE.
4. ALL QUANTITIES ARE NEAT/IN-PLACE AND ARE APPROXIMATE.
5. ACCESS LOCATION IS APPROXIMATE AND WILL BE DETERMINED DURING FUTURE DESIGN STAGES.
6. DETAILS OF THE SURFACE WATER MANAGEMENT FEATURES WILL BE INCLUDED DURING FUTURE DESIGN STAGES, INCLUDING EROSION AND SEDIMENT CONTROL PROVISIONS.
7. SLOPE ANGLES FOR CONCRETE GRAVITY DAM TO BE CONFIRMED BASED ON STRUCTURAL AND GEOTECHNICAL RECOMMENDATIONS IN FUTURE DESIGN STAGES.
8. EXCAVATION, TOPSOIL, AND SUBSOIL STOCKPILE CAPACITY ACCOUNT FOR A 30% BULKING FACTOR.
9. LOW LEVEL OUTLET AND GATE WORKS TO BE SIZED DURING FUTURE DESIGN STAGES.
10. SPILLWAY TO BE SIZED DURING FUTURE DESIGN STAGES.
11. GUARD RAILS TO BE PLACED ALONG THE INNER AND OUTER EDGES OF THE DAM CREST.
12. TRAFFICABLE SURFACE QUANTITIES FOR OPERATIONS AREA ALLOWANCE AND ACCESS ROADS TO BE SOURCED FROM ACCESS ROAD CUT EXCESS EXCAVATION.
13. ACCESS ROAD OPTIONS 1 AND 2 SHOWN ON VP19-SCR-01-00-DWG-CI-404.
14. TOPSOIL, SUBSOIL, AND EXCAVATED OVERBURDEN WILL BE STOCKPILED ADJACENT TO SITE ACCESS ROAD (SHOWN ON CP19-SCR-01-00-DWG-CI-404).
15. EXISTING LAKE PERIMETER FROM LIDAR COLLECTED IN JUNE 2019.
16. CLEARING AND GRUBBING WILL TAKE PLACE WITHIN THE FOOTPRINT OF DAM, OPERATIONS AREA ALLOWANCE, AND ACCESS ROAD, AS WELL AS ADDITIONAL AREA REQUIRED FOR CONSTRUCTION ACTIVITIES.
17. CURRENT DESIGN PLANS ARE SCOPING - LEVEL BASED ON THE SITE CHARACTERIZATION COMPLETED TO DATE. DESIGN IS TO BE PROGRESSED AND CONFIRMED BASED ON DETAILED SITE CHARACTERIZATION AND CONSTRAINTS.

0 25 50 75m

SCALE 1 : 1,500
UTM NAD83 ZONE 10

NOT FOR CONSTRUCTION

REFERENCE DOCUMENTS		REV	DESCRIPTION	BY	DATE (YYYY-MM-DD)	CHK	APP	PE
VP19-SCR-01-00-DWG-CI-404	SUPPORTING INFRASTRUCTURE - PLANS			DH		HM	AJS	AJS
VP19-SCR-01-00-DWG-CI-403	DESIGN PROFILES	B	ISSUED AS FINAL	DH	2019-10-29	HM	AJS	AJS
VP19-SCR-01-00-DWG-CI-401	EXISTING CONDITIONS PLAN	A	ISSUED FOR REVIEW	DH	2019-10-18	HM	AJS	AJS

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
A. J. SPERSKE
29 OCT 2019

PREPARED BY
INTEGRATED SUSTAINABILITY

CLIENT
SUNSHINE COAST REGIONAL DISTRICT

SUNSHINE COAST REGIONAL DISTRICT
RAW WATER RESERVOIR FEASIBILITY STUDY
SITE C4
DESIGN PLAN

DRAWN BY	CHECKED BY	ENGINEERED BY
D. HELYAR	H. MASSONG	A. SPERSKE

SCALE	PROJ NO	DRAWING NO	REV
1:1,500	VP19-SCR-01-00	VP19-SCR-01-00-DWG-CI-402	B

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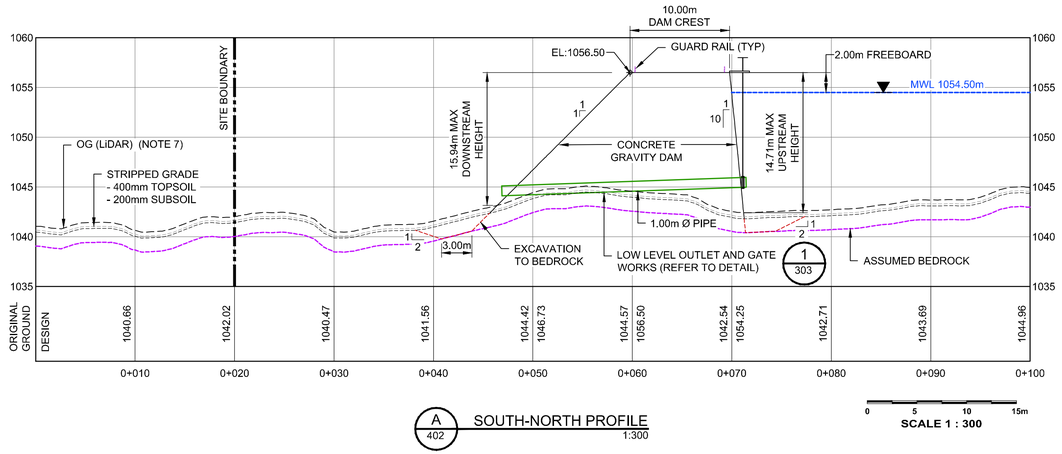
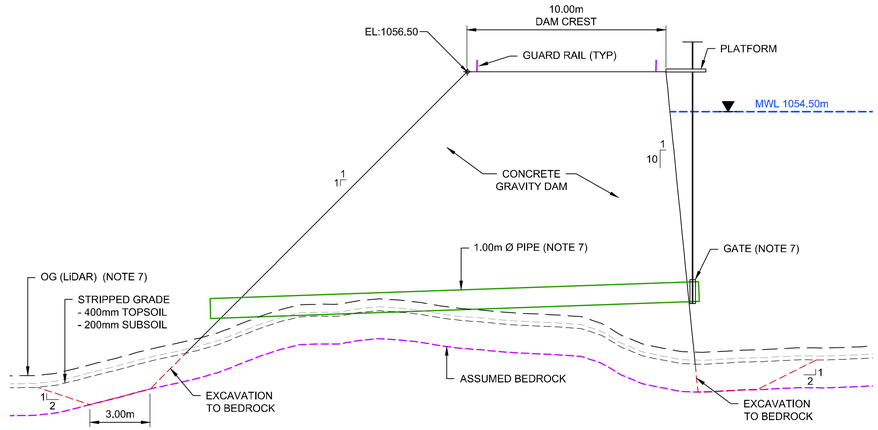


A/402 SOUTH-NORTH PROFILE
1:300

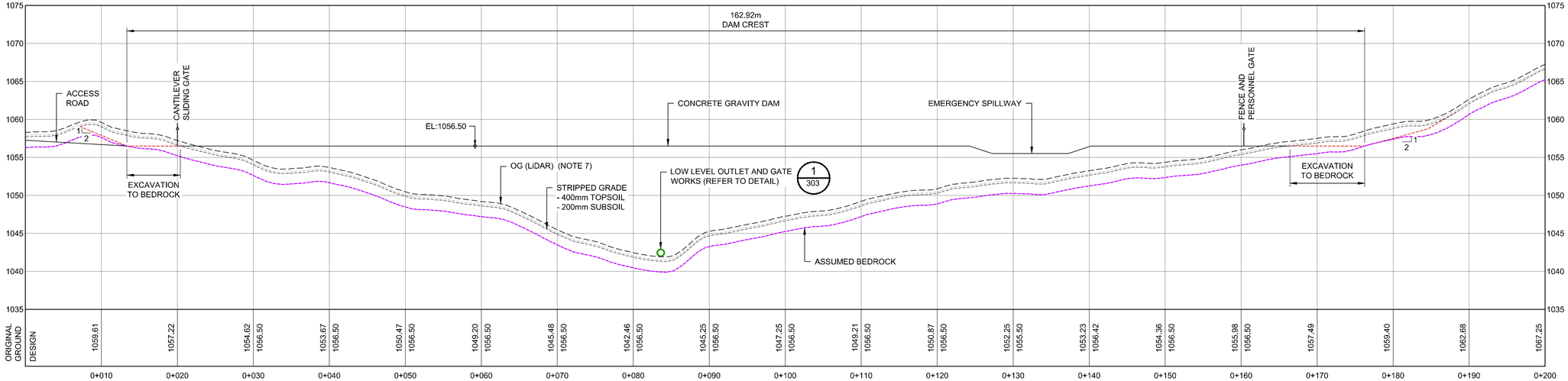


1/303 LOW LEVEL OUTLET AND GATE WORKS
1:150

NOTES:

1. FOR GENERAL NOTES, REFER TO DRAWING VP19-SCR-01-00-DWG-CI-401.
2. DESIGN OF SEEPAGE MANAGEMENT STRUCTURES (I.E. DRAINS, FILTERS, ETC.) WITHIN THE EMBANKMENT DAM AND WITHIN THE FOUNDATION TO BE COMPLETED DURING FUTURE DESIGN STAGES.
3. FOUNDATION TREATMENT AND GROUTING DESIGN TO BE COMPLETED DURING FUTURE DESIGN STAGES.
4. DETAILS OF THE SURFACE WATER MANAGEMENT FEATURES WILL BE INCLUDED DURING FUTURE DESIGN STAGES.
5. SLOPE ANGLES FOR EMBANKMENT DAM TO BE CONFIRMED BASED ON GEOTECHNICAL RECOMMENDATIONS IN FUTURE DESIGN STAGES.
6. LOW LEVEL OUTLET AND GATE WORKS TO BE SIZED DURING FUTURE DESIGN STAGES. LOW LEVEL OUTLET PIPE MAY BE EXTENDED TO MAXIMIZE WATER OUTFLOW FROM LAKE.
7. LIDAR SURFACE DOES NOT INCLUDE SURFACE OF EXISTING LAKE BOTTOM AND INSTEAD FOLLOWS EXISTING LAKE SURFACE.
8. CURRENT DESIGN PLANS ARE SCOPING - LEVEL BASED ON THE SITE CHARACTERIZATION COMPLETED TO DATE. DESIGN IS TO BE PROGRESSED AND CONFIRMED BASED ON DETAILED SITE CHARACTERIZATION AND CONSTRAINTS.

WEST
EAST



B/402 WEST - EAST PROFILE
1:300

NOT FOR CONSTRUCTION

REFERENCE DOCUMENTS		REV	DESCRIPTION	BY	DATE (YYYY-MM-DD)	CHK	APP	PE
				DH		HM	AJS	AJS
VP19-SCR-01-00-DWG-CI-402	DESIGN PLAN	B	ISSUED AS FINAL	DH	2019-10-29	HM	AJS	AJS
VP19-SCR-01-00-DWG-CI-401	EXISTING CONDITIONS PLAN	A	ISSUED FOR REVIEW	DH	2019-10-18	HM	AJS	AJS

PROFESSIONAL ENGINEER A. J. SPERSKE # 29 OCT 2019

PREPARED BY
INTEGRATED SUSTAINABILITY

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SUNSHINE COAST REGIONAL DISTRICT

SUNSHINE COAST REGIONAL DISTRICT
RAW WATER RESERVOIR FEASIBILITY STUDY
SITE C4
DESIGN PROFILES

DRAWN BY	CHECKED BY	ENGINEERED BY
D. HELYAR	H. MASSONG	A. SPERSKE

SCALE	PROJ NO	DRAWING NO	REV
AS NOTED	VP19-SCR-01-00	VP19-SCR-01-00-DWG-CI-403	B

SCALE APPLIES IF PRINTED ON SIZE 'D' (22"X34") PAPER

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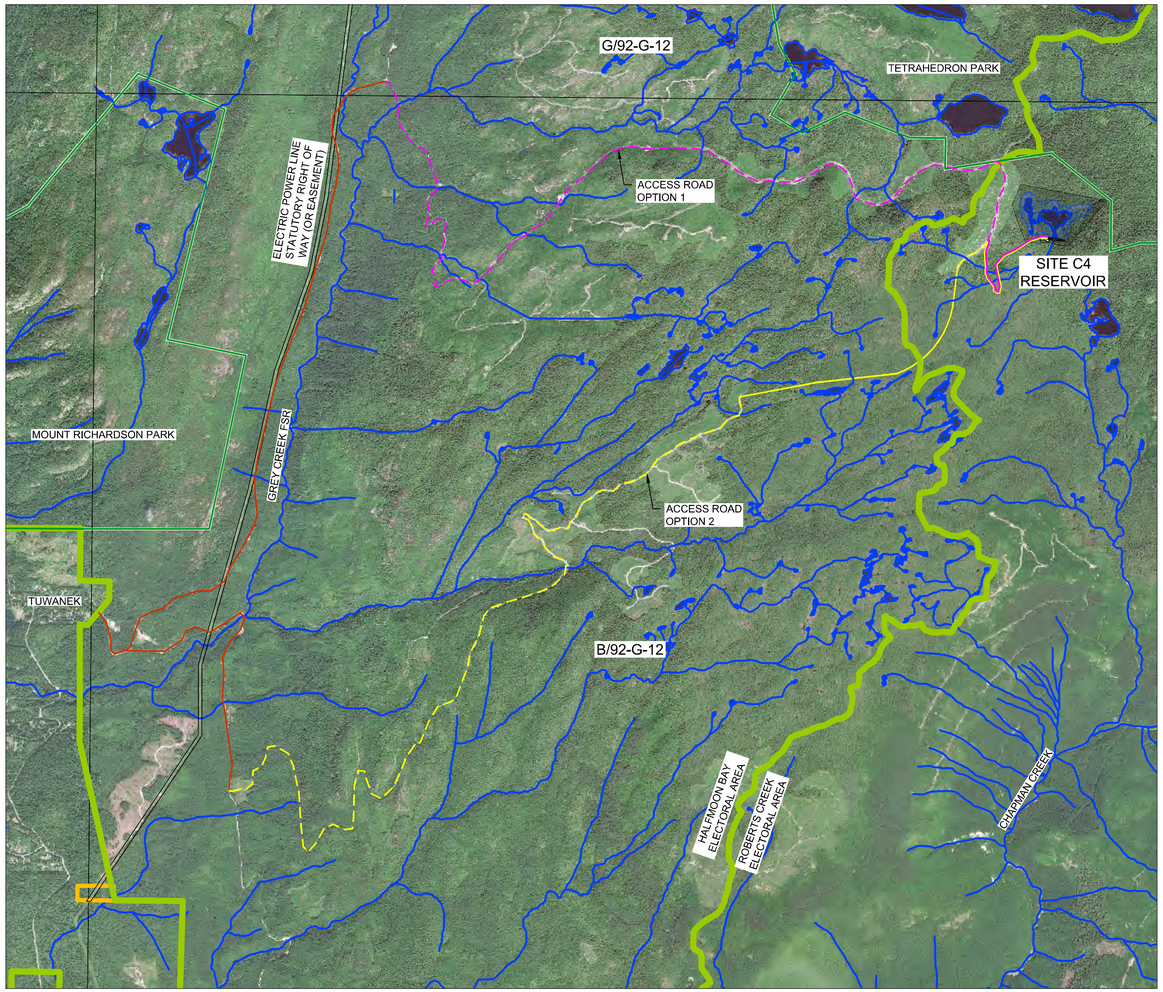
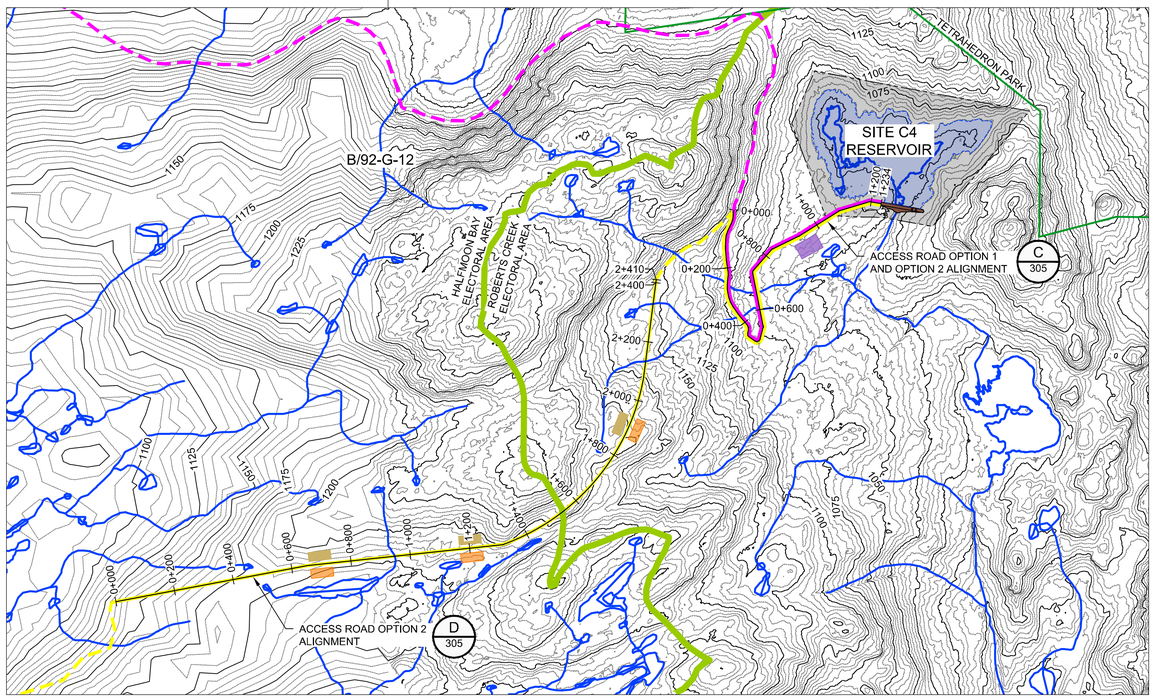


AERIAL VIEW OF ACCESS ROAD OPTIONS FOR SITE C4
1:25,000

0 250 500 750 1000m
SCALE 1 : 25,000

GOOGLE TERRAIN DATA | LiDAR DATA



SITE C4 ACCESS ROAD OPTIONS - ALIGNMENTS
1:10,000

0 100 200 300 400 500m
SCALE 1 : 10,000

NOTES:

1. FOR GENERAL NOTES, REFER TO DRAWING VP19-SCR-01-00-DWG-CI-401.
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LEGEND:

SITE BOUNDARY		EXISTING (ACTIVE) ROAD	
SITE AREA		OPTION 1 NEW SITE ACCESS ROAD	
OG MAJOR CONTOUR (25.0m INTERVAL) (NOTE 2)		OPTION 1 EXISTING, DECOMMISSIONED ROAD (NOTE 6)	
OG MINOR CONTOUR (5.0m INTERVAL) (NOTE 2)		OPTION 2 NEW SITE ACCESS ROAD	
WATERCOURSE (APPROX)		OPTION 2 EXISTING, DECOMMISSIONED ROAD (NOTE 6)	
PARK BOUNDARY		TOPSOIL STOCKPILE (NOTE 5)	
SCRD ELECTORAL AREA BOUNDARY		SUBSOIL STOCKPILE (NOTE 5)	
DESIGN MWL		OVERBURDEN STOCKPILE (NOTE 5)	

NOT FOR CONSTRUCTION

REFERENCE DOCUMENTS		REV	DESCRIPTION	BY	DATE (YYYY-MM-DD)	CHK	APP	PE
				DH		HM	AJS	AJS
VP19-SCR-01-00-DWG-CI-405	SUPPORTING INFRASTRUCTURE - PROFILES	B	ISSUED AS FINAL	DH	2019-10-29	HM	AJS	AJS
VP19-SCR-01-00-DWG-CI-401	EXISTING CONDITIONS PLAN	A	ISSUED FOR REVIEW	DH	2019-10-11	HM	AJS	AJS

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA A.J. SPERSKE 29.OCT.2019

PREPARED BY
INTEGRATED SUSTAINABILITY

CLIENT
SUNSHINE COAST REGIONAL DISTRICT

SUNSHINE COAST REGIONAL DISTRICT
RAW WATER RESERVOIR FEASIBILITY STUDY
SITE C4
SUPPORTING INFRASTRUCTURE - PLANS

DRAWN BY	CHECKED BY	ENGINEERED BY
D. HELYAR	H. MASSONG	A. SPERSKE

SCALE	PROJ NO	DRAWING NO	REV
AS NOTED	VP19-SCR-01-00	VP19-SCR-01-00-DWG-CI-404	B

SCALE APPLIES IF PRINTED ON SIZE "D" (22"X34") PAPER

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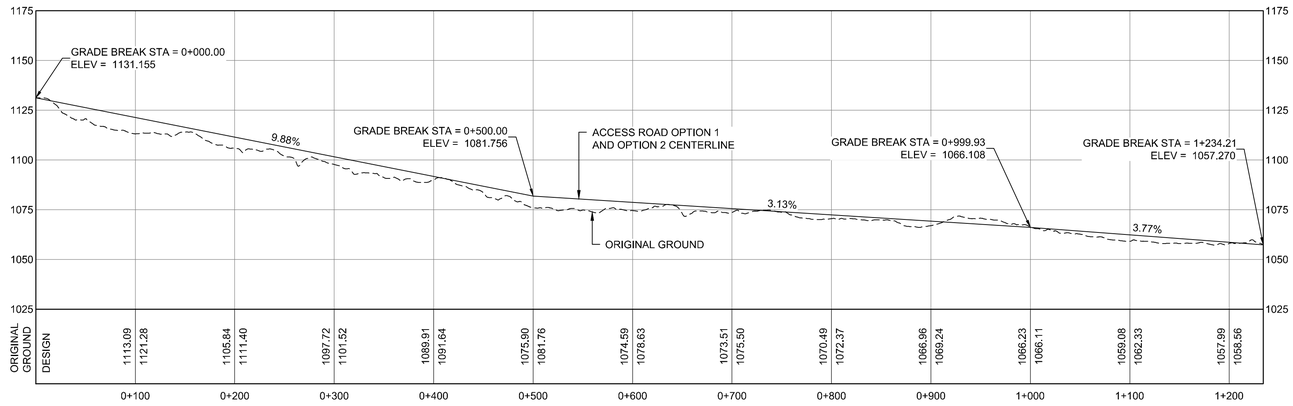
WEST

EAST



C 404 ACCESS ROAD OPTION 1 AND OPTION 2 ALIGNMENT PROFILE

VER. 1:1,500
HOR. 1:3,000

NOTES:

1. FOR GENERAL NOTES, REFER TO DRAWING VP19-SCR-01-00-DWG-CI-401.
2. ACCESS ROAD DESIGN DETAILS WILL BE INCLUDED DURING FUTURE DESIGN STAGES.
3. CURRENT DESIGN PLANS ARE SCOPING - LEVEL BASED ON THE SITE CHARACTERIZATION COMPLETED TO DATE. DESIGN IS TO BE PROGRESSED AND CONFIRMED BASED ON DETAILED SITE CHARACTERIZATION AND CONSTRAINTS.

SOUTHWEST

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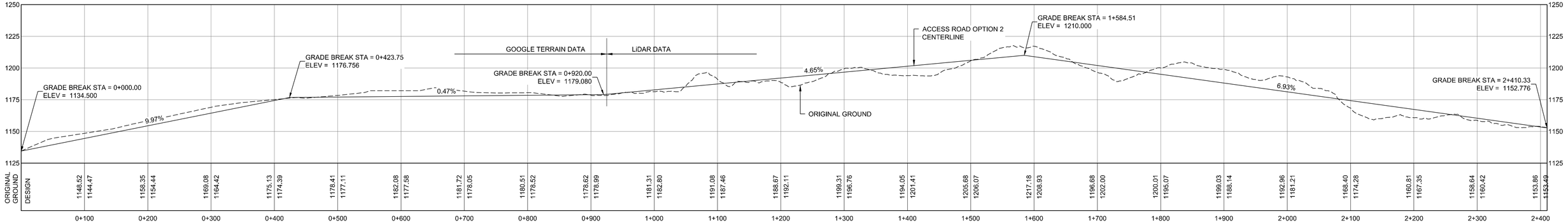

D 404 ACCESS ROAD OPTION 2 ALIGNMENT PROFILE

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NOT FOR CONSTRUCTION

				DH		HM	AJS	AJS
VP19-SCR-01-00-DWG-CI-404	SUPPORTING INFRASTRUCTURE - PLANS	B	ISSUED AS FINAL	DH	2019-10-29	HM	AJS	AJS
VP19-SCR-01-00-DWG-CI-401	EXISTING CONDITIONS PLAN	A	ISSUED FOR REVIEW	DH	2019-10-11	HM	AJS	AJS
REFERENCE DOCUMENTS		REV	DESCRIPTION	BY	DATE (YYYY-MM-DD)	CHK	APP	PE

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA A.J. SPERSKE # 37427 ENGINEERING 29 OCT 2019

PREPARED BY
INTEGRATED SUSTAINABILITY

CLIENT
SUNSHINE COAST REGIONAL DISTRICT

SUNSHINE COAST REGIONAL DISTRICT
RAW WATER RESERVOIR FEASIBILITY STUDY
SITE C4
SUPPORTING INFRASTRUCTURE - PROFILES

DRAWN BY	CHECKED BY	ENGINEERED BY
D. HELYAR	H. MASSONG	A. SPERSKE

SCALE	PROJ NO	DRAWING NO	REV
AS NOTED	VP19-SCR-01-00	VP19-SCR-01-00-DWG-CI-405	B

SCALE APPLIES IF PRINTED ON SIZE "D" (22"X34") PAPER

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SUNSHINE COAST REGIONAL DISTRICT STAFF REPORT

TO: Infrastructure Services Committee - November 21, 2019

AUTHOR: Remko Rosenboom, General Manager, Infrastructure Services

SUBJECT: **GROUNDWATER INVESTIGATION PROJECT UPDATE**

RECOMMENDATION(S)

THAT the report titled Groundwater Investigation Project Update be received;

AND THAT staff bring forward a budget proposal at the Round 2 2020 Budget meetings for a Groundwater Investigation Phase 3- Gray Creek project;

AND FURTHER THAT the SCRD no longer pursues the development of production wells at the Dusty Road and Mahan Road sites.

BACKGROUND

At its January 24, 2019 meeting the Infrastructure Services Committee received the report titled Groundwater Investigation Phase 2 Results. It subsequently adopted the following recommendations at its January 31, 2019 meeting.

015/19 **Recommendation No. 2** ***Groundwater Investigation Phase 2 Results***

THAT a 2019 Round 1 budget proposal with respect to the permitting phase for a well field in the Church Road area be brought forward;

AND THAT the Mahan Road site not be pursued at this time;

AND THAT a feasibility report with respect to the production well on the Gray Creek site be brought to Committee in Q4 2019;

AND THAT a feasibility report for the Dusty Road site be explored with staff resources;

AND FURTHER THAT staff share the Mahan Road data with the Town of Gibsons.

The purpose of this report is to provide an update on the four well sites investigated during Phase 2 of the groundwater investigation project.

DISCUSSION

Church Road site

At the December 2019 Planning and Community Development Committee meeting a report will be presented with an update on the development of a production well field at Church Road in Granthams Landing. The development of a productive well field at this site is indeed feasible. The update will include details on technical assessments, detailed design and cost estimates, as well as an update on permitting.

Mahan Road site

The Board placed all work by the SCRD on this site on hold. Staff shared all technical information it had gained from the drilling of the test well on this site with the Town of Gibsons. The Town of Gibsons has in the interim drilled a new production well in close proximity to this test well site (on Oceanmount Boulevard) and applied for a water licence to take this well into production, so it is unlikely that the SCRD could obtain a water licence for a production well at this location. Staff therefore recommends to not pursue a production well at this site at this time.

Dusty Road site

The January 24, 2019 report stated that "the anticipated use of the land upstream of this site for future large scale quarry activities could, in the long-term, impact the water quality at this well site. The aquifer at this location is non-confined, which means it is not protected by an impermeable clay layer on top of the aquifer and is therefore vulnerable to contamination. Due to the lack of a confining clay layer in this area, any such contamination would impact the water quality to the extent that it would no longer be suitable as a drinking water supply."

Staff have since confirmed with staff from the shíshálh Nation and Lehigh Hanson. that the upslope District Lot 7613 is intended to be logged and subsequently quarried in the upcoming decades, pending the completion of the land transfer component of the Foundation Agreement. Even though the intent is to meet or exceed the environmental standards for quarrying, it is impossible to eliminate to risk that the water quality or quantity in this area could be impacted by this future quarry activity such that it would not be suitable any longer as a drinking water source.

The upslope location of both the Sechelt Landfill and District of Sechelt's sewage disposal site could be contributing risk factor to long term water quality that cannot be mitigated.

While there are no regulatory limitations for the SCRD to apply for a water licence for a production well on this site, staff are not recommending pursuit of a production well on this site.

Gray Creek site

Staff met with representatives for the Northern Divine Aquafarms Ltd. and confirmed their willingness to collaborate on the development of a production well for a community water supply on their property as long as it does not impact their water rights and operations. An agreement would need to be formalized between the SCRD and the land owner before any physical work on this site could commence.

Several potential sites have been discussed and a desktop analyses of geotechnical information and the drilling of one or more test wells is required to confirm potential sustainable yields. The cost of developing a production well depends on the yield and required upgrades to the distribution system (e.g. water mains).

Staff recommends bringing forward a budget proposal at the Round 2 2020 Budget meetings for a Groundwater Investigation Phase 3- Gray Creek project that would include:

- Development of an agreement between SCRD and the private landowner;
- Desktop study, test drilling and pump tests;
- Preliminary design and cost estimates

The results of this phase would be presented to the Board by Q4 2020. If the results are positive, the Board decides to proceed, and funding is secured for the 2021 budget then a water licence application could be made in 2021 along with final design for an estimated construction and commissioning in 2022 and 2023.

STRATEGIC PLAN AND RELATED POLICIES

The Groundwater Investigation project support Strategy 2.1: Plan for and ensure year round water availability now and in the future.

Groundwater investigation is a supply expansion strategy identified in the Comprehensive Regional Water Plan.

CONCLUSION

Based on developments at the four potential groundwater sites investigated since Phase 2 of the Groundwater Investigation project, it can be concluded that the development of a production well to support the community water supply is realistic on the Church Road site and most likely also at the Gray Creek site. A report summarizing work done to date on the Church Road well field will be presented at the December 2019 Planning and Community Development Committee. A Round 2 2020 Budget Proposal is proposed for Groundwater Investigation Phase 3 – Gray Creek Site.

Staff recommends not pursuing the development of a production well at the Dusty Road and Mahan Road sites.

Reviewed by:			
Manager	X – S. Misiurak	Finance	
GM		Legislative	
Interim CAO	X – M. Brown	Other	

SUNSHINE COAST REGIONAL DISTRICT STAFF REPORT

TO: Infrastructure Service Committee – November 21, 2019

AUTHOR: Raphael Shay, Water and Energy Projects Coordinator
Jen Callaghan, Water Conservation Assistant

SUBJECT: **DROUGHT MANAGEMENT PLAN 2019 SUMMARY**

RECOMMENDATION(S)

THAT the report titled Drought Management Plan 2019 Summary be received for information.

BACKGROUND

The purpose of this report is to update the Board on the application of the Drought Management Plan (DMP) in 2019.

Additionally, this report will address a recommendation from the June 27, 2019 Board meeting in response to the Southern Sunshine Coast Farmers Institute (in part)

181/19 **Recommendation No.13** *Correspondence*

THAT staff investigate the impact of food growers to continue to water crops during Stage 4 and report back to Committee in Q4 2019.

The SCRD's DMP is the primary tool for minimizing impacts to water supplies caused by summer drought or unforeseen water shortage situations. The Plan prescribes water use restrictions leading up to, during, and following periods of drought, prioritizing water supply for human health, fire protection, and Environmental Flow Needs (EFN).

Water Conservation Regulations are in place from May 1 to September 30, each year, graduating from Stage 1 (Normal) to Stage 4 (Severe) based on seasonal conditions and trends.

DISCUSSION

Water Supply and Forecasts: Chapman Water System

The Sunshine Coast entered spring with below average levels of precipitation and snowpack. In addition, Environment Canada's seasonal forecast predicted dry conditions and warm weather to persist into the summer. These forecasts proved accurate through June.

As the Sunshine Coast entered July and August, resulting rainfall amounts were near historical averages at the Sechelt Airport Weather Station and well above five year average at Chapman Lake. Water storage in Chapman Lake and Edwards Lake, with the support of Chaster Well and Gray Creek, were able to meet community demand and EFN without the activation of the siphon

on Chapman Lake. The 200 litres per second EFN on Chapman Water System was maintained throughout the summer.

Chaster Well contributed to the Chapman Water System from June 20 to September 24, 2019.

Gray Creek contributed to the Chapman Water System from July 30 to August 1 and from August 14 to September 12, 2019.

Rainfall amounts increased in early September, replenishing lake storage and securing the water supply of the Chapman Water System for the fall season.

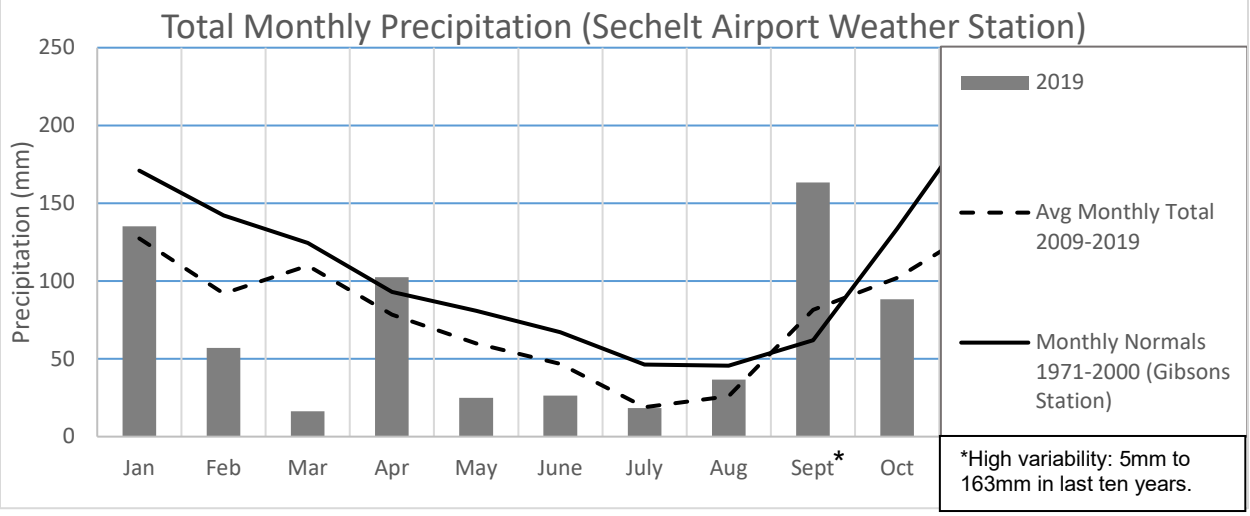


Figure 1. Monthly precipitation in 2019.

Water Consumption and DMP Targets: Chapman Water System

Water consumption is influenced by indoor and outdoor water use habits as well as seasonal population fluctuation. As such, Sundays had the highest water consumption, on average, followed by days that permitted sprinkling in Stages 1 and 2 (Wednesday, Thursday, Saturday). Outdoor use of water is further influenced by weather patterns, like rainfall and average temperature.

In 2019, May and June had drier than average weather leading to the use of regional water to irrigate lawns and gardens. In anticipation of upcoming regulations, residents may have focused on outdoor water uses such as filling pools and pressure washing, as well. Water consumption from the Chapman Water System peaked at 18,152,000 litres per day on Thursday June 13, 2019.

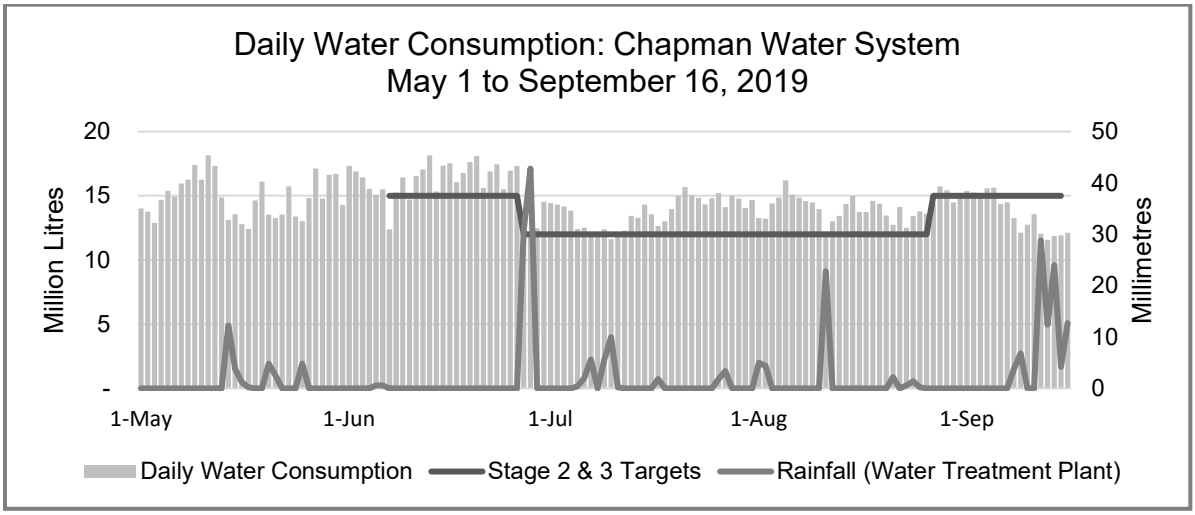


Figure 2. Daily Water Consumption of the Chapman Water System (Chapman Creek, Chaster Well and Gray Creek).

Use and effectiveness of Water Conservation Regulations

The SCRD worked to proactively implement and escalate Stages in 2019: to maintain operational confidence in water supply capacity for September and October, and to reduce the likelihood of implementing Stage 4 Water Conservation Regulations. As such, Stage 2 (Moderate) and Stage 3 (Acute) Water Conservation Regulations were implemented more conservatively than previous years.

Stage 2 and Stage 3 of the DMP were in place from June 7 to September 16 in 2019. This aligns with weather conditions experienced on the South Coast of BC. The Province of BC Drought classification[1] for the South Coast was Level 3-Very Dry from June 13 to September 6, returning to Level 1-Normal on September 20, 2019.

Stage 4 Water Conservation Regulations (Water Supply Conditions: Severe) were not implemented in 2019.

Table 1. Drought Management Plan Stage Implementation Timeline (2015-2019).

Year	Stage 2	Stage 3	Stage 4	De-escalation to Stage 2 or 3
2015	9-Jun	11-Jul	13-Aug	8-Sep
	32 days	32 days	22 days	13 days
2016	25-Jul	26-Aug	N/A	19-Sep
	32 days	24 days		17 days
2017	21-Jul	1-Sep	3-Oct	28-Oct
	42 days	32 days	25 days	12 days
2018	5-Jul	13-Aug	31-Aug	14-Sep
	38 days	18 days	14 days	3 days
2019	**7-Jun**	**27-Jun**	**N/A**	**27-Aug**
	20 days	**61 days**		**21 days**

[1] Based on stream flow conditions. Describes state of ecosystems.

Water Use for Food Production

In 2019, the SCRD adopted changes to the Water Conservation Regulations to prioritize water supply for food production. This included:

- Prohibiting lawn watering in Stage 2
- Reducing total time allowed for lawn watering in Stage 1
- Exempting Commercial Food Producers from watering restrictions in Stages 1, 2 and 3.

This shift resulted in a decrease in average daily water consumption in Stages 1 and 2 in 2019. Prohibiting lawn watering in Stage 2 was one factor contributing to a 14% decrease in average daily water consumption, compared to 2018.

Commercial food producing farms were permitted to use their own watering schedules during Stage 1, 2 and 3 Water Conservation Regulations. For all other residents, hand watering or micro-drip irrigation of food producing plants was unrestricted in Stages 1, 2, and 3.

Staff do not have exact numbers on the impact of community-wide watering of food plants at Stage 4. A review of the Farm Water Demand Study of 2014 and 2015 combined with water meter data of properties with Farm Status in Rural Electoral Areas reveals a significant range between properties and hence cannot be generalized.

Earlier in 2019 the SCRD provided financial and staff support to a Ministry of Agriculture project to better understand agricultural water demand on the Sunshine Coast and elsewhere in the Province. Results will be shared with the Board when received as they will provide the requested insight in the impacts of allowing commercial farms to continue to use water during a Stage 4 water conservation stage.

In 2019, the DMP continued to prohibit water use for food production (with the exemption of livestock) during Stage 4. This is required to maintain the effectiveness of strict regulations when water supply conditions are severe. Programs, like the rainwater harvesting rebate, were offered as first steps in supporting food security of the community during times of extended drought.

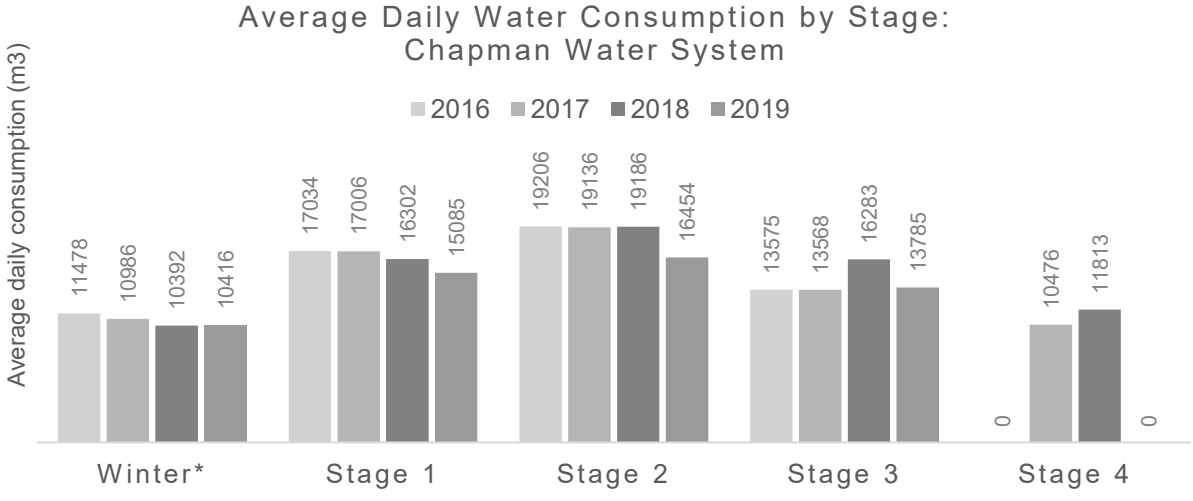


Figure 3. Average daily water consumption for each Stage.
*Winter baseline is November 1 to April 31.

Water Conservation Regulations: All Water Systems

The Chapman Water System services 85% of SCRD water customers. The remaining SCRD water systems service smaller populations and experience less escalation in Water Conservation Regulations.

Table 2. Drought Management Plan Stage Implementation: All Water Systems.

System	Source	Water Conservation Regulation in 2019
Langdale	Groundwater	Stage 1,2
Soames	Groundwater	Stage 1,2
Granthams	Groundwater	Stage 1,2
Chapman	Surface water: Chapman Creek, Chapman Lake, Edwards Lake, Gray Creek Groundwater: Chaster Well	Stage 1, 2, 3
South Pender Harbour	Surface water: Haslam Creek, McNeill Lake	Stage 1
North Pender Harbour	Surface water: Garden Bay Lake	Stage 1
Cove Cay	Surface water: Ruby Lake	Stage 1
Egmont Cove	Surface water: Waugh Lake	Stage 1
Eastbourne	Groundwater	Restricted water use

Lawn Watering Permits

Lawn watering permits were available for watering beyond the allowable times in order to establish new lawns (seed or sod). Permits were only available during Stage 1 (Normal) water conservation regulations, for a period of 21 days or until Stage 3 (Acute) was declared. Permits were available at the SCRD Field Road office for $50.

Table 3. Lawn watering permits by year

Year	Number of permits
2019	54
2018	54
2017	26
2016	55
2015	16

Communication

The SCRD utilized multiple channels of communication to share the Water Conservation Regulations with residents, businesses, and visitors.

- Direct communication with: Town of Gibsons, District of Sechelt, shíshálh Nation, SCRD Parks and Recreation, Fire Halls, and large water users.
- Revised Water Conservation Regulations mailed to every property.
- Weekly Water Use Updates posted on website and social media.

- Notification for each change between Stages:
    - Media releases
    - Website
    - Radio
    - Social Media
    - SCRD Office
    - Permanent Stage signs on highway in areas B, D and F
    - Sandwich boards at 8 high volume street intersections (Stages 3 and 4)
- Visitors provided with Water Conservation Regulations information through:
    - Ferry Ambassadors and Public Service announcements
    - Restaurant and accommodation provider Pledge to Reduce Water Use campaign
    - Signage on highways

SCRD staff supported public inquiries about Water Conservation Regulations by phone, email, social media channels, and in person.

Compliance and Enforcement

The DMP and corresponding Water Conservation Regulations are dictated in Bylaw 422 and Bylaw 638.

In the enforcement of Bylaw 422, the SCRD has a compliance approach of: 1) Education; 2) Warning; 3) Fine. In 2019, the fine for each infraction of Water Conservation Regulations increased to the following:

Stage 1: $200 Stage 2: $300 Stage 3: $400 Stage 4: $500

SCRD staff responded to 117 water use violations complaints from the public. Complaints that provided accurate information allowed for verbal and written warnings to be issued to property owners. A door hanger was developed to support the distribution of warnings to property owners. The door hanger was a communication channel used when a property owner was not home during a site visit.

Patrols by SCRD staff were used to respond to complaints and gauge overall compliance to the Water Conservation Regulations. Patrols occurred weekly in Stage 1 and 2, and twice per week in Stage 3 (with the exception of weeks with rain). SCRD staff observed high rates of compliance to regulations during patrols.

A Bylaw Enforcement Notice (BEN) and the associated fine was issued in the case of ongoing violation, despite knowledge of Water Conservation Regulations. Both BEN in 2019 were issued for continuing to use sprinklers during Stage 3.

Verbal warnings: 53
Notice of Violation: 17
BEN and fine: 2

Enforcement of Water Conservation Regulations is limited by staff capacity to patrol all areas of the SCRD, as well as limits created by time of day and line of sight to properties. As such, emphasis is also placed on education and incentive programming that supports compliance and a culture of conservative water use.

Supporting Education and Outreach

Community Events

The SCRD participated in two community events at the start of summer, to promote Water Conservation Regulations and respond to questions and concerns from community members. SCRD staff spoke with 186 booth visitors at the events:

June 8: Home and Garden Expo in Gibsons.

July 1: Canada Day at Hackett Park in Sechelt.

Water Dialogues

Water Dialogues were held June 3, 4, and 5. Information about the water supply situation at the start of the 2019 summer was presented to 350 citizens during the three events. A report on the Water Dialogues was presented to the Board at the Corporate and Administrative Services Committee meeting of June 27, 2019.

Water Treatment Plant Tours

Public tours of the Chapman Creek Water Treatment Plant were offered on: May 10, June 20, July 25, and August 15. The 1.5 hour tour was hosted by the Superintendent of Utilities and the Water Conservation Assistant. Tours provided an overview of the regional water systems, with a focus on the Chapman System, step by step overview of water treatment and quality monitoring, and supporting information on SCRD Water Conservation Regulations, Universal Metering and Supply projects.

Tour participants expressed gratitude for the opportunity to engage with SCRD Utilities staff and an increased appreciation for the complexity of the Chapman Water System and Treatment Plant.

STRATEGIC PLAN AND RELATED POLICIES

Strategic Focus Area 2.1: Review and update DMP to ensure alignment with water supply capacity.

Strategic Focus Area 1: To proactively engage with our residents, partners and staff in order to share information and obtain their input on issues and decisions that affect them.

The DMP is a critical component of the Region's overall water supply strategy, as outlined in the Comprehensive Regional Water Plan, and furthering the SCRD goal of reducing water consumption by 33% relative to 2010 levels by 2020.

CONCLUSION

The DMP provides direction for the timely and responsive management of water supplies during times of supply challenges or seasonal drought.

In 2019, weather, proactive "Stage calling", and community adoption of regulations prevented escalation to Stage 4 Water Conservation Regulations.

This report is for information. A review of the DMP with staff recommendations will be included in the Water Rates and Regulations Bylaw 422 review scheduled for 2020.

Reviewed by:			
Manager		Finance	
GM	X - R. Rosenboom	Legislative	
Interim CAO	X – M. Brown	Other	

SUNSHINE COAST REGIONAL DISTRICT STAFF REPORT

TO: Infrastructure Service Committee – November 21, 2019

AUTHOR: Raphael Shay, Water and Energy Projects Coordinator
Jen Callaghan, Water Conservation Assistant

SUBJECT: **WATER CONSERVATION PUBLIC PARTICIPATION SUMMARY**

RECOMMENDATION(S)

THAT the report titled Water Conservation Public Participation Summary be received for information;

AND THAT the public participation results inform a review of the Drought Management Plan and the review of the Water Rates and Regulations Bylaw 422 scheduled for 2020.

BACKGROUND

At the July 18, 2019 Infrastructure Services Committee meeting staff indicated they would report back to Committee with the outcomes of a public participation process reviewing the 2019 implementation of water conservation regulations and programs.

DISCUSSION

From September 30 to October 30, 2019, the Sunshine Coast Regional District (SCRD) worked with the community to review the water regulations of the Drought Management Plan and supporting conservation programs. The public engagement was designed to better understand community perspectives of Water Conservation Regulations and to provide a platform for sharing impacts of the regulations. It was also used to better understand community values and help shape incentive programs, education, enforcement, and communication.

Three avenues of public participation were developed:

1) Water Regulations and Conservation Programs Questionnaire;
2) Community Check-in Events; and
3) Rainwater Harvesting Rebate Feedback Questionnaire for program participants.

A report with a summary of the results of this entire public participation process is included in Attachment A.

Some of the highlights of the results are:

- The highest participation was via the online questionnaire with 555 responses.
- Food producing plants are the most important outdoor water use to citizens.
- 1,673 adaptations to drought and the Water Conservation Regulations were noted.
- Half of survey respondents prefer to hand water gardens in the morning while the other half prefer to hand water in the evening.
- There is low interest in greater enforcement.
- Social media and the newspaper are preferred communication avenues.

The results of this public participation could inform:

- the development of rebate programs, which is the topic of another report included in this Committees agenda;
- future outreach and education efforts; and,
- future policy and regulation development.

Timeline for next steps

The results of this public participation will inform a review of the Drought Management Plan in early 2020 and the water conservation outreach and education approach for 2020.

Additionally, pending budget approval, the results will be used as part of the Water Rates and Regulations Bylaw 422 review scheduled for 2020.

STRATEGIC PLAN AND RELATED POLICIES

This public participation process along with some of the specific feedback support many strategies and tactics in the 2019-2023 Strategic Plan, including:

- Develop public outreach strategy.
    - Develop displays, materials and other media to increase awareness about SCRD programs and services at SCRD facilities and events.
- Plan for and ensure year round water availability now and in the future.
    - Review and update Drought Management Plan to ensure alignment with water supply capacity.
    - Expand water conservation programs and increase engagement with residents and stakeholders on water conservation.
- Develop climate change adaptation strategy.
    - Develop and implement adaptation strategies and measures for priority risk areas.

CONCLUSION

A public participation process was undertaken from September 30 to October 30 2019 to better understand community values and help shape water conservation regulations, incentive programs, education, enforcement and communication efforts.

Attachments:

Attachment A - Report on 2019 Water Conservation Public Participation

Reviewed by:			
Manager		Finance	
GM	X - R. Rosenboom	Legislative	
Interim CAO	X – M. Brown	Other	

SUNSHINE COAST REGIONAL DISTRICT

PUBLIC PARTICIPATION SUMMARY

Drought Management Plan and Water Conservation Programs Review
Sunshine Coast, British Columbia
November 21, 2019

Public Participation Summary

The purpose of this report is to present a summary of public feedback received during the Drought Management Plan review.

This report includes the results of the 1) Water Regulations and Conservation Programs Questionnaire; 2) Community Check In Events on October 23 and October 28, 2019; and 3) Rainwater Harvesting Rebate Recipient Questionnaire.

Background

In fall 2019, the Sunshine Coast Regional District (SCRD) worked with the community to review the water regulations and conservation programs that are part of our Drought Management Plan. The SCRD reviews the Drought Management Plan annually. This year, in an effort to continue the momentum of the Water Dialogues of June 2019 and build trust in SCRD water management decisions, the SCRD facilitated public participation in the Drought Management Plan review process.

The SCRD's Drought Management Plan includes regulations on outdoor water uses. Outdoor water uses can more than double water demand in the summer compared to the winter, potentially exceeding the capacity of the water systems. As such, outdoor Water Conservation Regulations are initiated every year from May 1st to September 30th.

The public engagement was designed to further understand community perspectives of Water Conservation Regulations and to provide a platform for sharing impacts of the regulations. It was also used to better understand community values and help shape incentive programs, education, enforcement, and communication. Two avenues of participation were developed: 1) Questionnaire and 2) Community Check In Events. An additional questionnaire was developed specifically for Rainwater Harvesting Rebate recipients to learn successes and challenges of that program.

Water supply expansion and universal metering were not included in the scope of the Questionnaire and Community Check Ins. These projects are already moving forward and aspects of these projects will be the subject of public participation in 2020. A two

page summary of updates on all current water supply projects and conservation programs was provided to Community Check In participants.

Water Regulations and Conservation Programs Questionnaire

An online questionnaire provided opportunity to:

- Learn residential, agricultural, and commercial impacts of Water Conservation Regulations in 2019.
- Measure effectiveness of communication streams used in Drought Management Plan outreach.
- Collect public values and support for future conservation programming.

The online questionnaire collected responses from September 30 to October 30, 2019. Paper copies of the questionnaire were available at the SCRD Administration Office and the Community Check In events.

Community Check In: October 23 & 28, 2019

Framed as “Community Check Ins”, two public events focused on sharing how the SCRD approached Water Conservation Regulations in summer 2019 as wells as the results of accompanying conservation programs. The SCRD prepared a slideshow and displays to support self-directed gathering of information. Question stations at key displays generated written contributions or discussions with SCRD staff and Directors. Specifically, the SCRD asked about:

- Experienced impacts of water conservation regulations.
- Communication
- Education and Incentive programs

Summary information on water supply projects, metering, bylaw review, and conservation programs was also provided for event participants.

Rainwater Harvesting Rebate Program Questionnaire

A questionnaire was shared with 82 recipients of the Rainwater Harvesting Rebate. The questionnaire provided an opportunity to collect feedback on the administration of the rebate program and to gain insights on how people are using their Rainwater Harvesting systems.

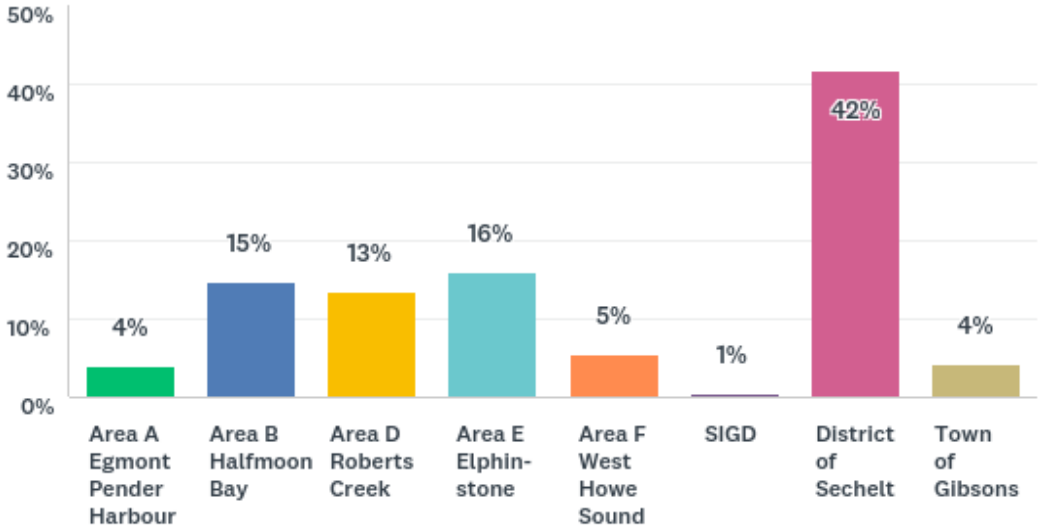
The online questionnaire was emailed to rebate recipients. Responses were collected for one week, between September 22 and 28, 2019.

Maintenance tips for rainwater harvesting systems were provided with the questionnaire.

Overview of Results

Water Regulations and Conservation Programs Questionnaire

A total of 555 responses were submitted between September 30 and October 30, 2019. Responses were received from all electoral areas, with the majority of responses selecting District of Sechelt as the Electoral Area. Chapman Water System was selected by 88% of responses as the water system that services a home or business.

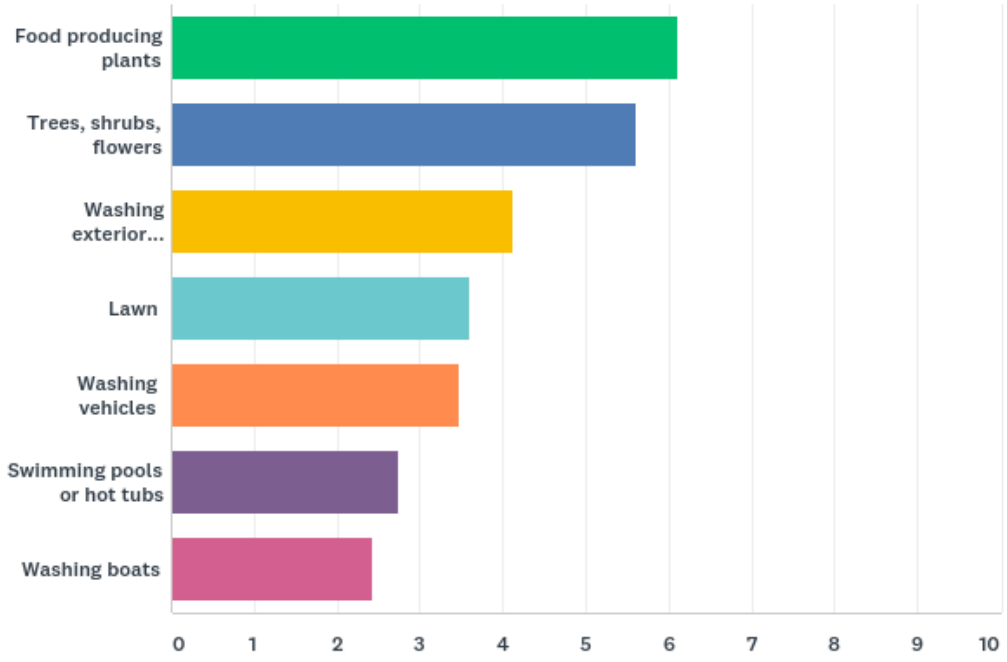


Multiple choice and open ended questions were designed to gathering feedback in the following categories.

Topic 1. Water Conservation Regulations

Questions gauged the types of outdoor water uses people most value and if they are finding ways to adapt to the Water Conservation Regulations.

Question 8. What outdoor use of water is most important to you? Rank outdoor water use, from most (1) to least (7) important.

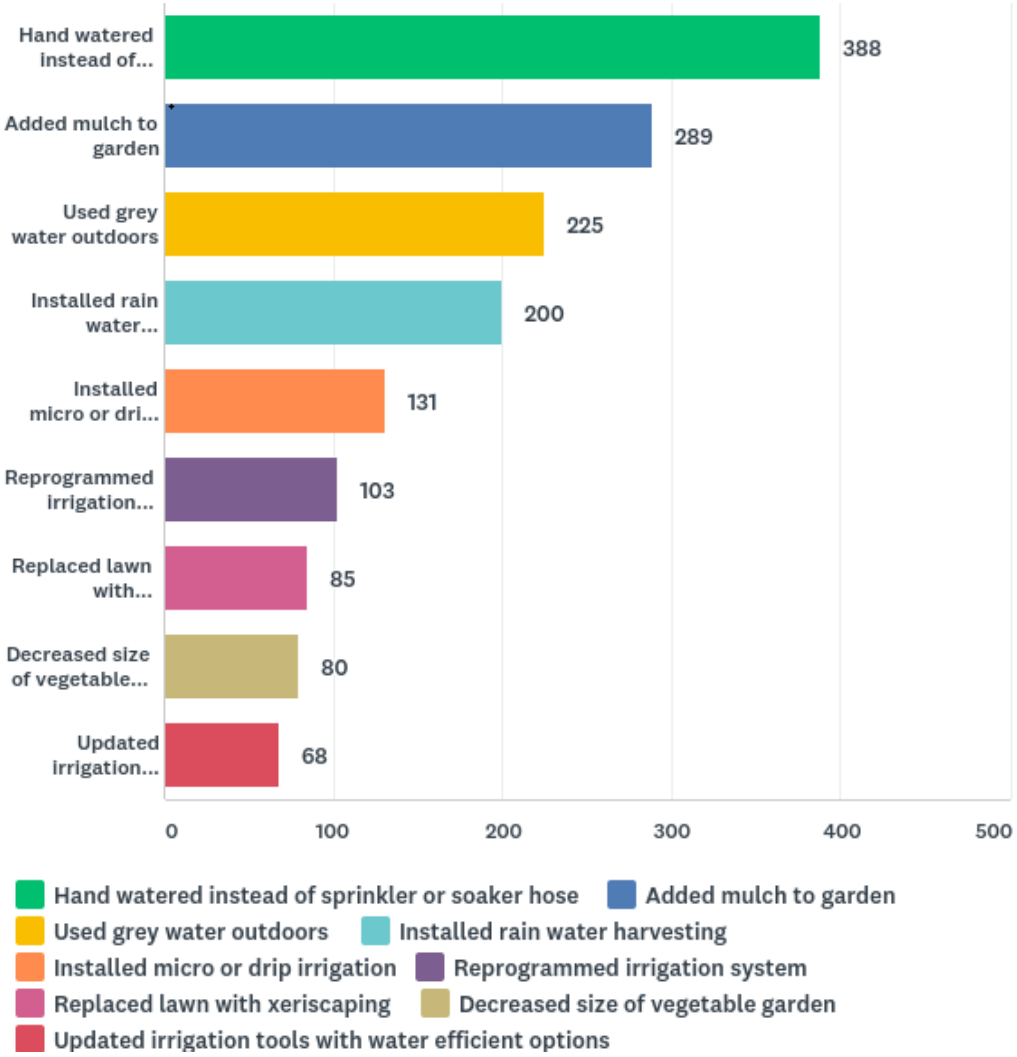


Question 9. Do you support Water Conservation Regulations that prioritize food producing plants over trees, shrubs, flowers and lawns?

Yes	79%
No	21%

Question 10 describes changes survey respondents have made to adapt. In total, 1,673 adaptations were noted, which leads staff to believe the community is engaged.

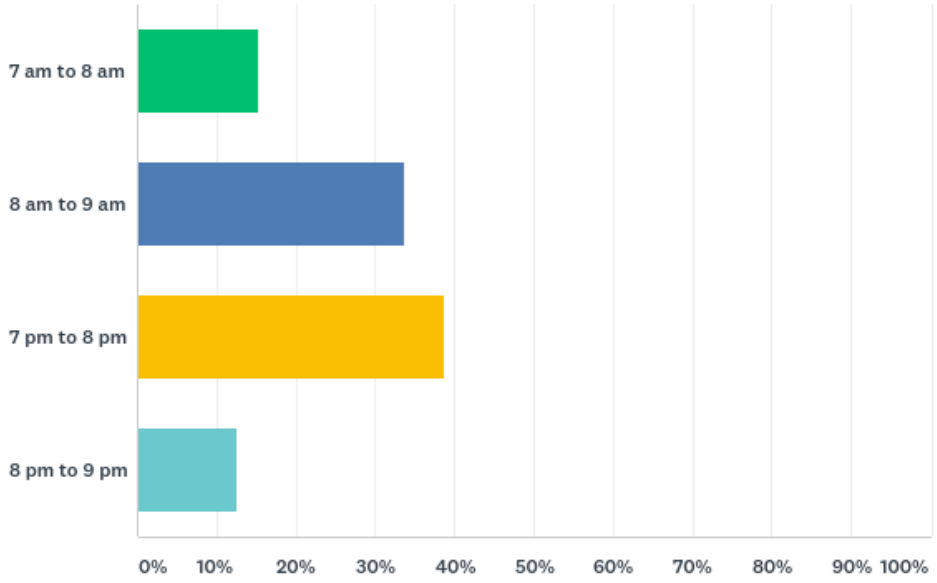
Question 10. What changes have you made to adapt to current Water Conservation Regulations? Select all that apply.



Additional changes were entered as comments. Nine responses indicated no change.

Indoor and outdoor water conservation	22
Stopped watering lawn	17
Drought tolerant plants	6
No washing of vehicles or boats	4
Use of drip irrigation	3
Property design to include ponds and swales	3
Upgraded appliances	2
Adjusted timing of planting	1
Used an alternative water source	1

Question 11. What time of day would you prefer to hand water your garden?



Question 12. In 2019, the SCRD declared Stage 3 on June 27, the earliest start of Stage 3 to date, to decrease overall demand and the likelihood of progressing to Stage 4: A complete ban on outdoor use of treated water. Do you agree that Stage 3 should be called early in the summer, if it will reduce the chances of going to Stage 4?

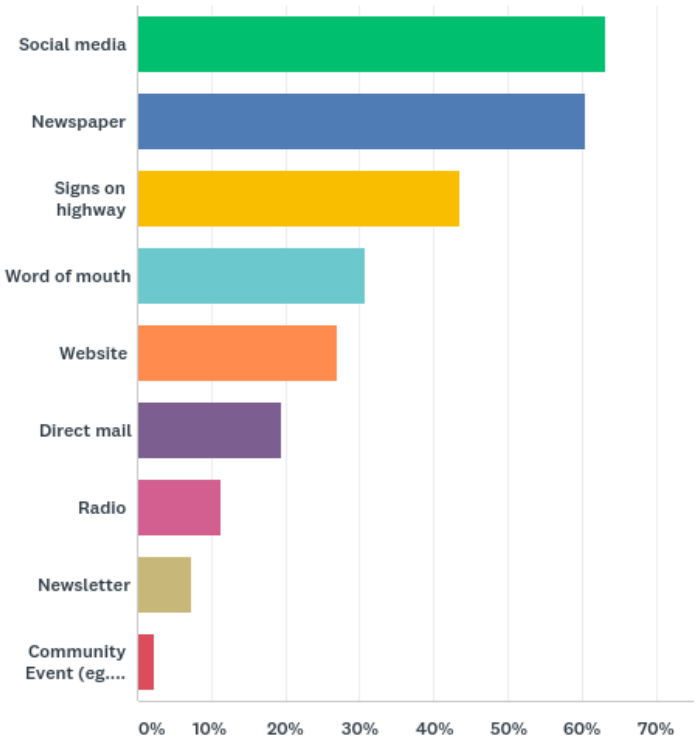
Yes	70%
No	30%

Topic 2. Communication

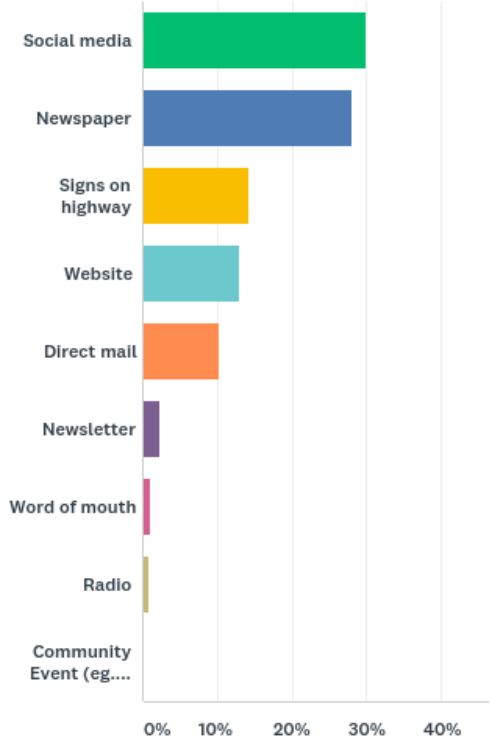
Questions sought to identify which communication channels residents use to access information about Water Conservation Regulations as well as the type of information they find useful.

Question 13, 14. How did you hear about the Water Conservation Regulations? Select all. What is your preferred way to stay up to date on Water Conservation Regulations? Select one.

Hear about regulations



Preferred avenue



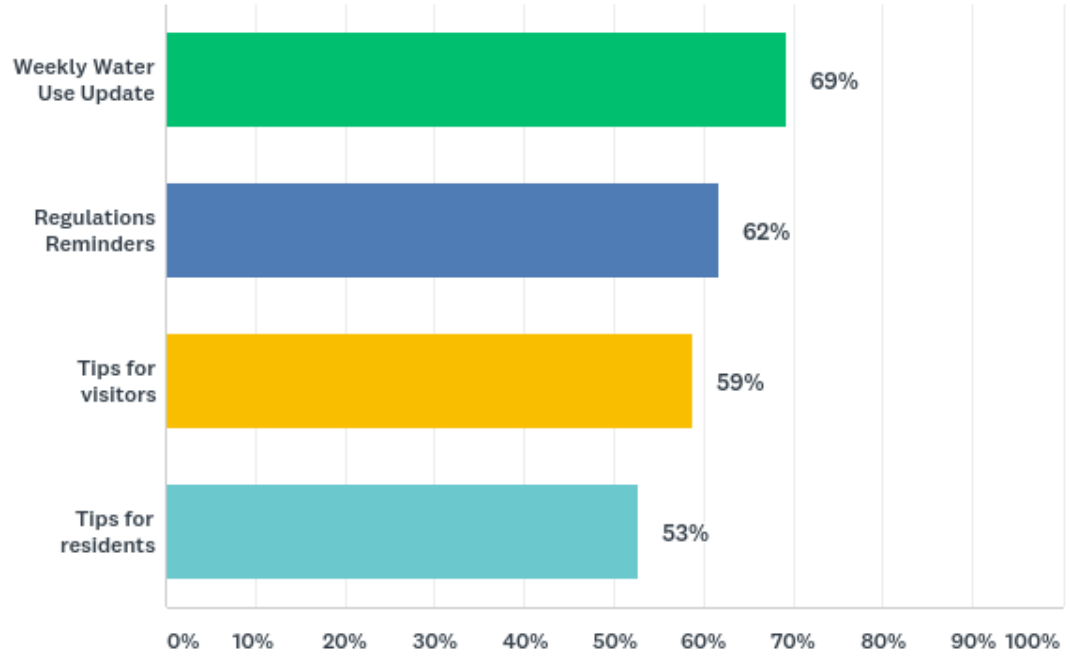
Question 15. In 2019, were you given enough notice about the NEW Water Conservation Regulations?

Yes	74%
No	13%
I was not aware of changes to the regulations	13%

Question 16. In 2019, were you give enough notice for the transition between Stages 1, 2 and 3?

Yes	77%
No	23%

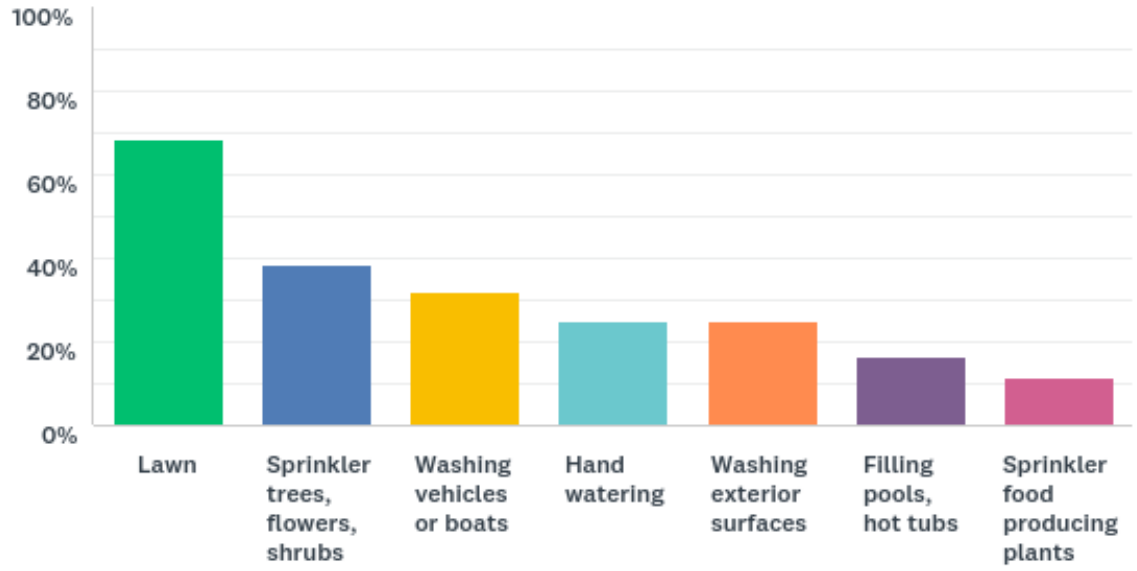
Question 17. What types of information, about water consumption, do you like to see shared by the SCRD? Select all that apply. (451 answered. 102 skipped)



Topic 3. Enforcement of Water Conservation Regulations

Questions collected the type of violations to Water Conservation Regulations observed and how residents would like to engage with the SCRD about violations.

Question 18, 19. 241 responses observed violations of Water Conservation Regulations in 2019. The types of water use violations observed were the following.

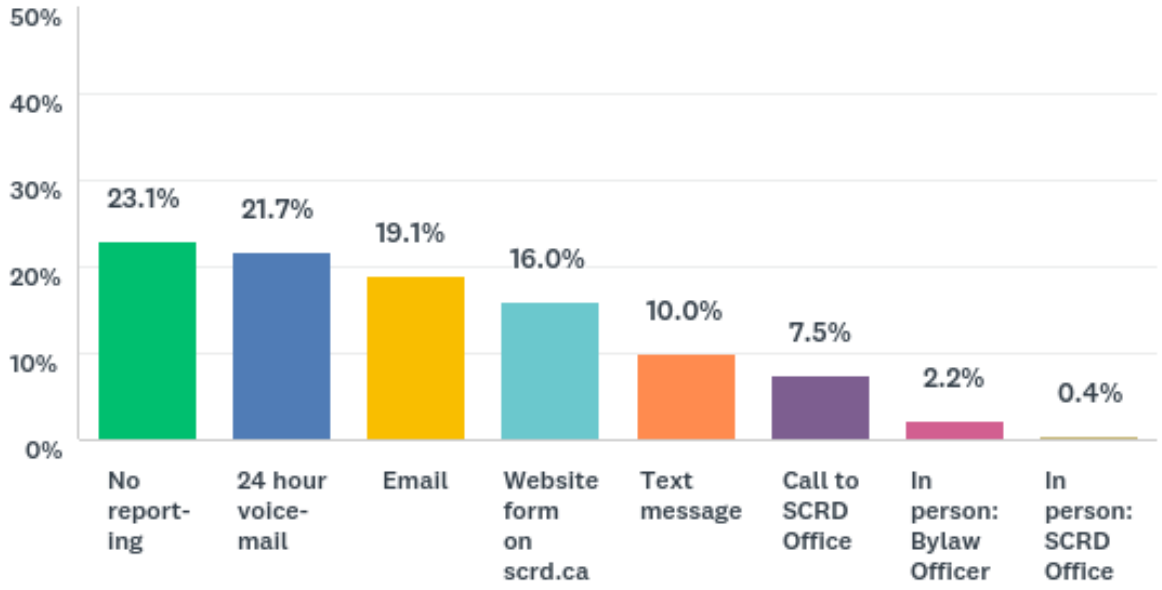


Question 20, 21. If you observed a violation, what action did you take?

Notify the SCRD	7%
Notify the SCRD if a repeat offence	7%
Approach and speak with the individual	14%
Take no action	72%

Many responses indicated not being aware of the results of a reported violation.

Question 22. How would you prefer to communicate violations of Water Conservation Regulations to the SCRD?



Question 23. Have you observed patrolling or enforcement of Water Conservation Regulations by the SCRD?

Yes	11%
No	89%

Question 24. In 2019, were you ever in violation of Water Conservation Regulations? Answers are anonymous and will not be used for Bylaw enforcement.

Yes	126 responses (28%)
No	329 responses (72%)

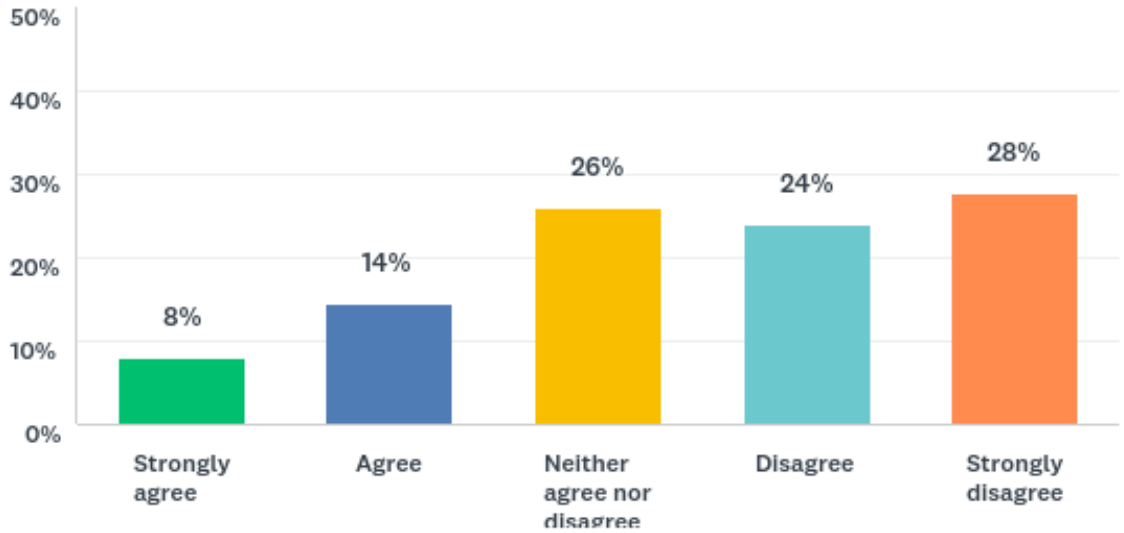
Comments on violations of Water Conservation Regulations were collected from 131 responses. 55 responses (42%) indicated challenges with adhering to the allowed watering times, with specific reference to the hand watering schedule by 15% of those responses. Remaining responses indicated the following reasons:

- Watering of food plants: 20 responses
- Away on vacation: 8 responses
- Unaware or mistake: 9 response
- Frustration with water supply: 5 responses
- Needed water for work or home improvements: 4 responses
- Filling ponds: 3 responses
- Kids in sprinkler: 2 responses

Questions 25. Have you received a warning or fine due to a violation of Water Conservation Regulations?

7 of 434 responses indicated receiving a warning from the SCRD

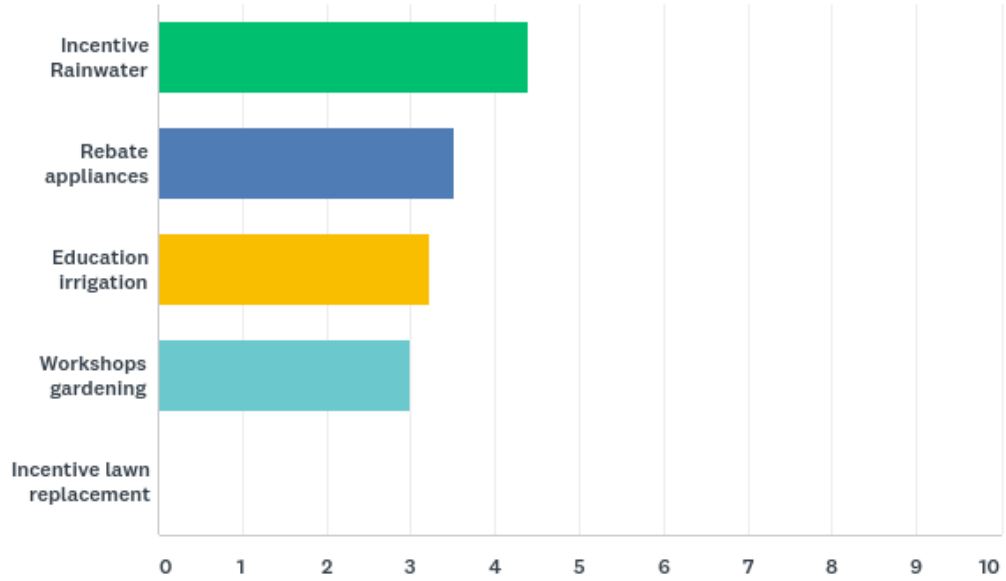
Question 26. Do you think more resources should be dedicated to the enforcement of Water Conservation Regulations, even if this results in an increase to your utility bill?



Topic 4. Incentives and Education Programming

Questions gauged the types of incentive and education programs people most value.

Question 27. What type of SCRD programming would be of most value to support your water conservation efforts? Rank from most (1) to least (4) valuable.



Question 28. Provide a program suggestion.

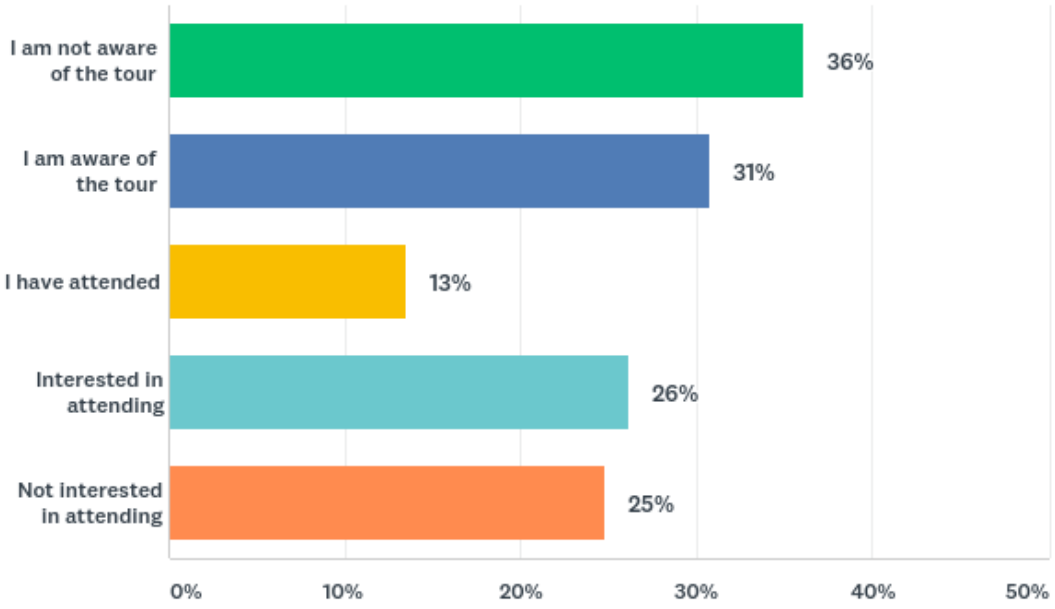
Responses provided input in the following areas:

- Education: Workshops and/or supporting materials in the areas of:
  - Waterwise Gardening
  - Rainwater Harvesting
  - Irrigation
  - Partnerships in delivery with relevant organizations
  - Tourism
  - Composting
  - Waterwise – All types of outdoor water uses
  - Water Use Audit
- Incentives:
  - Rainwater harvesting
  - Landscaping
  - Irrigation
  - Appliances
  - Toilets
- Grey and storm water systems
- Watering Metering

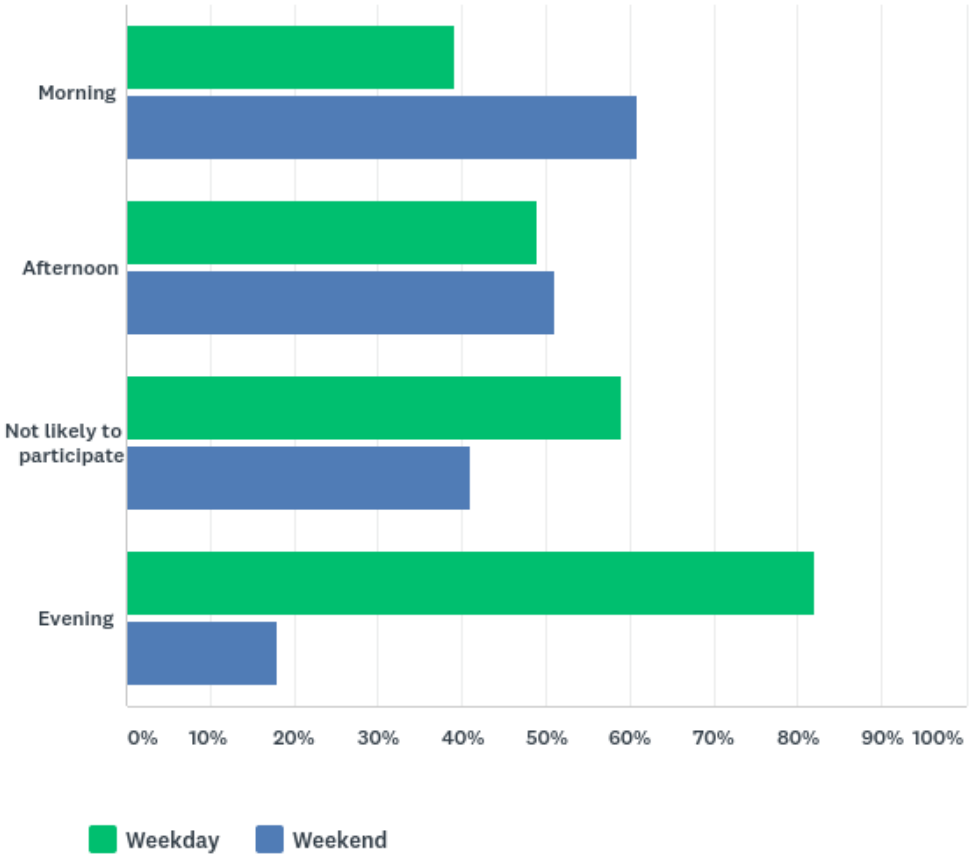
Question 29, 30, 31.

I would like opportunities to learn about:	Yes	No
Water conservation and adapting to seasonal droughts	196	212
The SCRD water systems	235	177
Our watersheds and aquifers	288	126

Question 32. The SCRD offers tours of the Chapman Creek Water Treatment Plant. This facility opened in 2004 and treats approximately 90% of the drinking water in the SCRD. Select all that apply.



Question 33. The SCRD will continue to host public events about water. What event time is most suitable?



Question 34. I would like more opportunities to engage with the SCRD Water team about:

- SCRD Water Supply
- Growth
- Water metering and volumetric pricing
- Communications
- Water Conservation programs
    - Education: Tourism, community workshops, appliance options
    - Incentives: Rainwater Harvesting, Irrigation
    - Grey water systems
    - Storm water systems
- Water Conservation Regulations and resulting impacts
- Enforcement of Water Conservation Regulations
- Water source protection, ecosystem health

Question 35. I completed this questionnaire because. The 326 responses included the following themes:

- SCRD Water Supply concerns
- Care and concern for community
- Interest in the review processes
- Importance of Water Conservation
- Input on Water Conservation Regulations and resulting impacts
- Submission of critiques or frustrations
- Communication approaches by SCRD
- Food production
- Water meters and leaks
- Education and Incentives, including rainwater harvesting
- Grey water, storm water, and rainwater use.
- Water source protection
- Risk of fires

Topic 5. Commercial and Farm Operations

Question 4, 5. Do you operate a commercial business or farm that requires outdoor water use?

Thirty-five responses indicated outdoor water use is part of their commercial operations, with twenty-eight responses identifying the type of operation.

Food production (commercial and non)	18
Livestock	2
Landscaping and irrigation	4
Nursery	1
Boat washing	1
Accommodation	1
Pressure washing	1
Total	28

Question 6. Share changes or adaptations you made to operations as a result of Water Conservation Regulations in 2019.

Reduced water use to adhere Water Conservation Regulations	8
Used an alternative source, including rainwater harvesting	8
Designed property with swales and ponds	2
No change	1
Stopped pressure washing in the summer and stopped watering the landscaped areas and lawns	1
Applied for Commercial water account	1

Question 7. Please comment on the impact of Water Conservation Regulations (WCR) on business operation.

- Landscaping
  - Reduced plant yield and loss of some plants.
  - Property aesthetics declined as landscapers reduced watering.
- Food production
  - Severe restrictions may limit farm gate (sales and community food supply).
  - Conservation more challenging in areas like livestock care.
  - Emotional stress of possibility of losing crops and investments.
  - Sourcing alternative water supplies and efficient water use design, but can be costly (subsidies and incentives help. Interest in supporting workshops too).
  - Small (non-commercial) farms take to hand watering – difficult for larger properties - and mulching.
  - Two farms that had transitioned to water efficient design and alternative water sources stated No Impact from WCR (and weather) this summer.
  - Five responses indicated they were in violation of WCR
- Boat washing
  - Significant financial impacts due to reduced operations (2 months without)
  - One response indicated they were in violation of WCR
- Pressure washing (maintenance of homes)
  - Financial impacts due to reduced operations.
  - Want to support conservation, avoid fines.
- One respondent indicated motivation to move.
- Appreciate incentive support for transition to water efficient options
- Commercial operators preferred WCR updates via newspaper and website
- Program Suggestions

Watering of food producing plants. Permaculture course.	2
Rainwater Harvesting Rebate	3
Grey water use	1

Community Check In Events

Attendance from public

October 23, 2019 at Frank West Hall (Area E). 7 attended.

October 28, 2019 at Chatelech Secondary (District of Sechelt). 15 attended.

Themes discussed

Water Supply

- Reservoir concerns – appreciated update timeline
- Perceptions from Water Dialogues – Same old. No action. Presentation needed to bring more. Some interpreted Gray Creek as SCRD supply focus.
- Seeking clarification on Chapman Project, Clowhom Lake, and next steps from SCRD
- Concern for appropriate agreements with shíshálh Nation

Meters

- Meters implementation – When?
- Water meters – support for
- Water meters – support for volumetric rates
- Support for meter adoption by public. Ideas about voluntary adoption and feedback campaign to encourage positive uptake.

Bylaws – Development, Building, Water

- Cisterns – Code changes to include water run off
- Hot water pumps in homes so cold water does not go to waste when waiting for hot water
- All automatic sprinklers should have permits with a local person contact to change settings and shut off
- Stop all new builds until our water shortage is fixed
- Code changes to reduce water demand of new developments
- Gospel Rock + Water Shortage

Water Conservation Regulations

- Raise the fines (how much is a cigarette butt fire risk fine?)
- Sprinkler patrols
- Don’t allow washing of driveways or sidewalks at any stage
- I had to tank water in for construction
- Hand watering regulations not matching needs/schedules
- Question how much water hand watering uses compared to sprinkling.
- Marine repair business impacted – turned down business this summer due to boat pressure washing regulations

Communication

- Tourism – communicate conservation culture and regulations to visitors
- Bigger signs about water projects on the highway
- Less conservation tips about things like ice cubes
- Package communication and updates for public consumption. Frustration with trying to read Board reports or document links from SCRD website.
- Provide regular water project and related updates in newspaper.
- Provide project summaries and updates on website (not as attachments)

Incentives

- Incentives for smaller collection systems (1000-2000L)
- Recall the Australian toilets that were to save water. They actually consume 2 times more water! Brush required!

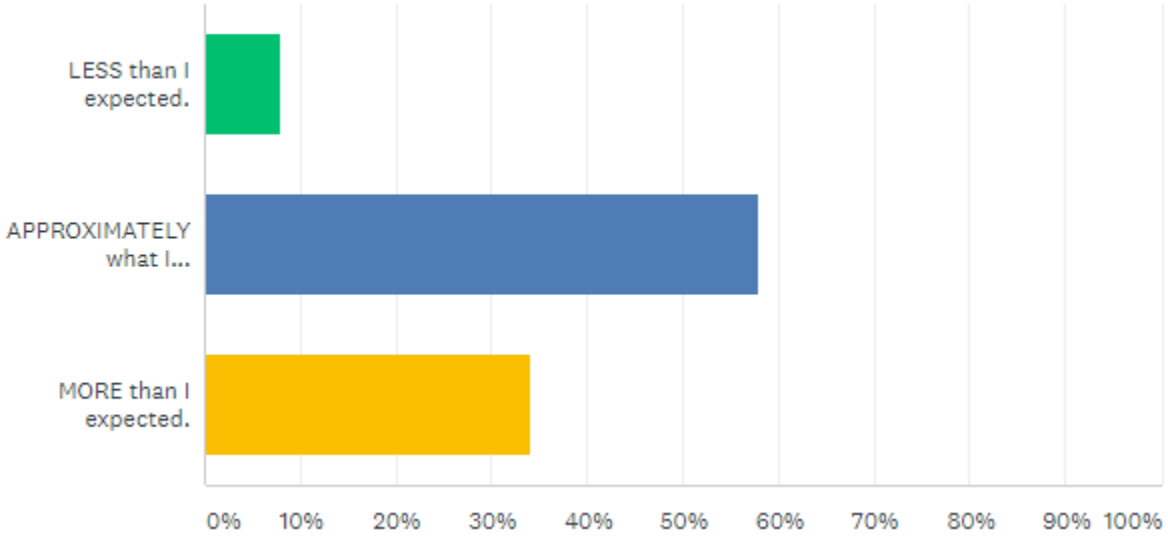
Rainwater Harvesting Rebate Program Questionnaire

A total of 50 responses were collected from rebate program participants from September 22 to 28, 2019.

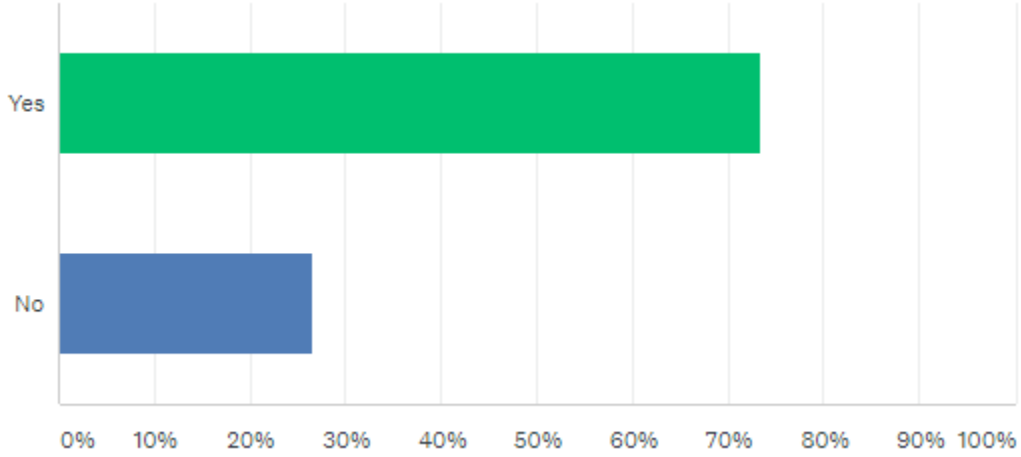
Question 2. How many litres of rainwater storage did you install?

- Participants installed on average 5700 litres of rainwater storage.

Question 3. Did the cost of the system meet your expectations?

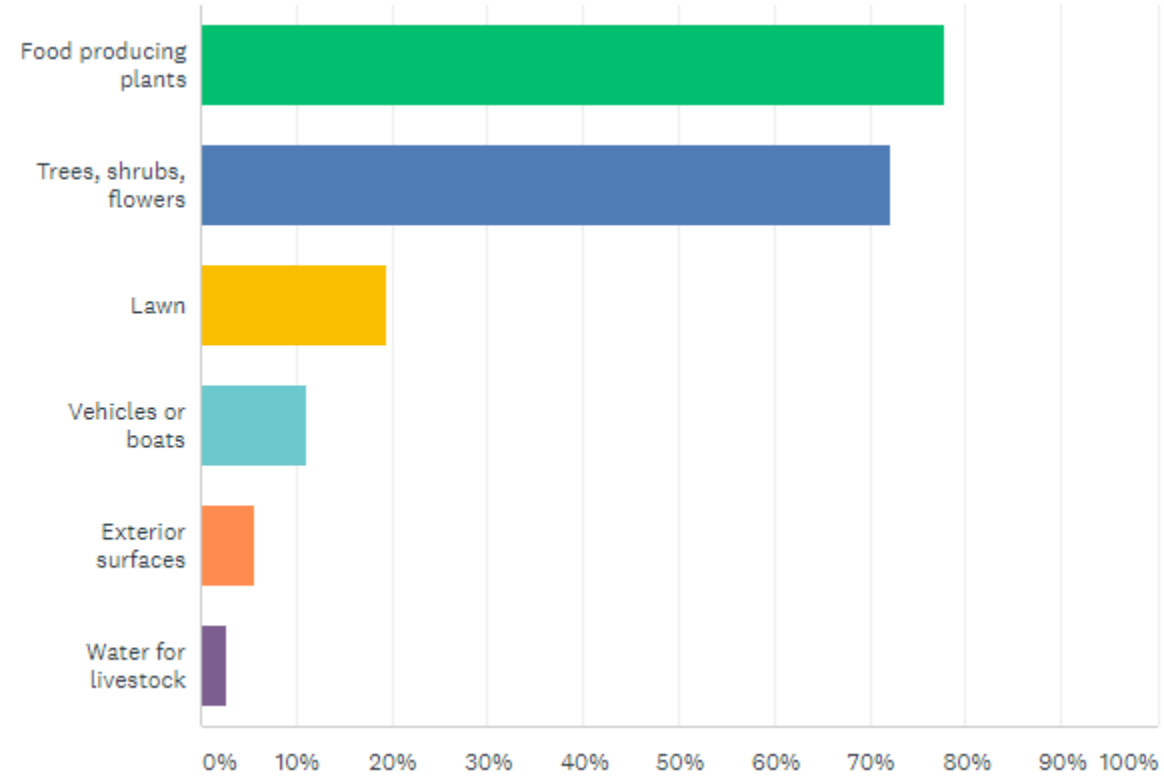


Question 4. Did you use your rainwater harvesting system during summer 2019?



In some cases, the system was installed too late in the summer to be used. In other cases, people saved the water in case Stage 4 Water Conservation Regulations were declared.

Question 5. What did you use your collected rainwater for this summer?



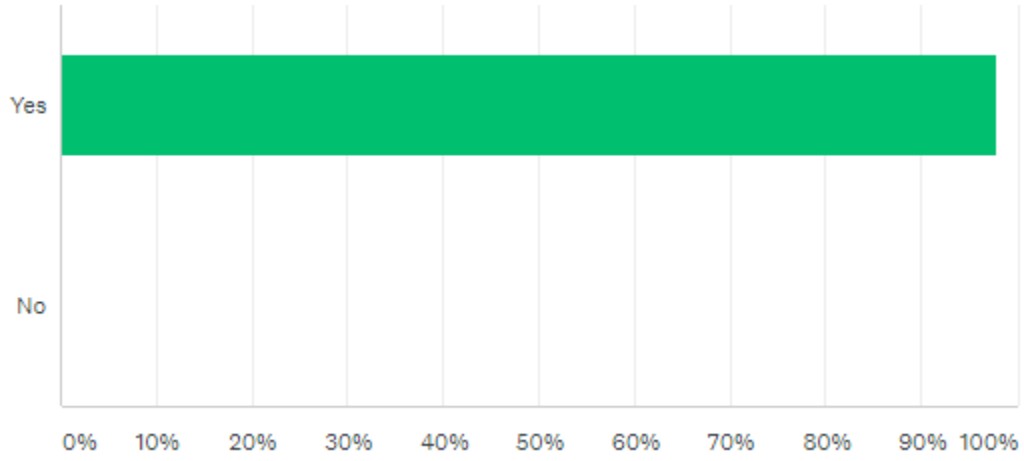
Question 6. Did your rainwater harvesting system meet your outdoor water needs this summer?

Yes	37%
Yes, weather helped	35%
No	27%

Question 7. Did you change any water consumption habits as a result of collected rainwater being your outdoor water source?

- Reduced SCRD water use
- Increased Water Conservation
- Watered on own schedule
- Did not use the water as they were saving it for Stage 4

Question 8. Do you think the SCRD should continue to offer a rainwater harvesting rebate?



Question 9. Please share any additional comments or experiences related to the Rainwater Harvesting Rebate program.

- Positive comment supportive of program
- Looking for more information how to install and maintain system
- Storage is good and in some cases, more is needed
- Starting program earlier so people can capture fall rains would be good
- Costs more than expected
- Should be expanded
- SCRD needs community scale storage

Summary

Public participation in the review of the Drought Management Plan allowed the SCRD to engage with over 600 residents on the topics of Water Conservation Regulations, Communication, Enforcement, Education, and Incentive programs. Responses shared individual experiences and impacts, providing insights for upcoming revisions of the Drought Management Plan and direction for the design of support conservation programs. In addition, participants shared interest and concerns about water supply projects, regional growth, and water meters which will be incorporated into future project communication.

SUNSHINE COAST REGIONAL DISTRICT STAFF REPORT

TO: Infrastructure Services Committee – November 21, 2019

AUTHOR: Raphael Shay, Water & Energy Projects Coordinator

SUBJECT: **WATER CONSERVATION REBATE PROGRAM OPTIONS**

RECOMMENDATION(S)

THAT the report titled Water Conservation Rebate Program Options be received for information;

AND THAT a 2020 Budget Proposal be brought forward to expand the existing water conservation rebate program, including the BC Hydro Appliance Rebate Program.

BACKGROUND

At the July 18, 2019 Infrastructure Services Committee, the Board discussed the Drought Management Plan Debrief process for 2019. This report includes a review of the water conservation rebate programs addressed in the Water Conservation Public Participation Summary report that is part of the November 21, 2019 Infrastructure Services Committee agenda.

Additionally, this report will address recommendations from the June 27, 2019 Board meeting in response to the Southern Sunshine Coast Farmers Institute (in part):

181/19 **Recommendation No. 11** *Correspondence*

THAT the letter from the Southern Sunshine Coast Farmers Institute be referred to staff and that staff report back to Committee in Q4 2019 on the water saving measures requested in the letter, the feasibility of implementation and the financial implications.

As part of the 2020 proposed initiatives presented at the October 24, 2019 Corporate & Administrative Services Committee, staff presented an option to expand the water conservation rebate. The purpose of this report is to provide additional background and options in preparation for the Round One Budget deliberations occurring the first week of December 2019.

DISCUSSION

The following starts with an explanation of the prohibition on financial assistance to businesses from Regional Districts. The discussion then outlines a variety of possible rebate programs for consideration by the Board.

Rebates for Farmers

In correspondence shared at the June 2019 Infrastructure Services Committee, the Southern Sunshine Coast Farmers Institute (SSCFI) recommended a $1,000 grant for every farmer to use towards either a 9,000 litres or more cistern, well development, or pond development.

The *Local Government Act* Section 273 states "a board must not provide assistance to an industrial, commercial or business undertaking." Farms that are businesses do not qualify, however, the residential portion of a farm would qualify for a rebate.

Water Conservation Rebate Program Options

1. *Rainwater Harvesting Rebates*

The SCRD started a Rainwater Harvesting (RWH) Rebate Program in 2018. With little advertisement in 2019, interest exceeded rebates available in the Regional Water Service Area.

As mentioned in the public participation report, 100% of respondents to the Rainwater Harvesting Rebate Participants questionnaire believe the program should continue. It was also the highest ranked preference in the Water Regulations and Conservation Programs questionnaire.

Water savings from RWH depend heavily on precipitation patterns and user behaviour. Assuming historical average summer precipitation, total annual savings for 50 systems would be approximately 0.03% of total SCRD water demand between May and October.

The benefits are seen in the shift of outdoor water use to non-potable sources when water supply is least plentiful. It can lead to behaviour changes and increases the resilience of small scale food producers.

The Rainwater Harvesting Rebate Program offers flexible storage creation. The program recommends best practices, including enclosed storage to limit evaporation losses and prevent the spread of mosquitoes. Ponds are eligible in the current framework because this is a recommendation rather than a requirement. It should be noted that reducing standing water bodies that can act as a breeding ground for mosquitoes is generally accepted as best practice, especially since mosquito-borne diseases are likely to spread further north with climate change.[1]

The SSCFI proposed having another stream for a $1,000 rebate if 9,000 litres of storage are installed. Staff research on irrigation demand and Sunshine Coast water meter data suggest 4,500 litres would be too small for many gardeners. This is supported by the 27% the Rainwater Harvesting Program Participant questionnaire indicating the storage volume is insufficient to meet their needs.

Given the interest and benefits of larger cisterns, staff recommend adding a rebate tier of $1000 for a minimum of 9,000 litres storage to better support large gardens in the existing Rainwater

[1] Government of Canada. (2019). Increased risk of exotic mosquito-borne diseases with climate change. https://www.canada.ca/en/public-health/services/reports-publications/canada-communicable-disease-report-ccdr/monthly-issue/2019-45/issue-4-april-4-2019/article-4-exotic-mosquito-borne-diseases-climate-change.html

Harvesting Rebate Program. Staff also recommend expanding the program budget allocated to the rebates to $40,000 in the Regional Water Service Area.

2. Washing Machine Rebate Program

Washing machines are the second largest indoor water use after toilets. The potential water savings from an efficient washing machine is almost the same as those of an efficient toilet, which was the target of the long running Toilet Rebate Program. An efficient washing machine can reduce water use by 40% to 50% compared to an inefficient model. Savings from 80 efficient machines represent approximately 0.01% of water demand between May and October.

A rebate for appliances was the second highest ranked preference in the Water Regulations and Conservation Programs questionnaire.

BC Hydro promotes energy efficiency and has partnered with local governments on joint rebates. BC Hydro offers between $50 and $100 dollars for qualifying appliances. Their list of eligible washing machines are a selection of the best Energy Star models with an Integrated Water Factor (IWF)[2] of 3.2 or lower. The rebates are accessible via month-long campaigns that have occurred twice per year in the past.

The SCRD can benefit from BC Hydro's knowledge and administrative handling of a rebate program. In the 2019 program, 10 local governments partnered with BC Hydro with an additional $50 rebate per washing machine. Based on BC Hydro's experience, 80 rebates would be an appropriate target for the SCRD. A budget of $4,000 would support 80 rebates of $50 from the SCRD, in addition to staff administration time.

Staff recommend a washing machine rebate program be brought forward as part of a 2020 Budget Proposal and discussions with BC Hydro be initiated.

3. Efficient Irrigation System Rebate Program

The Water Regulations and Conservation Programs questionnaire recorded significant interest in education programming to support efficient irrigation. Additional comments also raised the idea of a rebate to incentivize efficient irrigation systems. There are two main components to irrigation systems that can save water:

a) Micro-drip irrigation system: The Drought Management Plan allows systems using less than 76 litres per hour to operate at Stages 1, 2, and 3. A garden hose can use approximately 4,000 litres per hour. Savings are significant and plant health is generally improved. Programs supporting micro-drip tend to have a rebate per square meter with a cap on the dollar amount awarded.

b) Advance Irrigation Controllers: These controllers can connect to weather reports or soil moisture sensors. If there is rain in the forecast or soil moisture is adequate, then a scheduled irrigation time will be skipped. The ability to automatically incorporate forecasts into the irrigation schedule provides water savings beyond the rain sensors currently required by Water Rates and Regulations Bylaw 422.

Staff recommend focusing efforts on sharing water meter data and raising awareness about water consumption trends with educational work. In many cases, heavy irrigators do not know

[2] Integrated Water Factor is the number of gallons used per cycle per cubic foot. A smaller number is more efficient.

they are large water users or what they can do to make their systems more efficient. Research on removing obstacles to adoption of efficient irrigation systems can happen in parallel to this outreach.

4. Xeriscaping, or Low Impact Development Landscaping Rebate Program

Xeriscaping and Low Impact Development (LID) landscaping can help reduce irrigation water demand during dry summer months. Potential water savings are highly dependent on adoption from properties that use sprinkler systems. Participation from properties that let their lawns go dormant or have non-irrigated lots would not result in water savings.

In terms of reach, this type of program could be of interest to a variety of properties. The inhabited coastal area of the Sunshine Coast is predominantly a dry biogeoclimatic zone. A rebate would be by square meter of irrigated lawn replaced with other features such as raingardens, bioswales, or xeriscaping.

There was no interest in a rebate program for replacing lawns in the Water Regulations and Conservation Programs questionnaire. However, there was interest in educational programs.

Staff do not recommend a xeriscaping or low impact development landscaping rebate program at this time.

5. Greywater and Composting Toilet Rebate Programs

Greywater and composting toilets are allowed in BC and in the SCRD. The Province's Ministry of Health has a Manual of Composting Toilet and Greywater Practice[3] that outlines requirements to meet regulations[4]. A Certified Wastewater Practitioner would need to sign off on a system for it to be approved by the SCRD Building Department.

Water savings can be substantial since toilet flushing can be the largest indoor water use. Capital and operating costs are barriers to these systems and they could benefit from a rebate incentive. They also involve more operator effort than standard systems. Many residents in the community are willing and able to do this extra work.

Staff recommend further research, education, and outreach in 2020 on grey water and composting toilets. Research will include better understanding obstacles to adoption and possible adoption rates in the community.

6. Rainwater Harvesting Rebates – Program for Smaller Storage

There is interest in rebates for smaller cisterns and rain barrels. Of the 42 comments supporting rainwater harvesting in the Water Regulations and Conservation Programs questionnaire, 20 spoke about a rebate or bulk buy for a rain barrel or a smaller cistern.

Rain barrels are approximately 200 litres of storage that can be easily installed at a downspout. The benefits of rain barrels come from the awareness raising as it is easier for someone to visualize the amount of water used for irrigation when it comes from a rain barrel than when it

[3] https://www2.gov.bc.ca/assets/gov/environment/waste-management/sewage/provincial-composting-toilet-manual.pdf
[4] Sewerage System Regulation (SSR), Environmental Management Act, Municipal Wastewater Regulation and BC Building Code.

comes from the tap. Additionally, a rain barrel acts as a public prompt that normalizes wise use of water.

Unfortunately, in a prolonged drought as is becoming more common for the Sunshine Coast, rain barrels are too small to provide a useful amount of water for watering plants. Because administering a program would require additional staff capacity and a program would have a limited impact on building resilience to prolonged drought, staff do not recommend this option.

7. Rebate for Private Well development

To be eligible for SCRD rebate programs, properties must have an SCRD water account and pay the utility user rate. Properties with private wells can opt to not be connected to the SCRD water system and not pay a user rate. If funds are allocated to a rebate for the development of private wells, recipients could disconnect from the SCRD water system, taking away from the user rate base that is set to cover the operation and maintenance costs of the water function.

Staff do not recommend providing a rebate for the development of private wells.

Financial Implications

The current water conservation rebate program is budgeted at $25,000 for Regional Water [370], $1,500 for North Pender, and $2,500 for South Pender. The proposal will increase the Regional program to $40,000 with an approximate addition of $4,000 for the BC Hydro washing machine program. Detailed financial implications will be included as part of the 2020 Round 1 Budget Proposal.

STRATEGIC PLAN AND RELATED POLICIES

Water conservation rebate programs support the 2019-2023 Strategic Plan priority to “plan for and ensure year round water availability now and in the future”. Specifically, it supports the tactic to “expand water conservation programs and increase engagement with residents and stakeholders on water conservation”.

Additionally, water conservation rebate programs can help the community adapt to climate change, another priority in the 2019-2023 Strategic Plan.

Water conservation programs are a part of the Comprehensive Regional Water Plan’s recommended intensive demand management approach.

CONCLUSION

This report considered a variety of possible water conservation rebate programs.

An expanded Rainwater Harvesting Rebate Program is recommended to include a tier for larger cisterns with a minimum storage of 9,000 litres with a $1,000 grant. The total program rebate funds are recommended to be expanded to $40,000 to better reflect the interest in the program.

A Washing Machine Rebate Program is also recommended via a partnership with BC Hydro’s appliance rebate. Many other municipalities have adopted this approach, simplifying the implementation of such a program.

Finally, it is recommended that more outreach, education, and research be conducted on more efficient irrigation technologies, xeriscaping, low impact development landscaping, grey water, and composting toilets.

Reviewed by:			
Manager		CFO/Finance	X – T. Perreault
GM	X - R. Rosenboom	Legislative	X – S. Reid
Interim CAO	X – M. Brown	Other	

SUNSHINE COAST REGIONAL DISTRICT STAFF REPORT

TO: Infrastructure Services Committee – November 21, 2019

AUTHOR: Remko Rosenboom, General Manager, Infrastructure Services

SUBJECT: **STRATEGIC PLAN INITIATIVES INFRASTRUCTURE SERVICES DEPARTMENT**

RECOMMENDATION(S)

THAT the report titled Strategic Plan Initiatives Infrastructure Services Department be received for information.

BACKGROUND

At its October 10, 2019 meeting, the Board adopted its Strategic Plan 2019-2023. This plan includes several strategies and tactics related to the Infrastructure Services Department.

The purpose of this report is to provide the current anticipated implementation schedule and resource implications to support these strategies and tactics.

DISCUSSION

Analysis

Table 1 provides an overview of the more significant initiatives associated with the strategies and tactics related to the Infrastructure Services Department and their anticipated implementation schedule.

Strategic initiative	Departmental Project lead	2020	2021	2022	2023
Water supply expansion: Church Rd well field	Manager, Capital Projects				
Water supply expansion: Raw Water Reservoir	Manager, Capital Projects				
Water supply expansion: Dusty Road or Grey Creek Groundwater investigation	Manager, Capital Projects				
Climate change risk/vulnerability assessments	*Manager, Strategic Initiatives*				
Develop and implement adaptation strategies	*Manager, Strategic Initiatives*				
Develop and implement Water Sourcing Policy	*Manager, Strategic Initiatives*				
Develop and implement Strategic Water Plan North Pender Water System	*Manager, Strategic Initiatives*				

Develop and implement Strategic Water Plan South Pender Water System	*Manager, Strategic Initiatives*					
Develop and implement Strategic Water Plan Regional Water System	*Manager, Strategic Initiatives*					
Water Summit and increased public participation on water conservation and supply	*Manager, Strategic Initiatives*					
Expand water conservation programs	*Manager, Strategic Initiatives*					
Review bylaw to increase water conservation focus	*Manager, Strategic Initiatives*					
Water supply expansion: Electoral funding approval	*Manager, Strategic Initiatives*					
Develop and implement water metering program (including rate structure review)	*Manager, Strategic Initiatives*					
Water meter installation Phase 3	Manager, Utilities					
Develop and implement Asset Management Plans for 17 wastewater facilities	Manager, Utilities					
Develop and implement Asset Management Plan for North Pender Water System	Manager, Utilities					
Develop and implement Asset Management Plan for South Pender Water System	Manager, Utilities					
Develop and implement Asset Management Plan for Regional Water System	Manager, Utilities					
Improved Water Governance	General Manager, Infrastructure Services					
Develop Watershed Protection Action Plan	General Manager, Infrastructure Services					
Update and implement Regional Organics Diversion Strategy	Manager, Solid Waste Programs					
Develop options for long-term waste management approaches	Manager, Solid Waste Operations					
Update Solid Waste Management Plan	Manager, Solid Waste Programs					
Update Transit Future Plan	Manager, Transit and Fleet					
Development and implementation of corporate fleet management strategy	Manager, Transit and Fleet					

The table lists the initiatives directly supporting the Strategic Plan 2019-2023 and does not include all initiatives and activities associated with the day to day service delivery and ongoing asset management (including maintenance, repairs and infrastructure replacements).

Organizational and Intergovernmental Implications

A review of the resource requirements for execution of the listed strategic initiatives concluded that the current staffing complement is insufficient to allow for the listed initiatives to be completed within the timeframe identified in the Strategic Plan 2019-2023.

The majority of the strategic initiatives that required additional staff resources are associated with the development and implementation of strategic thematic plans, associated polices, public participation and water conservation. In order to optimize these initiatives, it is recommended that a new division be formed within the Infrastructure Department, Strategic Infrastructure Initiatives. This team would be led by a newly hired manager and would consist of staff specialized in strategic planning and policy development, public participation processes and water conservation.

The proposed team is to consist of existing staff and some newly hired staff. Budget proposals for these new proposed positions will be presented as part of the 2020 budget process.

The General Manager Infrastructure Services will continue to play a strong leadership role during the implementation the Board's Strategic Plan.

The Strategic Plan 2019-2023 includes the strategy to enhance the intergovernmental collaboration. One of the strategic initiatives listed in Table 1 to support this strategy is to improve Water governance on the Sunshine Coast.

Financial Implications

Budget proposals associated with the proposed new positions will be brought forward at the Round 1 2020 Budget meetings on December 5 and 6, 2019.

STRATEGIC PLAN AND RELATED POLICIES

This report is intended to provide details on the anticipated implementation schedule and resource implications associated with Strategic Plan 2019-2023 implementation as it is related to water and wastewater.

CONCLUSION

This report is intended to provide details on the current anticipated implementation schedule and resource implications associated with the implementation of the Strategic Plan 2019-2023 as it relates to the Infrastructure Services Department.

A review of the resource requirements for execution of the listed strategic initiatives concluded that the current staffing complement is insufficient to allow for the listed initiatives to be completed within the timeframe identified in the Strategic Plan 2019-2023.

Budget proposals associated with the proposed new positions will be brought forward at the Round 1 2020 Budget meetings on December 5 and 6, 2019

Reviewed by:			
Manager	X – R. Cooper X – S. Walkey X – A. Kumar X – S. Misiurak	Finance	
GM		Legislative	
Interim CAO	X – M. Brown	Other	

SUNSHINE COAST REGIONAL DISTRICT STAFF REPORT

TO: Infrastructure Services Committee – November 21, 2019

AUTHOR: Arun Kumar, Manager, Solid Waste Operations

SUBJECT: **PENDER HARBOUR TRANSFER STATION OPERATIONS CONTRACT TERM EXTENSION**

RECOMMENDATION(S)

THAT the report titled Pender Harbour Transfer Station Operations Contract Term Extension be received;

AND THAT the SCRD exercises the right to extend the existing contract with Indian Isle Construction for Pender Harbour Transfer Station Operations for an additional two (2) year period in the amount of up to $498,544 plus GST;

AND THAT the 2020-2024 Financial Plan be amended accordingly.

BACKGROUND

The Solid Waste Division oversees the operation and maintenance of the Pender Harbour Transfer Station, where the public disposes of their waste. The waste is then transferred to Sechelt Landfill for burial or, in the case of recyclable items, to an appropriate facility for recycling.

At this location, the in-house operations consists of scale operations and yard monitoring. Contracted services operations consists of loading and transporting the designated bins to Sechelt landfill for disposal.

In 2016, the SCRD sought proposals from qualified contractors to provide this type of service and signed a four (4) year contract with Indian Isle Construction.

The current term of the contract with Indian Isle Construction is from January 1, 2016 to December 31, 2019 with options to renew for an additional one (1) or more periods of two (2) years, up to a maximum of six (6) years.

The purpose of this report is to review the option to extend the original term of the contract with Indian Isle Construction for an additional two (2) year term.

DISCUSSION

The SCRD has benefitted from having Indian Isle Construction provide services at Pender Harbour Transfer Station since 2016 and for many years as the maintenance contractor of the now closed Pender Harbour landfill.

Options and Analysis

Staff have been satisfied with the level of service as well as quality of work from Indian Isle Construction since the original contract inception. Indian Isle Construction continues to provide reliable and adequate service to the SCRD. Staff have found the work to be satisfactory and the pricing to have remained competitive.

As requested by SCRD Staff, on October 30, 2019 Indian Isle Construction confirmed their interest in extending the contract at the same rate as set out in the original contract with an annual increase that was outlines in their proposal.

The original contract lists the rate for additional work and equipment, if required by the SCRD. Indian Isle Construction expressed a desire to increase the hourly rate for the roll off truck and dump truck as stated in the contract amendment. An annual allowance of $15,000 for extra work has been included in the contract value based on historical amounts.

Financial Implications

The pricing submission was evaluated and compared to both current market pricing, and Indian Isle Construction's 2016 submission. Table 1 shows the breakdown of the overall contract value from the beginning of the contract. Table 2 details the annual contract values for budgeting purposes. The annual operating expense budget will increase by $3,295 in 2020 and $3,344 in 2021 as a result of this contract extension.

Table 1: Contract Value Details

	Cost
Original Contract Value	$868,325
Contract Extension Value (2 years)	$498,544
Total Contract Value	**$1,366,869**

Table 2: Annual Contract Details

	2020	2021	**Totals**
Base Operations	$222,950	$226,294	**$449,244**
Bin Rental & Hauling	9,650	9,650	**19,300**
Allowance for Extra Work	15,000	15,000	**30,000**
Totals	**$247,600**	**$250,944**	**$498,544**

STRATEGIC PLAN AND RELATED POLICIES

N/A

CONCLUSION

The SCRD entered into a four year contract in 2016 with Indian Isle Construction for Pender Harbour Transfer Station Operations, which expires on December 31, 2019. The contract included the option to extend the original contract for an additional one (1) or more periods of two (2) years, up to a maximum of six (6) years.

Staff have reviewed the submission of updated pricing from Indian Isle Construction and recommend exercising the right to extend the contract for an additional period of two (2) years for the Pender Harbour Transfer Station Operations.

Reviewed by:			
Manager		CFO/Finance	X – T. Perreault
GM	X – R. Rosenboom	Legislative	
Interim CAO	X – M. Brown	Other (Purchasing)	X – V. Cropp

SUNSHINE COAST REGIONAL DISTRICT STAFF REPORT

TO: Infrastructure Services Committee – November 21, 2019

AUTHOR: Yuli Siao, Senior Planner

SUBJECT: **ZONING AMENDMENT BYLAW NOS. 310.184, 2018 AND 337.118, 2018 FOR SHORT TERM RENTAL ACCOMMODATION REGULATIONS - CONSIDERATION OF THIRD READING**

RECOMMENDATIONS

1. **THAT the report titled Zoning Amendment Bylaw Nos. 310.184, 2018 and 337.118, 2018 for Short Term Rental Accommodation Regulations - Consideration of Third Reading be received;**

2. **AND THAT Sunshine Coast Regional District Zoning Amendment Bylaw No. 310.184, 2018 and Sunshine Coast Regional District Electoral Area A Zoning Amendment Bylaw No. 337.118, 2018 be forwarded to the Board for Third Reading;**

3. **AND FURTHER THAT prior to adoption of the zoning amendment bylaws, staff bring forward for consideration an implementation plan for temporary use permits for short term rental accommodations and other relevant bylaw amendments to facilitate such implementation.**

At the May 23, 2019 Regular Board meeting Resolution 157/19 was adopted as follows:

Recommendation No. 3 *Sunshine Coast Regional District Zoning Amendment Bylaw No. 310.184 and Sunshine Coast Regional District Electoral Area A Zoning Amendment Bylaw No. 337.118 – Short Term Rental Accommodation Regulations*

THAT the report titled Zoning Amendment Bylaws No. 310.184 and 337.118 for Short Term Rental Accommodation Regulations - Consideration of Second Reading and Public Hearing be received;

AND THAT Sunshine Coast Regional District Zoning Amendment Bylaw No. 310.184, 2018 and Sunshine Coast Regional District Electoral Area A Zoning Amendment Bylaw No. 337.118, 2018 be forwarded to the Board for Second Reading;

AND THAT a Public Hearing to consider the bylaws be scheduled for June 18, 2019 at 7:00 p.m. at the Seaside Centre, 5790 Teredo Street, Sechelt, BC;

AND THAT Director Pratt be delegated as the Chair and Director Siegers be delegated as the Alternate Chair for the Public Hearing with all other Electoral Area directors in attendance;

AND FURTHER THAT all Advisory Planning Commissions be notified of the Public Hearing.

With a focus on analyzing feedback received from the Public Hearing, this report draws conclusions from the entire review process of short term rental accommodations, and recommends consideration of Third Reading of the proposed bylaws as revised and provided in Attachments A and B, and consideration of implementation mechanism prior to adoption of the bylaws. The previously proposed bylaws considered at the Public Hearing are provided as Attachments D and E.

DISCUSSION

Public Hearing Summary

Approximately 45 members of the public attended the Public Hearing held on June 18, 2019. The Public Hearing Report and nine written submissions received prior to the closing of the Public Hearing can be found in Attachment C. Debate on three common topics throughout the previous public consultation process culminated at the Public Hearing. These topics are:

1. The benefit, impact and scale of operation of short term rental accommodation business;
2. Whether or not management by off-site operator should be permitted; and
3. The need for bylaw enforcement.

These topics are discussed as follows.

Benefit and Impact

Five speakers at the Public Hearing and one written submission stress the benefits of short term rental accommodation, which include making it affordable to own a permanent or vacation property on the Coast, providing employment for operators, offering affordable vacation opportunities for families, as well as many positive spin-off effects on tourism and the local economy. They ask for less restrictive regulations and allowance of off-site operators, so that the economic benefits of short term rental accommodation businesses will not be hampered. In particular, they regard the limits on the number of bedrooms and the number of occupants too restrictive and impractical for traveling families or for operations that need to rent entire properties to be profitable.

On the other hand, five speakers and eight written responses expressed concerns about the negative impacts of short term rental accommodations on property value and quality of life of their neighbourhoods. Many have expressed frustration with problems brought upon them by adjacent short term rentals, especially those without on-site managers, such as noise, disrespectful guests, party houses, fire hazards, property damage, and parking and garbage issues. They are also frustrated with the lack of bylaw enforcement. They demand stricter rules on short term rentals, and particularly the limit on the scale of operation and requirement for on-site operators.

The above contending views have led to two critical questions:

1. What is the appropriate scale of operation that protects a property from negative impacts yet does not hamper the economic benefits of short term rental accommodations?

2. What are the appropriate options for operators: on-site only, or should off-site also be permitted?

Scale of Operation

A Scalable Policy Framework

One of the main concerns on the scale of operation of a short term rental accommodation or B & B is the limit on the number of bedrooms. There is a misperception that a two bedrooms per dwelling limit is proposed as a new regulation to be imposed on all short term rental accommodations in all properties.

Limits on the number of B & B bedrooms have existed in both zoning bylaws for years, and these are not proposed to be changed. These limits are not a one-size-for-all regulation that applies to all kinds of properties and all land use designations.

The existing limits are part of a framework of policies and regulations for bed and breakfast use that has long been established in SCRD's Official Community Plans and Zoning Bylaws. This policy framework has established the fundamental principle for the scale of operation of this type of use in most residential and rural areas, namely, the use must be of an auxiliary nature, and must not alter the primary use and character of the land use designation. Maintaining the balance between principal use and auxiliary use is important to fulfilling the community's vision on this type of land use and its compatibility with other land uses. It is also important that the intended scale and intensity of auxiliary uses, as set out in the policy framework can be sustained by SCRD's infrastructure and servicing capacity.

This existing policy framework provides for a diverse array of zones and scalable options suited to a wide range of B & B operations which are generally proportional to the size of a property, rather than a one-size-for-all solution. The current zoning bylaws permit up to two B & B bedrooms per dwelling on smaller parcels not exceeding 2000 m^2 in several residential zones where only one dwelling is permitted. In most residential zones, parcels exceeding 2000 m^2 are allowed to have one single family dwelling plus one auxiliary dwelling or one half of a duplex to form a duplex with the existing dwelling. Each dwelling, including the auxiliary dwelling, can have up to two B & B bedrooms, amounting to a total of 4 bedrooms per property. On larger residential or rural properties over 3500 m^2 or 4000 m^2, two or more dwellings may be permitted, providing more opportunities beyond 4 or 5 B & B bedrooms. There are approximately 2500 residentially designated parcels exceeding 2000 m^2 in size within the SCRD. This is a substantial potential for operators who wish to rent more than two bedrooms. Alternatively, commercial zones may be better suited for larger B & B operations. Additionally, the Roberts Creek OCP allows an increase to three bedrooms in the Enhanced B & B Area within the Roberts Creek Village Core.

Operators who wish to rent a large number of bedrooms may look for larger properties in suitable zones, rather than turning an entire smaller residential property into a short term rental business, which would risk commercializing and changing the character of the entire property and potentially affecting the adjacent residential neighbourhood.

With over 700 responses, the on-line questionnaire conducted in March and April of 2019 indicates that the majority of participants think that generally two bedrooms or less per dwelling is an appropriate limit.

The SCRD Bylaw Compliance Division has investigated considerable number of short term rental infraction cases which are operations beyond zoning bylaw limits on the number of bedrooms, including entire properties being rented. This type of operation appears to have the

most negative impact on adjacent neighbourhoods. This further reinforces the notion that it is important to maintain an appropriate balance between auxiliary use and principal use.

Defining the Scale of Operation

As discussed above, the number of bedrooms is a well-established factor in defining the scale of operation. The number of bedrooms is also a common indicator of scale of operation used by the hospitality and accommodation industry and most accommodation booking systems. However, the number of bedrooms alone cannot define the scale of operation completely. Another important factor, the number of occupants, is also often used together with bedroom numbers to determine the capacity of an accommodation facility. These two factors, which are complementary to each other, must be used hand in hand in order to effectively define the scale of operation.

Limiting the total number of occupants in a B & B establishment is important to maintaining the auxiliary nature of the use. Currently Zoning Bylaw No. 310 does not regulate the number of occupants, while Zoning Bylaw No. 337 limits the number of occupants to four per dwelling for a bed and breakfast home where two bedrooms are permitted, and ten per dwelling for a bed and breakfast inn where five bedrooms are permitted. Hence it was recommended that a consistent approach be introduced to both bylaws that controls the total number of occupants based on two occupants per bedroom permitted. It is important to note that this is used to calculate the maximum total number of occupants for the entire B & B establishment, rather than dictating the exact number of occupants in each bedroom. This allows for flexibility for allocating occupants to different bedrooms based on the setup of each property and the needs of the occupants. For example, where two B & B bedrooms are permitted, the establishment can accommodate a maximum of four people, regardless of whether one bedroom or two bedrooms are rented, or whether the guests are four adults or a couple with two children. B & B guests can choose the facilities that suit their needs.

According to SCRD Bylaw Compliance, both the number of bedrooms and the number of occupants are verifiable and enforceable through various methods, for example, checking booking websites, contacting the operator or owner of the property, neighbour observation, on-site investigation, etc. The number of bedrooms and the number of occupants are two complimentary key factors in providing Bylaw Compliance effective control over the scale of operation.

A third factor in defining the scale of operation, bedroom size, was recommended in the previously proposed bylaw amendments. The maximum bedroom size was recommended to be an average of 28 m^2 for all permitted bedrooms in a B & B establishment. However, due to the variation in interior setup and partition of each dwelling, bedroom size or floor area is difficult to define or measure, for example, a loft, or an unenclosed open interior space has undefined floor area. Bedroom size is also difficult to verify or enforce through bylaw compliance investigation. With regulations for the number of bedrooms and number of occupants defined, it is unnecessary to define bedroom or bedroom size for the purpose of controlling the scale of operation. There will be more flexibility in interior setup without bedroom size limits. Therefore it is recommended that the definition of bedroom and requirement for bedroom size be removed from the bylaw amendments. This does not alter the B & B use or density or the general intent of the bylaws.

Based on the above discussion, existing regulations appear to be a well-balanced and scalable system that is appropriate for controlling the scale of operation of short term rental

accommodations in a wide range of situations, rather than being “too restrictive”. Hence it was recommended that this system be maintained, with amendments to be made to enhance the overall consistency and clarity of the two zoning bylaws, as noted above.

Off-site Operator and TUP

Throughout the entire public consultation process, there appears to be a strong interest in the community towards permitting on-site operators only, but there is also support for off-site management if the short term rental accommodations can be effectively regulated and monitored. The recommended temporary use permit (TUP) regulations for off-site operators are intended to provide a mechanism to establish operator accountability, enable neighbourhood oversight and assist SCRD monitoring and bylaw enforcement.

In response to Public Hearing feedback, a number of revisions to the TUP regulations are recommended as follows.

1. Changing the off-site operator’s required response time to any issues from 24 hours to 30 minutes for noise and safety issues, and 12 hours to all other issues. This will help to provide more timely and effective responses to different types of issues. The operator must also inform the occupants of any applicable regulations rather than, as previously proposed, ensuring compliance. These standards take into account comments from operators through the public participation process and received at the Public Hearing whereby operators noted that vetting of guests and operating at a scale appropriate for the property prevent many nuisance problems from occurring in the first place.

2. With respect to further continuation of a TUP beyond the maximum duration of six years for the permit including one permitted renewal as authorized by the *Local Government Act*, a local government may subject the continual use to an amendment to the zoning bylaw. Staff are aware that the TUP approach is a short-term solution and that a more formal rezoning process will eventually be required if the use is to continue permanently.

3. The operation of a short term rental accommodation does not change the use of a dwelling in terms of BC Building Code requirements. Compliance with Building Code requirements is the owner’s or operator’s responsibility. Hence it is recommended that the requirement for a special building inspection as proposed in the previous version of bylaws be removed.

4. In addition to application processing fee, a security deposit should also be required to guarantee performance.

Additionally, in order to make a clear distinction between the currently permitted bed and breakfast use operated by a resident of the property (on-site operator) and the short term rental accommodation use operated by an off-site operator to be introduced into the zoning bylaws, it is recommended that definitions and regulations for either type of use be separated in the revised bylaws (Attachments A and B).

TUP Implementation

If the Board directs staff to proceed further with the TUP regulation process, an implementation plan and amendments to related bylaws will be brought forward to the Board for consideration. The TUP application fee, security deposit, approval criteria and administrative procedures will be established in the Planning and Development Procedures and Fees Bylaw No. 522.

Without a full understanding of the number and distribution of off-site operators within the SCRD, staff are uncertain as to how many TUP applications to expect to be submitted. In addition, staff have not yet fully assessed the impact that administering and implementing TUP regulations will have on SCRD's administrative capacity. The implementation plan will provide further analysis of possible number of applications and an assessment of resources necessary to administer them.

As a way of streamlining the TUP process, the Board may consider exercising its authority to delegate approval of the TUP to staff. Details of this option will be included in the implementation plan which will provide analysis of the pros and cons of delegation and mechanism to enact delegation through an amendment to the Delegation Bylaw No. 710.

Therefore, staff recommend that prior to adoption of the zoning bylaw amendments, a comprehensive TUP implementation plan along with relevant bylaw amendments be brought forward for the Board's consideration and direction.

Bylaw Enforcement

Throughout the entire public consultation process, problems and negative impacts of short term rental accommodations have been largely attributed to the delay or lack of bylaw enforcement. Some suggest that these problems should be dealt with only by stronger bylaw enforcement and heavier penalties rather than restricting the scale of operation, and well-managed operations with no complaints should be allowed to operate without limit.

In reality, as indicated by SCRD Bylaw Compliance records, many nuisance problems are often resulted from over-the-limit operations or lack of on-site management. No matter how well an operation is managed, it still must be contained within the limits of the zoning bylaws and must adhere to the OCP principle that it is an auxiliary use.

Short term rental related problems are not the only infractions SCRD Bylaw Compliance deals with. In order to enhance and strengthen the overall effectiveness of bylaw enforcement, there needs to be a holistic and consistent strategy to deal with all kinds of infractions, which may include staffing resources, penalty structures, coordination with other regulations, technological mechanism, etc. Stronger and clearer regulations, such as the bylaw amendments recommended in this report, can promote compliance and assist bylaw enforcement, but bylaw enforcement is beyond the purview of the zoning bylaw, and should be reviewed and implemented through separate regulations.

Financial and Organizational Implications

As part of bringing forward the TUP implementation plan and possible amendments to other relevant bylaws, staff will review staffing resources for permit application processing, notification, inspection, monitoring, enforcement and cost recovery to ensure the service can be provided. Further information will be provided as part of the recommended next steps.

Timeline for Next Steps

If the Board gives the bylaws Third Reading, staff should be directed to bring forward the aforementioned TUP implementation plan and amendments to other relevant bylaws.

Communication Strategy

The decisions of the Board on these bylaws will be posted on the SCRD website and social media. If the Board adopts the bylaws and any other related bylaws or procedures, it will be advertised in the newspaper and on the SCRD website and social media.

CONCLUSION

The Public Hearing process reveals that public interest in short term rental accommodations continue to centre on three common themes – scale of operation, operator options and bylaw enforcement. Further analysis on these themes in this report re-affirms that with improvements to clarity and consistency of the zoning bylaws and incorporation of temporary use permit regulations for off-site operators, SCRD's existing framework of policies and regulations can be strengthened to provide a sound and balanced solution to short term rental accommodation issues on the Sunshine Coast that reflects a broad range of community interests.

Staff recommend that the revised zoning amendment bylaws be forwarded to the Board for Third Reading, and prior to adoption of these bylaws, a TUP implementation plan along with other relevant bylaw amendments be brought forward for consideration.

Attachments

Attachment A – Zoning Amendment Bylaw 310.184, 2018 for Third Reading

Attachment B – Zoning Amendment Bylaw 337.118, 2018 for Third Reading

Attachment C – Public Hearing Report

Attachment D – Zoning Amendment Bylaw 310.184, 2018 that received Second Reading

Attachment E – Zoning Amendment Bylaw 337.118, 2018 that received Second Reading

Reviewed by:			
Manager	X – D. Pady	CFO/Finance	
GM	X – I. Hall	Legislative	
I/CAO	X – M. Brown	Building	

Attachment A SUNSHINE COAST REGIONAL DISTRICT

BYLAW NO. 310.184

A bylaw to amend the *Sunshine Coast Regional District Zoning Bylaw No. 310, 1987*

The Board of Directors of the Sunshine Coast Regional District, in open meeting assembled, enacts as follows:

PART A – CITATION

1. This bylaw may be cited as *Sunshine Coast Regional District Zoning Amendment Bylaw No. 310.184, 2018*.

PART B – AMENDMENT

2. *Sunshine Coast Regional District Zoning Bylaw No. 310, 1987* is hereby amended as follows:

   a. Replace the definition for “bed and breakfast” in Section 201 with the following definition:

      “bed and breakfast” means rental accommodation provided in and auxiliary to a dwelling, occupied by the same occupant(s) for not more than 30 consecutive days, and operated by an on-site operator, but specifically excludes accommodation provided in a campground, a sleeping unit, a housekeeping unit, a motel, a lodge, a hotel or a resort hotel.

   b. Insert the following definitions in Section 201:

      “short term rental accommodation” means rental accommodation provided in and auxiliary to a dwelling, occupied by the same occupant(s) for not more than 30 consecutive days and operated by an off-site operator, but specifically excludes accommodation provided in a campground, a sleeping unit, a housekeeping unit, a motel, a lodge, a hotel or a resort hotel.

      “on-site operator” means an operator of a bed and breakfast who resides on the property where the bed and breakfast is located and for the duration of when the bed and breakfast is in operation.

      “off-site operator” means an operator of a short term rental accommodation who does not reside on the property where the short term rental accommodation is operated, but resides within the boundaries of the Sunshine Coast Regional District when the short term rental accommodation is in operation.

   c. Replace Sections 502.11(a) to (f) with the following sections:

      (a) Except as provided for in Section 1001A.4 for the RU1A zone and Section 1001C.3(h) for the RU1C zone or any other parts of this bylaw, the number of bedrooms utilized for bed and breakfast shall not exceed two per dwelling. Where short term rental accommodation is also permitted, the total number of bedrooms

for both bed and breakfast and short term rental accommodation shall not exceed two per dwelling.

(b) The total number of occupants of a bed and breakfast establishment shall not exceed two per each permitted bedroom.

(c) No external indication or advertising associated with a bed and breakfast shall be permitted on the property except a single sign not exceeding 3500 square centimetres.

(d) Any dwelling utilized for bed and breakfast shall be connected to sewerage disposal and water supply facilities that are in compliance with current regulations pursuant to the *Public Health Act* of British Columbia.

(e) A bed and breakfast shall be operated by an on-site operator.

d. Insert the following section immediately following Sections 502.11:

Short Term Commercial Accommodation

(12) (a) Short term rental accommodation is permitted in the R1 zone where the parcel size exceeds 2000 square metres, and in the R2, C2, C2A, C3, C4, C6, CR1, CR2, RU1, RU1A, RU1B, RU1C, RU1D, RU2, PA2 and PA3 zones, subject to the following conditions:

i. A short term rental accommodation shall be operated by an off-site operator when the short term rental accommodation is in operation.

ii. The number of bedrooms utilized for short term rental accommodation shall not exceed two per dwelling. Where bed and breakfast is also permitted, the total number of bedrooms for both bed and breakfast and short term rental accommodation shall not exceed two per dwelling.

iii. The total number of occupants of a short term rental accommodation shall not exceed two per each permitted bedroom.

iv. No external indication or advertising associated with a short term rental accommodation shall be permitted on the property except a single sign not exceeding 3500 square centimetres.

v. Any dwelling utilized for short term rental accommodation shall be connected to sewerage disposal and water supply facilities that are in compliance with current regulations pursuant to the *Public Health Act* of British Columbia.

vi. A minimum of one off-street parking space shall be provided for each permitted short term rental accommodation bedroom in addition to all off-street parking spaces required by this bylaw for all other permitted uses in the parcel where the short term rental accommodation is operated.

(b) All zones within this bylaw that permit short term rental accommodation are designated as a Temporary Use Permit Area for the consideration of

permitting short term rental accommodations, subject to the following conditions:

i. The maximum duration of a Temporary Use Permit is three years. The permit may be renewed only once. After the renewed permit expires, further continuation of the same use on the same property may be considered through an application to rezone the property.

ii. Notice regarding a Temporary Use Permit application must be published in a local newspaper and provided to owners and residents of properties within a 100-m radius of the subject parcel. If the permit is granted, contact information of the operator shall be provided to those owners and residents therein.

iii. An application fee and a deposit shall be required for a Temporary Use Permit application in accordance with the Planning and Development Procedures and Fees Bylaw in effect.

iv. An off-site operator shall be responsible for all operations of the short term rental accommodation, and shall address noise and safety issues within 30 minutes of being notified, and all other issues within 12 hours of being notified.

v. An off-site operator shall inform the short term rental accommodation occupants of all applicable bylaws and regulations, including on-street parking, noise bylaw, garbage disposal, water usage restriction and fire ban when in effect.

vi. Upon a total of three infractions of any terms or conditions of the Temporary Use Permit, the zoning bylaw or any applicable bylaws, the permit may be revoked.

e. Renumber Subsections 12 to 16 of Section 502 as Subsection 13 to 17.

f. Insert the following subsection after subsection 601.2(3):

(4) short term rental accommodation subject to Section 502(12) of this bylaw.

g. Insert the following subsection after subsection 611.1(5):

(6) short term rental accommodation subject to Section 502(12) of this bylaw.

h. Insert the following subsection after subsection 612.1(3):

(4) short term rental accommodation subject to Section 502(12) of this bylaw.

i. Insert the following subsection after subsection 801.1(6):

(7) short term rental accommodation subject to Section 502(12) of this bylaw.

j. Insert the following subsection after subsection 811.1(15):

(16) short term rental accommodation subject to Section 502(12) of this bylaw.

k. Insert the following subsection after subsection 811.1(15):

(16) short term rental accommodation subject to Section 502(12) of this bylaw.

l. Insert the following subsection after subsection 811A.1(12):

(13) short term rental accommodation subject to Section 502(12) of this bylaw.

m. Insert the following subsection after subsection 821.1(11):

(12) short term rental accommodation subject to Section 502(12) of this bylaw.

n. Insert the following subsection after subsection 831.1(8):

(9) short term rental accommodation subject to Section 502(12) of this bylaw.

o. Insert the following subsection after subsection 1000.1(4):

(5) short term rental accommodation subject to Section 502(12) of this bylaw.

p. Insert the following subsection after subsection 1001.1(6):

(7) short term rental accommodation subject to Section 502(12) of this bylaw.

q. Insert the following subsection after subsection 1001A.1(6):

(7) short term rental accommodation subject to Section 502(12) of this bylaw.

r. Insert the following subsection after subsection 1001B.1(6):

(7) short term rental accommodation subject to Section 502(12) of this bylaw.

s. Insert the following subsection after subsection 1001D.1(6):

(7) short term rental accommodation subject to Section 502(12) of this bylaw.

t. Insert the following subsection after subsection 1011.1(7):

(8) short term rental accommodation subject to Section 502(12) of this bylaw.

u. Insert the following subsection after subsection 1011A.1(6):

(7) short term rental accommodation subject to Section 502(12) of this bylaw.

v. Insert the following subsection after subsection 1102.1(14):

(15) short term rental accommodation subject to Section 502(12) of this bylaw.

w. Insert the following subsection after subsection 1103.1(9):

(10) short term rental accommodation subject to Section 502(12) of this bylaw.

PART C – ADOPTION

READ A FIRST TIME this	25TH DAY OF	OCTOBER,	2018
READ A SECOND TIME this	23RD DAY OF	MAY,	2019
PUBLIC HEARING HELD PURSUANT TO THE *LOCAL GOVERNMENT ACT* this	18TH DAY OF	JUNE,	2019
READ A THIRD TIME this	DAY OF	MONTH	YEAR
ADOPTED this	DAY OF	MONTH	YEAR

Corporate Officer

Chair

Attachment C **SUNSHINE COAST REGIONAL DISTRICT**

BYLAW NO. 337.118

A bylaw to amend *Sunshine Coast Regional District Electoral Area A Zoning Bylaw No. 337, 1990*

The Board of Directors of the Sunshine Coast Regional District, in open meeting assembled, enacts as follows:

PART A – CITATION

1. This bylaw may be cited as *Sunshine Coast Regional District Electoral Area A Zoning Amendment Bylaw No. 337.118, 2018*.

PART B – AMENDMENT

2. *Sunshine Coast Regional District Electoral Area A Zoning Bylaw No. 337, 1990* is hereby amended as follows:

   a. Revise the definitions for “bed and breakfast home” and “bed and breakfast inn” and insert new definitions in Section 201 as follows:

      “bed and breakfast home” means rental accommodation provided in not more than two bedrooms of a dwelling, occupied by the same occupant(s) for not more than 30 consecutive days and operated by an on-site operator, but specifically excludes accommodation provided in a campground, a sleeping unit, a housekeeping unit, a motel, a lodge, a hotel or a resort hotel.

      “bed and breakfast inn” means rental accommodation provided in not more than five bedrooms of a dwelling, occupied by the same occupant(s) for not more than 30 consecutive days and operated by an on-site operator, but specifically excludes accommodation provided in a campground, a sleeping unit, a housekeeping unit, a motel, a lodge, a hotel or a resort hotel.

      “short term rental accommodation” means rental accommodation provided in and auxiliary to a dwelling, occupied by the same occupant(s) for not more than 30 consecutive days and operated by an off-site operator, but specifically excludes accommodation provided in a campground, a sleeping unit, a housekeeping unit, a motel, a lodge, a hotel or a resort hotel.

      “on-site operator” means an operator of a bed and breakfast who resides on the property where the bed and breakfast is located and for the duration when the bed and breakfast is in operation.

      “off-site operator” means an operator of a short term rental accommodation who does not reside on the property where the short term rental accommodation is operated, but resides within the boundaries of the Sunshine Coast Regional District when the short term rental accommodation is in operation.

b. Replace Section 509 Bed and Breakfast Homes and Section 510 Bed and Breakfast Inns with the following:

Bed and Breakfast Homes and Bed and Breakfast Inns

509 Bed and breakfast homes and bed and breakfast inns, where permitted and herein referred to as bed and breakfast, are subject to the following conditions:

(a) Where short term rental accommodation is also permitted, the total number of bedrooms for both bed and breakfast home and short term rental accommodation shall not exceed two per dwelling.

(b) Where short term rental accommodation is also permitted, the total number of bedrooms for both bed and breakfast inn and short term rental accommodation shall not exceed five per dwelling.

(c) The total number of occupants of a bed and breakfast establishment shall not exceed two per each permitted bedroom.

(d) No external indication or advertising associated with a bed and breakfast shall be permitted on the property except a single sign not exceeding 3500 square centimetres.

(e) Any dwelling utilized for bed and breakfast shall be connected to sewerage disposal and water supply facilities that are in compliance with current regulations pursuant to the *Public Health Act* of British Columbia.

(f) A bed and breakfast shall be operated by an on-site operator.

c. Insert the following section immediately following Section 509:

Short Term Rental Accommodation

510

(a) Where bed and breakfast home is also permitted, the total number of bedrooms for both the bed and breakfast home and short term rental accommodation shall not exceed two per dwelling.

(b) Where bed and breakfast inn is also permitted, the total number of bedrooms for both the bed and breakfast inn and short term rental accommodation shall not exceed five per dwelling.

(c) The total number of occupants of a short term rental accommodation shall not exceed two per each permitted bedroom.

(d) A short term rental accommodation shall be operated by an off-site operator when the short term rental accommodation is in operation.

(e) No external indication or advertising associated with a short term rental accommodation shall be permitted on the property except a single sign not exceeding 3500 square centimetres.

(f) Any dwelling utilized for short term rental accommodation shall be connected to sewerage disposal and water supply facilities that are in compliance with current regulations pursuant to the *Public Health Act* of British Columbia.

(g) A minimum of one off-street parking space shall be provided for each permitted short term rental accommodation bedroom in addition to all off-street parking spaces required by this bylaw for all other permitted uses in the parcel where the short term rental accommodation is operated.

(h) All zones within this bylaw that permit short term rental accommodation are designated as a Temporary Use Permit Area for the consideration of permitting short term rental accommodations, subject to the following conditions:

i. The maximum duration of a Temporary Use Permit is three years. The permit may be renewed only once. After the renewed permit expires, further continuation of the same use on the same property may be considered through an application to rezone the property.

ii. Notice regarding a Temporary Use Permit application must be published in a local newspaper and provided to owners and residents of properties within a 100-m radius of the subject parcel. If the permit is granted, contact information of the operator shall be provided to those owners and residents therein.

iii. An application fee and a deposit shall be required for a Temporary Use Permit application in accordance with the Planning and Development Procedures and Fees Bylaw in effect.

iv. An off-site operator shall be responsible for all operations of the short term rental accommodation, and shall address noise and safety issues within 30 minutes of being notified, and all other issues within 12 hours of being notified.

v. An off-site operator shall inform the short term rental accommodation occupants of all applicable bylaws and regulations, including on-street parking, noise bylaw, garbage disposal, water usage restriction and fire ban when in effect.

vi. Upon a total of three infractions of any terms or conditions of the Temporary Use Permit, the zoning bylaw or any applicable bylaws, the permit may be revoked.

d. Insert the following subsection after subsection 600.1(1)(b):

(c) short term rental accommodation subject to Section 510 of this bylaw.

e. Insert the following subsection after subsection 601.1(3)(b):

(c) short term rental accommodation subject to Section 510 of this bylaw.

f. Insert the following subsection after subsection 602.1(2)(a):

(b) short term rental accommodation subject to Section 510 of this bylaw.

g. Insert the following subsection after subsection 603.1(1)(b):

(c) short term rental accommodation subject to Section 510 of this bylaw.

h. Insert the following subsection after subsection 611.1(1)(b):

(c) short term rental accommodation subject to Section 510 of this bylaw.

i. Insert the following subsection after subsection 612.1(1)(b):

(c) short term rental accommodation subject to Section 510 of this bylaw.

j. Insert the following subsection after subsection 621.1(1)(b):

(c) short term rental accommodation subject to Section 510 of this bylaw.

k. Insert the following subsection after subsection 631.1(1)(b):

(c) short term rental accommodation subject to Section 510 of this bylaw.

l. Insert the following subsection after subsection 641.1(1)(b):

(c) short term rental accommodation subject to Section 510 of this bylaw.

m. Insert the following subsection after subsection 651.1(1)(b):

(c) short term rental accommodation subject to Section 510 of this bylaw.

n. Insert the following subsection after subsection 801.1(j):

(k) short term rental accommodation subject to Section 510 of this bylaw.

o. Insert the following subsection after subsection 811.1(h):

(i) short term rental accommodation subject to Section 510 of this bylaw.

p. Insert the following subsection after subsection 811A.1(h):

(i) short term rental accommodation subject to Section 510 of this bylaw.

q. Insert the following subsection after subsection 821.1(p):

(q) short term rental accommodation subject to Section 510 of this bylaw.

r. Insert the following subsection after subsection 821A.1(o):

(p) short term rental accommodation subject to Section 510 of this bylaw.

s. Insert the following subsection after subsection 831.1(e):

(f) short term rental accommodation subject to Section 510 of this bylaw.

t. Insert the following subsection after subsection 1001.1(1)(b):

(c) short term rental accommodation subject to Section 510 of this bylaw.

u. Insert the following subsection after subsection 1011.1(1)(c):

(d) short term rental accommodation subject to Section 510 of this bylaw.

v. Insert the following subsection after subsection 1021.1(1)(c):

(d) short term rental accommodation subject to Section 510 of this bylaw.

w. Insert the following subsection after subsection 1031.1(1)(b):

(c) short term rental accommodation subject to Section 510 of this bylaw.

x. Insert the following subsection after subsection 1041.1(1)(c):

(d) short term rental accommodation subject to Section 510 of this bylaw.

y. Insert the following subsection after subsection 1051.1(1)(c):

(d) short term rental accommodation subject to Section 510 of this bylaw.

z. Insert the following subsection after subsection 1061.1(1)(c):

(d) short term rental accommodation subject to Section 510 of this bylaw.

PART C – ADOPTION

READ A FIRST TIME this	25TH DAY OF	OCTOBER,	2018
READ A SECOND TIME this	23RD DAY OF	MAY,	2019
PUBLIC HEARING HELD PURSUANT TO THE *LOCAL GOVERNMENT ACT* this	18TH DAY OF	JUNE,	2019
READ A THIRD TIME this	DAY OF	MONTH	YEAR
ADOPTED this	DAY OF	MONTH	YEAR

Corporate Officer

Chair

SUNSHINE COAST REGIONAL DISTRICT

REPORT OF A PUBLIC HEARING HELD AT
Seaside Centre
5790 Teredo Street, Sechelt, BC
June 18, 2019

Sunshine Coast Regional District Zoning Amendment Bylaw No. 310.184, 2018 and
Sunshine Coast Regional District Electoral Area A Zoning Amendment Bylaw No. 337.118, 2018

PRESENT:	Chair, Area B Director	L. Pratt
	Alternate Chair, District of Sechelt Director	D. Siegers
	Electoral Area A Director	L. Lee
	Electoral Area D Director	A. Tize
	Electoral Area F Director	M. Hiltz
ALSO PRESENT:	Senior Planner	Y. Siao
	General Manager, Planning & Community Development	I. Hall
	Manager, Planning & Development	A. Allen
	Recording Secretary	A. O'Brien
	Members of the Public	45 (+/-)
	Media	1

CALL TO ORDER

The public hearing for *Sunshine Coast Regional District Zoning Amendment Bylaw No. 310.184, 2018* and *Sunshine Coast Regional District Electoral Area A Zoning Amendment Bylaw No. 337.118, 2018* as called to order at 7:00 p.m.

The Chair introduced staff and elected officials in attendance and read prepared remarks with respect to the procedures to be followed at the public hearing. The Chair then indicated that following the conclusion of the public hearing the SCRD Board may, without further notice or hearing, adopt or defeat the bylaws or alter and then adopt the bylaws providing the alteration does not alter the use or increase the density. The Chair asked Yuli Siao, Senior Planner, Planning & Development, to introduce *Sunshine Coast Regional District Zoning Amendment Bylaw No. 310.184, 2018 and Sunshine Coast Regional District Electoral Area A Zoning Amendment Bylaw No. 337.118, 2018.*

PURPOSE OF BYLAW

The Senior Planner began by explaining that the proposed bylaws are concerning Short Term Rental Accommodations and Bed & Breakfast (B & B) regulations.

The public hearing addressed two zoning bylaws within the Sunshine Coast Regional District. *Sunshine Coast Regional District Zoning Amendment Bylaw No. 310.184, 2018* covers the SCRD electoral areas: Halfmoon Bay, Roberts Creek, Elphinstone and West Howe Sound*. Sunshine Coast Regional District Electoral Area A Zoning Amendment Bylaw No. 337.118, 2018* covers Pender Harbour and Egmont.

Bylaw Process Timeline

First Reading – October 28, 2018
Referrals – November 2018 – January 2019
Public Information Meetings – February 20 and 27, 2019
Second Reading – May 23, 2019
Public Hearing – June 18, 2019
Consideration of Third Reading and Adoption is the next step in the process (Fall 2019).

Public Consultation

Since 2017, the SCRD has conducted public consultation, research and analysis on the subject of short term rental accommodation. The consultation included 5 public information meetings, 2 public workshops, stakeholder meetings, agency and committee referrals, and 2 online surveys that received a total of about 1400 responses.

Feedback

The business communities of the Sunshine Coast generally support the approach of the proposed bylaws. Public opinions are equally split on whether or not the current regulations for bed and breakfast are working. A moderate majority is not in favor of off-site operators, although some support off-site operators if there are regulations.

Key Issues

Following public feedback, two main common issues have been identified: home vs business and operator options.

Issue 1 is the contention between the use of short term rental as a business and the need to control its scale and impact, and maintain the character and livability of residential neighbourhoods.

Issue 2 is the debate on whether or not off-site operators should be allowed. On-site operator is the existing requirement and the majority of feedback supports it. On the other hand, there are well-managed properties by off-site operators, and there is demand for such an option and regulations for off-site operators.

The two main issues can create significant problems when the balance between home and business is broken, or when the operator is not on-site. For example, party house is a major complaint when the scale of operation exceeds the limit, and many disturbances to the neighborhood such as noise, garbage, parking, violation of fire ban or water restrictions are results of over scale operation or absence of on-site supervision.

The SCRD proposes a balanced solution: improving an existing framework of policies and regulations to strengthen the balance between home and business on residential properties, and introducing new regulations for off-site operators.

<u>Solution 1: Balancing Home & Business</u>

Existing policy framework for B & B use:

- Regulations have been long established in zoning bylaws and Official Community Plans (OCP)
- Permitted as auxiliary use in most commercial, rural and residential zones.

- Number of bedrooms: 2- 5 per dwelling
- Number of occupants: 4 – 10 per dwelling
- Principal resident is required to operate the use.

This policy framework is important because it sets the community's vision for B & B use, which is meant to be a small scale, auxiliary and limited commercial opportunity to help sustain the lifestyle on the Coast and support tourism. It must not affect the primary use and character of a neighborhood. Limiting the scale of B & B use is also important for maintaining current infrastructure and servicing capacity.

B & B and Short Term Rental Accommodations (STRA) have many similarities despite some difference in terminology or provision of breakfast:

B & B	**STRA**
Traditional term	Contemporary term
Home based	Mostly residential area
Accommodation Rental business	Accommodation Rental business
Days to weeks	Days or weeks
Breakfast usually provided	Breakfast usually not provided
Resident operator on site	Operator on or off site
Existing regulations	No current regulations

The SCRD proposes to consolidate the terminology and expand the definition for Bed and Breakfast to include all kinds of Short Term Rental Accommodations. The redefinition clarifies that the length of stay for the same guests is limited to 30 days.

In most residential and rural residential zones, residential use is the principle use; a home business or B & B is an auxiliary use. To achieve the balance between principal and auxiliary uses, the auxiliary nature of a B & B use must be enforced and the size of operation must be defined. There are three crucial and inter-related elements to measure the size of operation: bedroom size, number of bedrooms and number of occupants.

Bedroom is an almost universal unit of measurement used in the hospitality and accommodation industry to measure the scale of operation. The term "bedroom" is also established in SCRD zoning bylaws and OCPs.

For the purpose of the zoning bylaw, a bedroom should be defined as either an enclosed room, or floor space such as a loft, for the exclusive use of the B & B occupants. This includes shared space among the occupants, but excludes space shared with the owner or resident.

The average size of a hotel or accommodation bedroom in North America is 28-30 m^2, including bathroom. In Zoning Bylaw 310, 28 m^2 is the maximum bedroom size for B & B. In Zoning Bylaw 337, maximum bedroom size is currently not specified. This is reasonable size, providing adequate space for sleeping, lounging and washing. Staff recommend using 28 m^2 as the maximum average size for all bedrooms, so that there is flexibility for larger or smaller rooms.

The number of bedrooms per dwelling is already established in both Bylaws No. 310 and No. 337 and is consistent with the existing policy framework. Staff recommend retaining the provisions as follows:

- Zoning Bylaw 310: 2 bedrooms for most zones that permit B & B; 5 bedrooms per parcel for RU1A and RU1C zones.
- Zoning Bylaw 337: 2 bedrooms for B & B Home; 5 bedrooms for B & B Inn.

The number of occupants depends on the number of bedrooms and how many people a bedroom can reasonably accommodate. Zoning Bylaw 337 has an average scale of 2 persons per bedroom. This is a reasonable number an average-size bedroom can accommodate without overcrowding. A group of three people or more, such as a family with children, is often better accommodated in two or more bedrooms, a larger bedroom or a family suite with more than one bedroom. Staff recommend the total number of occupants be calculated based on 2 persons per bedroom. Controlling occupant numbers is also important for preventing the party house situation.

Solution 2: Operator Options

Staff recommend a balanced solution with two options:

- On-site operator – existing requirement
- Off-site operator - Temporary Use Permit

Some properties are successfully managed by off-site operators with no or very little negative impact. Off-site management is regarded as an important alternate for many property owners, especially seasonal dwellers. Off-site management can also create employment opportunities. Various technological devices can be used to control the property and occupants. The key to off-site management is to establish accountability for the operator and enable monitoring and enforcement of regulations.

Temporary Use Permit (TUP)

Due to the lack of provincial authority for a business licensing system in the SCRD, staff recommend using Temporary Use Permit (TUP) to implement regulations for off-site operators. A TUP is good for 3 years with one renewal allowed. After that, a new application is required.

An off-site operator can be an individual or a management company, but it has to be accountable for the overall management. The operator must reside within the SCRD, and address issues within 24 hours of being notified. The operator has to make sure the guests comply with all local regulations.

A TUP application will give notice to properties within 100m, and if approved, the contact information of the operator will be given to owners and residents of those surrounding properties. An application fee must be paid, and a building inspection is required. To deter violations, the permit may be revoked after 3 infractions.

Bylaw provisions relating to operators can assist bylaw enforcement by strengthening existing regulations and providing clear directions, by providing a legal channel for off-site operator to do business, by enabling SCRD monitoring and neighborhood watch, and by deterring violations through revocation of permits. Enforcement can also be supported by using technical devices by the operator.

A summary of the bylaw amendments is provided in the following table:

	Bylaw 310	**Bylaw 337**
Where B&B or STRA is permitted	Unchanged	
Number of bedrooms	Unchanged	
Signage, parking & utility requirements	Mostly unchanged except the addition of requiring water supply system	
Definition for Bed and Breakfast	**New definition to include STRA**	
Length of stay	**30 days for the same occupant(s)**	
Bedroom size	**Average 28 m^2**	
Number of occupants	**Total based on 2 people per bedroom**	
Operator	**On-site or off-site with TUP**	

Extensive consultation on short term rental accommodations has identified that the key issues are the need to maintain the livability of residential neighbourhoods while allowing the coexistence of short term rental accommodation business as an auxiliary use, and the need to regulate operations without on-site management. These conflicting interests call for a balanced solution moving forward that maintains and improves upon the existing policy framework, and introduces Temporary Use Permit regulations for off-site operators.

PUBLIC SUBMISSIONS AT PUBLIC HEARING

The Chair called a first time for submissions.

Joe Freeburn, 1466 Smith Road, West Howe Sound

Mr. Freeburn stated that his neighbour's house is listed on Air B & B and there have been issues of partying, noise, safety and damage to their property. The owners of the Air B & B do not live on site and the off-site management company has been contacted on numerous occasions to deal with the issues. Mr. Freeburn is not able to enjoy his property or outdoor spaces as there are large groups (15 people) consistently renting the house next door and partying. There are bylaw enforcement challenges with the noise bylaw not being enforceable until after 10:00. The party rental is impacting real estate and property values in the neighbourhood. Mr. Freeburn is not against short term rentals, as he also has an Air B & B listing in his home. He supports short term rental accommodations that are owner-occupied. He believes that the proposed regulations favour off-site owners. Mr. Freeburn supports owner occupied short term rentals.

Mr. Freeburn's written submission is attached in Appendix 1.

Ian Winn, 1990 Thornbrough Road, Williamsons Landing, West Howe Sound

Mr. Winn has owned and operated a B & B in Williamsons Landing for 12 years. There is only one suite and one group (4 people/family) at a time. The owner is on-site in the same building at all times during the rental. There have not been any noise or parking complaints from neighbours. Mr. Winn spoke about the efforts of local governments to catch up on the changing market of short term rental accommodations. Mr. Winn feels that the proposed amendments do not address the economic benefits of this type of business for the Sunshine Coast. He believes there are some aspects of the proposed amendment that are too restrictive, don't address the needs of the current market, or require some clarification. The restriction of two bedrooms per dwelling, regardless of parcel size or zoning does not meet the needs of operators.

There are inconsistencies between Zoning Bylaw 310 and 337. Mr. Winn suggests a scalable allowance depending on parcel size and zoning. Another suggestion is to make Zoning Bylaw 310 and 337 consistent with the addition of allowance for B & B inn. The restriction of maximum two occupants per bedroom is too restrictive for families; parents and children should be allowed to stay in the same room. This restriction will impact family tourism on the Sunshine Coast.

Mr. Winn's written submission is attached in Appendix 1.

Justin Hull, 162 Mable Road, Elphinstone

Mr. Hull stated that he invested in his family's property and it is now operating as a short term rental accommodation. Mr. Hull expressed concerns regarding the restriction of the number of bedrooms. His four bedroom is rented by small groups or two families sharing the home. Mr. Hull does not use an online platform for rentals. He conducts in person meetings prior to rentals to establish rental rules and expectations. Mr. Hull noted that in the same neighbourhood, two homes have been purchased by investors and put straight into short term rental pool. There have only been minor issues in the neighbourhood due to this. Mr. Hull would like to see some differentiation between investors taking away from long term rentals and property owners who would like to supplement their income and live on-site. Mr. Hull supports the direction of the TUP process and accountability. He would like to see more flexibility on the number of bedrooms allowed as there is a market for larger homes.

Val McQueen, 2217 Pixton Road, Roberts Creek

Ms. McQueen stated that there are issues in her neighbourhood with a large 5 bedroom home being rented through Air B & B by an off-site owner and there is a party every weekend. Neighbours can hear the noise from all side and on most weekends it is impossible to sit outside and enjoy their property due to the noise. She has filed official complaints through bylaw enforcement, however the owner has not made any changes and continues to operate. The experience has been very disappointing for her and her neighbours. Ms. McQueen stated that the 100m radius for comments on the TUP is not sufficient due to the size of properties in the area, some neighbours would not receive notifications. She believes that the response time of 24 hours is not acceptable, an immediate response of 15 minutes should be expected. Noise is a big concern in the neighbourhood and she is required to sleep with windows closed during the summer due to partying. Ms. McQueen inquired about the process for enforcement and regulations for off-site operators and if the TUP applies to the property or the owner? She does not support off-site operators, preference for on-site operators.

The Manager, Planning and Development clarified that the TUP is valid for three years and can be renewed one time. A new TUP application could also be made. Staff will address questions in a future staff report to the Planning and Community Development Committee.

Carl Oster, 1466 Smith Road, West Howe Sound

Mr. Oster stated that he has concerns regarding the large volume of people in the neighbouring Air B & B rental which impacts his enjoyment of this property. It is not his responsibility to advise the off-site management company if there is a problem. The management company knows that there is no bylaw for noise offences during the day. Mr. Oster is not in favour of off-site management as they do not control the guests. There is concern regarding the number of bedrooms, number of guests allowed and parking. Mr. Oster believes that neighbourhood consultation should be before the TUP is permitted, not afterwards. He also believes that the fines should be raised to encourage off-site owners to follow the rules.

Gord Rutherford, 5310 Natalie Lane, Halfmoon Bay

Mr. Rutherford stated that there is a B & B next to his property and is busy during the summer. It is not clear if the owners are on or off-site. He is not able to sit outside because of the lights and noise. He is concerned that if the rules are not enforced now, then there is no point in changing them further. Mr. Rutherford spoke against the amendments and wants the current rules for B & B's to be enforced now.

Rola Priatel, 3241 Beach Ave, Roberts Creek

Ms. Priatel purchased a vacation home and rents it to family, friends and some online guests. She screens the guests strictly and has not allowed rentals unless the guests can follow strict rules. She requires that the guests have children. There have only been two complaint calls and in her experience vacation renters have been well behaved. Ms. Priatel commented on the issue of number of rooms and room occupancy. She rents a three bedroom home and if they cannot have more than two bedrooms or two people per room, this will limit their ability to rent to families. Ms. Priatel uses a local management company on the coast and a helper to assist and monitor rentals.

The Senior Planner clarified that in the current bylaw and proposed bylaw, most zones allow up to two bedrooms per dwelling, however there are a few zones where there are exceptions for up to five bedrooms.

Tricia Smurthwaite, 8420 Redrooffs Road, Halfmoon Bay

Ms. Smurthwaite lives next to a short term rental with a 5 bedroom house and semi-attached garage/carriage house. She has made numerous attempts to seek remedy to the noise and partying with the owner, RCMP and bylaw enforcement. There has not been any resolution to her complaints. Ms. Smurthwaite is not able to sleep in her own bedroom, use her back deck or invite guests to her home due to the noise. She is concerned about the number of bedrooms that could be rented and that the semi-attached carriage house may be considered a second dwelling. She feels that the proposed amendments will not improve the situation. She supports some aspects of the proposed TUP process, however the 24 hour response time is not acceptable, people cannot wait this long during excessive noise. She would like to see improvements to the current noise bylaw response. She believes the off-site owner has an advantage in rental income but it should not be at the expense of loss of quality of life to neighbours. She inquired if the history of the rental house and property owner willingness to comply with bylaws will form part of the TUP approval process. She recommends that the current noise bylaw and enforcement process be improved and clarified.

Suzanne Birch, 2975 Lower Road, Roberts Creek

Ms. Birch stated that she is a non-resident owner/operator of a short term rental accommodation. She rents out her family vacation property in order to cover the costs of ownership. Her guests contribute to the local economy and tourism industry and she employs cleaners and landscapers. She has had no complaints in seven years and has strict rules around garbage collection and parking. She has concerns for the fees associated with the proposed changes but understands the need for them to improve the process. Ms. Birch is concerned with the limitation on the number of bedrooms. The home has three bedrooms and if the occupancy was restricted to two people per room, this would impact families who have young children sleeping in the same room as the parents.

Andrew Priatel, 3241 Beach Ave, Roberts Creek

Mr. Priatel is concerned about enforcement of the two occupants per bedroom policy. This should not apply to kids in the same room as their parents. He noted that there could be noise concerns with a bad

property owner or long term renter, not necessarily only party house rentals. He feels that there are not very many hotels on the Coast and short term vacation rentals allows for a nice alternative. He makes the point that if vacation homes could not be rented on a short term basis then they would be sitting empty.

Donna Patrick, 7545 Islet Place, Tuwanek, Sechelt

Ms. Patrick operates a B&B. She believes that restricting two people per room is not realistic for guests. She does not agree with restricting the rental to only two bedrooms for rental, there is a BC regulation that allows for three bedrooms. The restriction on the size of the room or B & B house size is also un-realistic. She prefers the option for on-site operators or managers and that the TUP process should allow the neighbours to know who to phone in the case of concerns. The response time of 24 hours is not appropriate. The regulations should state that 10-10:30 is quiet time and no noise permitted. She noted a new regulation for anyone renting one or more bedrooms to be registered, pay taxes and insurance, which may cut back on illegal rentals. Respect for neighbours is not just an Air B & B noise issue. The problem with online platforms is that guests are not vetted. She screens all her guests before confirming the rental.

Ian Winn, 1990 Thornbourgh Road, West Howe Sound

Mr. Winn continued to read aloud his written submission.

Mr. Winn noted concerns regarding off-site owner management and fees. He believes the TUP process is acceptable but can be complex for the owner and SCRD to manage. Enforcement needs to be 24/7 but this is not within the SCRD's current service level. Tax payers should not be responsible to pay for the management and enforcement, it should come from the TUP fees and higher fines. Mr. Winn inquired about clarification of the definition of a "housekeeping unit" and average floor area. He noted that there is confusion about the different regulations in Bylaws 310 and 337 for short term rental accommodations. The SCRD has an opportunity to clarify the process and regulations for residents and tourists through the bylaw amendment process. The SCRD can ask the provincial government for authority to issue higher fines so that the TUP process can work. He feels that limiting the size of bedrooms, number of rooms in a house and number of occupants per room may deter family visitors, which is preferred over party house rentals.

Tricia Smurthwaite, 8420 Redrooffs Road, Halfmoon Bay

Ms. Smurthwaite continued her submission by noting the difference between owners and vacationers who make noise. She inquired about the three infractions to have a TUP permit revoked and what evidence is needed. She noted limitations on the enforcement capacity of bylaw enforcement officers because they need to witness the offence. She suggested that B & B's with a good history could be grandfathered whereas those that have continued infractions not be given a permit or have an on-site manager.

Donna Patrick, 7545 Islet Place, Tuwanek Sechelt

Ms. Patrick recommends that all B & B or short term rentals must have an operator on site at all times and be responsive within 30 minutes to any issues that could arise. She believes that each municipality should have all short term rentals on record and require proof of insurance for the TUP application. She would like to see the noise bylaw process improved. She thinks that B & B's with good history should not have to start all over again and that only new short term rental accommodations should be required to do the application. She supports having four people in a bedroom as long as there is someone on site who

can monitor what happens during the rental. She would like to see clarity about the roles and responsibilities of local governments with respect to short term rentals.

Rola Priatel, 3241 Beach Ave, Roberts Creek

Ms. Priatel recommends that off-site owners should have security/damage deposit requirements written within the regulations in order to operate. Having an on-site manager at all times is unrealistic.

Carl Oster, 1466 Smith Road, West Howe Sound

Mr. Oster commented that if the rental property is located within a commercial zone, then it is fine to have more bedrooms or people in the bedrooms than the proposed regulation. However, if the rental property is within a residential zone then the regulations need to be respected. The residents cannot enjoy their own home if there is a party house next door. He believes that having an on-site operator is better than having an absent owner.

The Chair called a second time for further submissions.

Sylvie Bruce, 1489 Henderson Ave, Roberts Creek

Ms. Bruce provided comments as an on-site owner and short term rental operator for ten years. She provides rentals for both tourists and locals. The benefits of having a short term rental accommodation allowed her to have a home based business, not commute to the city for work and support the local economy. Tourists stay on average for two nights and eat/shop locally. She noted that three families have moved to the coast since staying at her property. There are a lot of benefits to short term rentals if they can be managed and regulated in an appropriate way.

Joe Freeburn, 1466 Smith Road, West Howe Sound

Mr. Freeburn supports local owner/operators of short term rental accommodations. He does not support off-site owners who do not live on the coast or support the local economy and are using Air B & B to make money not as a mortgage helper.

CLOSURE

The Chair called a third and final time for submissions. There being no further submissions, the Chair announced the public hearing for proposed *Sunshine Coast Regional District Zoning Amendment Bylaw No. 310.184, 2018* and *Sunshine Coast Regional District Electoral Area A Zoning Amendment Bylaw No. 337.118, 2018* closed at 8:40 p.m.

The Chair thanked everyone for attending the public hearing.

Certified fair and correct:

L. Pratt, Chair

Prepared by:

A. O'Brien, Recording Secretary

Yuli Siao

From: Joe Freeburn <.
Sent: Saturday, June 8, 2019 5:42 PM
To: Yuli Siao
Cc: Carl Oster - Cajo Designs
Subject: STR Air B&B
Attachments: 2017-Bylaw Complaint formFreeburn.pdf

Yuli,

Mark Hiltz suggested that I send the Bylaw complaint regarding the Air B&B next door to our home to your attention. Please see the attached complaint and link to the audio file.
https://www.icloud.com/attachment/?u=https%3A%2F%2Fcvws.icloud-content.com%2FB%2FAWwTW8xRwIIHNaJTWb0_PNsgrA4uAX5PN7UGu87td6-YuBYWphXltv_f%2F%24%7Bf%7D%3Fo%3DApHebiV7YnGJfYzetk8CWJCgBTLtX7qXSVN9PwH1V6YU%26v%3D1%26x%3D3%26a%3DCAogplGyrZ6_u-0sGE18Q-S19aY0n_r9eFpVNKF9sZtNso8SGxDz_YfNsy0Y842Dob0tIgEAKggByAD_AWCp3w%26e%3D1562632046%26k%3D%24%7Buk%7D%26fl%3D%26r%3D1650DAAD-D31B-4496-AC68-8CABF2450398-1%26ckc%3Dcom.apple.largeattachment%26ckz%3D7661277F-4321-42F5-8375-BBC35EDABC6F%26p%3D52%26s%3DXt8_RYpSDbr5rD2dU8Re6gS_CgE&uk=d7Yzq7Ozhqo9q7zVtGqTAA&f=IMG_3451.MOV&sz=65047873

Issues with STR (AirB&B) at Smith Road

We purchased our home at Smith Road over nine years ago. In those nine years we have not had any issues with neighbours and have enjoyed the quiet lifestyle we moved to the Sunshine Coast to experience.

Two years ago the house at Smith Road was sold. We have never met the new owners. Last summer or there about the house was listed on Air B&B.

https://www.airbnb.ca/rooms/26425646?location=Gibsons%2C%20BC&adults=1&home_collection=1&guests=1&sl_alternate_dates_exclusion=true&source_impression_id=p3_1559073523_WyTDAHJkt7BJchxR&s=cOGLS6Tx

Shortly after the house was listed we had damage to our garage that faces the rented property – not having ever met the owner not ever being approached by the Management Company we felt we had not recourse at the time, but to fix it as we did not want to make an insurance claim. T

The house list it as suitable for 15 guests – with 7 bedrooms and rents for $923/night. Last summer having never met the owner nor the third party management company – we had to confront a large group of drunk rowdy renters that had installed an outdoor PA system and were screaming into the microphone. We confronted the group, but were not listened too, we then went to the Air B&B listing and after much searching tracked down the Management Company who said they would deal with it. We have had to contact the management company 5 or 6 times over the past year due to the large rowdy groups at this party house rental.

Our peace and tranquility has never been the same since this house started renting on AirB&B as there is a new large group in the house literally ever week or weekend. The property is less than 20 feet from our house and we have not been able to enjoy our own space. The Management Company now responds relatively quickly to our complaints – but we do not believe that we should be the ones monitoring this STR. And frankly five times is five too many.

There are also safety issues as we have had to on numerous occasions put out fires on the beach left by these weekend tenants. We also do not feel safe in our own home given the transient nature of the guests and the huge car traffic that this rental brings. Having to confront a group of drunken renters at anytime is not something a home owner should have to do – worrying about your safety in your own home is not something that one should have to experience on the Sunshine Coast.

The final straw came a few weeks ago. We have had our house listed to sell. A potential buyer came back to visit for a third time and heard the noise next door. Once the potential buyer learned of the "party house" rental they back out. And we have to say we understand as we would not spend over 2 million dollars to live next to a "party house". The reputation of this party rental has now affected our property value and this is unacceptable. This should be unacceptable for anyone that owns property and lives in the property on the Sunshine Coast. This does not just affect single family homes, but also condos and townhomes on the Coast should this type of rental be accepted to continue.

We have read all the arguments with respect to lack of hotel inventory for tourist and we support the tourism industry. We are not against STR – we have an AirB&B in our house. What we are against are STR that are not owner occupied. If an owner that does not live on the coast and owns multiple properties on the coast is not looking to AirB&B as a mortgage helper. It seems more like a place to hide money. These distant owners do nothing for the Coast Community except hire a management company. They do not care about the neighbours, does not invest in our community building and are simply taking advantage of the popularity of the Sunshine Coast as a vacation destination. Not to mention taking thousands of dollars from legitimate hotel properties and removing long term rental properties from lower income people.

Our recommendations to this committee are the following:

- Only allow owner occupied STR Air B&B – the owner must be living in a building on the property
- Ensure that houses that have STR and are in close proximity to neighbours have limits on the number of guests – six maximum – it should not be dependent on the number of bedrooms as real estate listing of bedrooms and AIR B&B listings of bedrooms in the same house are not consistant.
    - These close proximity rentals should also have limits on access to outdoor spaces such as decks, pools and hot tubs – not allowed after 10:00pm
- All STR's should be licensed and the license should be revoked after three complaints
- Complaints to the SCRD need to be documented and enforced – why can't the RCMP do this?

Thank you for your time – please let us know if there is anything else we can do.

Joe Freeburn MBA
First Year Program Head
School of Business
British Columbia Institute of Technology
T: _____ |
E: it.ca |bcit.ca/business/marketing

Subject: FW: Party House at Smith Road
Date: Saturday, June 15, 2019 at 3:05:42 PM Pacific Daylight Time
From: Carl Oster- Cajo Designs
To: 'Joe Freeburn'

-----Original Message-----
From: Garry Gray < m>
Sent: Saturday, June 15, 2019 1:05 PM
To: bylaw.compliance@scrd.ca
Cc: Carl Oster - Cajo Designs <
Subject: Party House at 1454 Smith Road

Dear Sir, We are writing to complain about the excessive noise and large numbers of people renting the house at Smith Road in Langdale. Previously, the house was rented to smaller groups whose sounds of music and laughter were of no concern to us. In the past two years the house has been an unsupervised party house: loud music, loud voices, 'f' word conversations, angry and violent conversations, fights, beer cans on our property, etc.. We have been awakened in the middle of the night with feelings of alarm as these renters turn up the music or shouting. We are writing to seek a solution to this problem. Sincerely, Garry and Nellie Gray

From: Jane Braun
To: Yuli Siao
Subject: Bylaw 310 amendment submission
Date: Monday, June 17, 2019 11:51:53 AM

To: Yuli Siao
From: Rolf and Jane Braun
Date: June17, 2019

Please accept this as our written submission in regards to the June 18 Bylaw public meeting. We live at Pixton Road, Roberts Creek. We are opposed to the proposed changes to the bylaws in regards to short term rentals.

Overview:

We purchased our property in a rural area to avoid STRs. We were aware when we purchased our property that B&Bs were permitted in our area if an owner lived on site and guests were limited to one bedroom.

After moving in our worst fears were realized, when the owners of the property next to us introduced themselves and informed us that they were running a Air BnB operation on their property from their home in the lower mainland.

We have since found that STRs rentals are destructive to a community, as the STR renters have no regard for the neighborhood. We have experienced extreme noise and inconsiderate STR guests. The number of guests often exceeds 6 and is often 8 or 10. As the owners are not on site, they cannot respond to the issues that occur in a timely manner. As a result, unfairly, neighbors are left to deal with the issues.

We have spent over $10,000 sound proofing our home to manage the noise at night. We have repeatedly reported these bylaw infractions to the SCRD with proof of each infraction and only one fine has been issued to the owner, who admits to operating an Air BNB and states that he intends to continue doing so.

We have provided proof of the infractions and the fines are not levied . We abide by the laws that are in place and yet ,the people who do not are allowed to get away with running a STR that is in violation of the current bylaw and the proposed amendments. This has occurred with the SCRDs full knowledge.

Bylaw Proposed changes:

1. We disagree with the use of Temporary Operating Permits. We firmly believe that owner must be on site. Having an owner on site, would have alleviated the majority of the problems that we experienced.
2. Fines need to be vastly higher for infractions and must be levied for each infraction. The current fines don't have enough clout and are rarely issued.
3. TUPs should not be issued to owners that are operating STRs, that have had previous noise and bylaw infraction complaints and fines imposed. That's just common sense, why make a problem worse?
4. Under the amendments the owner is given 24 hrs to rectify an issue. If the issue is noise, this amendment makes absolutely no sense. The noise issues must be addressed immediately . A party that goes on all night cannot be addressed in the morning. Noise complaints should be viewed as serious infractions requiring immediate attention. Each noise infraction should be subject to a fine .

Sincerely,
Rolf and Jane Braun
Pixton Road

James Dodds
Smith Road
Gibsons,B.C. V0N 1V6

17 June 2019

SCRD
Public feedback on Short Term Rentals

Dear SCRD representatives and staff,

I am submitting this letter in regards to the decision making process in regards to regulating short term rentals on the Sunshine Coast**My position is to forbid offsite owner short term rentals and to limit the number of rooms/people allowed for onsite ow ner rental**s.

The reason I hold this opinion is based on personal experience with an offsite owner Airbnb having been operating beside my residence. I have lived in my home for 23 years. Their are other bnbs that have sprung up on my street but they tend to be more private and have onsite owners. The problems I encountered were noise, parking, security, fire hazards (guests smoking and throwing butts beside combustible vegetation) and denigration of a semi rural lifestyle. The offsite owners were offering up to 16 people a night in various rooms,with a possible 16 different people the next day, this in what had been a single family home, this is like a motel opening on a quiet semi rural street, Guests were expected to do self check in and most individuals were not a problem, respectful etc. The problem was that this is an open hillside property, with limited onsite parking and decks that are located close to neighbouring homes. Noise was an issue, especially on weekday nights and with no onsite owner became an issue. Too many people for a home in an area that people moved to initially **because it afforded a lifestyle more attuned to nature.** On one occasion a group of guests were on my property smoking and throwing their cigarette butts on the ground, this during a time last summer when the fire hazard was extreme. On another occasion a guest got their car hung up on the steep driveway and I came to assist as there was no owner on site. Too many people on a site that wasn't meant to accommodate or was zoned to be

a business. The constant sound of suitcase roller wheels going up and down the driveway on a street that is a dead end and used to be dominated by birds chirping is enough to send one back to the city. I realize that this property is private and if the owners occupied the home and chose to rent a room or two although not my preference I could learn to live with it. At least someone would be there who hopefully cared and supplied some direction to guests. I think some homes can make good bnbs. They are private, not abutting other homes, perhaps fenced or behind hedging, others not so, they are on residential streets with residents who call it home and resent having their lifestyle taken away from them for people more interested in making money than building community. I urge the SCRD to adopt fair but firm and definitive bylaws regarding short term rentals. We need to protect communities and the majority who pay taxes and call this area home, not drive them elsewhere and at the same time welcome visitors to well run bnbs in the right locations with on site owners.

Sincerely, James Dodds

From: Bill
To: Yuli Siao
Subject: comments on STR amendments
Date: Monday, June 17, 2019 10:05:54 PM

Sunshine Coast Regional District June 15, 2019

Yuli Siao

Short Term Rentals - Our Issue is Accountability for Disturbance.

Our problem with STRs is **the lack of accountability for neighbourhood disturbance by 'bad' renters**. We have endured disturbances from late night parties as few as 3 or 4 people who are outdoors on the deck, patio or hot tub of the rental unit. Music, loud voices, yelling and whooping, and loud car engines and burnouts have woken us in the past. We have recently been annoyed by the buzzing noise from drones.

SCRD's recent proposal to limit STRs to units with less bedroom capacity may stifle the potential of larger parties, but 2 drunk couples loudly enjoying themselves outside at midnight can easily wake people sleeping in houses nearby – believe us!

Unregulated STRs provide a venue for people focused on partying. They know that such behaviour at home is not tolerated by their neighbours, but they can easily rent a vacation house to avoid the inevitable complaints and interventions.

For the year 2017, less than 10% of all bylaw complaints to SCRD had pertained to STRs. This statistic sounds like STRs are not a large bylaw problem. Consider though that many people do not complain officially for various reasons: personal reluctance to 'snitch', anxiety about repercussions, difficulty in contacting the RCMP on a non-emergency telephone line, inability to contact a bylaw officer after working hours, etc. For those who live outside the Gibsons or Sechelt areas, there is the feeling that there will likely be NO response, NO remedy that night, so some think why bother? Dig out some earplugs and close the windows. SCRD has told me that the public "should submit complaints to them or the RCMP so that a formal record is put on file." Well, SCRD needs to publicize this message – regularly through the summer months.

In order to make a formal complaint, I need to get the correct address of the house making the racket. So I must get up, dress, and walk or drive to identify the location. And then what's the practical outcome I can expect of these efforts to file a complaint? Pretty much nil.

The chief reason that B&Bs are superior to STRs is the onsite presence of the owner. They live in that neighbourhood – known, and accessible. Any proposal for an STR should meet the same criteria, i.e. the owner must live in the neighbourhood. A five minute drive away may as well be on the moon in terms of deterrance as well as accountability to the neighbours. The owner cannot be anonymous.

Operating a home business, including B&Bs, in a residential area has restrictions to reduce its impact on the neighbourhood. The STR is not the same animal. It is a strictly commercial venture whose owner is typically anonymous and lives at distance, and is often operated by a third-party company who is reluctant to disclose information or respond to complaints about renters. Their sole interest in the neighbourhood is just making money. SCRD residential zoning does not recognize STRs as a permitted use. Please enforce the original zoning bylaws.

Sincerely;

Bill Bengeyfield & Cathy Jenks

Orca Rd., Garden Bay

From: Dale Morgan
To: Yuli Siao
Subject: Short Term Rental
Date: Tuesday, June 18, 2019 9:43:26 AM

To Whom It May Concern,

The following are my concerns relating to unregulated Short Term Rental:

1. The number of living units and occupants often exceeds the intent of Single Family Zoning
2. Parking impacts on neighbours and street and the disruption of extra car traffic
3. Extra water usage during summer droughts and power consumption.
4. Septic systems not designed adequately handle excess capacity, resulting in overflow and unhealthy conditions.
5. Potential Fire hazards with unattended fire pits, barbeques and cigarettes.
6. Noise and general disregard for neighbour's privacy.(the party atmosphere of "Guests" acting like they are at a hotel resort and not a quiet private street)
7. Short Term Rentals that are not owner occupied. Absentee owners are not there to monitor problems or properly maintain property. The houses as a result become neglected and run down.
8. Impact on available affordable rentals. This has a long term corrosive effect of the viability of small communities.

Many of the people in favour of turning their properties into cash machines at the expense of the community are at heart preoccupied with material gain for its own sake. Avarice in of itself, is a larger societal problem that goes beyond policy regulation.

Regards,

Dale Morgan

Sent from Mail for Windows

Written Submission - Sorry, this is by hand. Rec'd June 1 20:2 g

I own a Vacation Rental management company. We know being off site isn't ideal for management. But we do our best to facilitate good neighbour relations. All of our properties have cameras, we ask all guests to be inside by 10pm. We have called guests at 11pm to tell them they will forfeit their deposits if they do not go inside. All of our properties have parking and garbage removal. We do have angry neighbours, who have yelled at guests at 5pm, 8pm. We have informed them that at 5pm it is unreasonable to ask guests to be silent. At 8pm it is unreasonable to ask two young children to stop playing outside. What I would ask is that you would consider the feedback you've gotten here tonight, and not necessarily believe every angry neighbour complaint. We keep 30 days of footage specifically to show that all guests are inside by 11pm and are not hurting neighbours. I would also ask that you reconsider the 2 bedroom limit. Many homes will be left empty if these limit are imposed. (By the way, we never wait 24 hours to deal with guest noise, unless the request is unreasonable, as we can monitor on our cameras.)

The 2 bedroom limit would mean we would not take on management properties in the SCRD. It would not be financially feasable. If you limit to 2 bedrooms, a company

would have to take on too many listings to properly manage. This creates an untenable situation, requiring offsite management, but making it impossible to make money!

I apologize that this is rambling. I had not prepared a statement prior to this meeting.

The speaker who said people won't know if guests are a problem...but we do, because we have noise receptive cameras that alert us to noise. I spent last Saturday night calling guests to stop them from using the hot tub after 10pm. We don't want to bother the neighbours!

If one of our houses were to be shut down, ~~we would~~ our owners would likely have to rent out rooms to cover the cost of the mortgage. That could mean 7-10 renters. Right now we monitor cameras, we meet all guests, we do our best to make sure there is oversight. If people are renting monthly - long-term, no such oversight will exist. Large houses will have many people living in them. Those people can be checked or they can be long-term and left alone.

Anyhow, these are my thoughts. Thanks!

Jacqueline Gillis
Beyond BnB Management
604-98[illegible]997

SUBMISSION

PROPOSED ZONING AMENDMENT BYLAWS NO. 310-184 AND 337.118
FOR SHORT TERM RENTAL ACCOMMODATION REGULATIONS
2019 MAY 9

from:
Patricia Smurthwaite
) Redrooffs Road, Halfmoon Bay, B.C.
email: .

PROPOSED AMENDMENT SCRD BYLAW NO.310-184.

I agree with sections of the proposed amendment that I have not commented on.

PART B – AMENDMENT

2.b.(b)
I DO NOT AGREE with this section.
A large lot allows 2 dwellings. Halfmoon Bay has many lots 1.5 acres +/- that allow 2 dwellings, but some lots are ony 100 feet wide. (a) There should be language distancing one dwelling from another to control density. (2) 'Dwelling' should explicitly exclude areas attached by breezeway (added carriage house, converted garage, etc.) as a second 'dwelling' to maintain acceptable density, otherwise a family home with carriage house/converted garage would be able to rent 4 bedrooms/8 persons from what is essentially one dwelling.
SCRD documents attached to the proposed amendments also call for adequate "buffering distances", what are they and will they be included in the bylaw.

2.b.(g)
I DO NOT agree with "OFF-SITE OPERATORS as presented. I believe the TUP system has many merits, among them "establish accountability for the operator and enable monitoring and enforcement of regulations". However, the one Fatal Flaw to the TUP is 2.b.(h)vii

2.b.(h) vii
This section is the main reason I DO NOT AGREE with TUP.
Allowing an off-site operator **24 hours** to resolve any issues possibly leaves the affected neighbour(s) without remedy for 24 hours. This is untenable, especially relating to Noise Bylaw infractions. Excessive noise can cause anxiety, heart-rate and blood pressure levels to rise. The related loss of rest/sleep is also a proven health risk. It would be wrong and insensitive to expect affected neighbours to endure excessive noise for up to 24 hours. We are looking for improvement in Noise Bylaw infraction response times.

~~I would be in favour of TUPs if~~ response time for resolving excessive noise ~~is~~ NEEDS TO BE 'immediate' ~~(it should be a phone call away), at worst a maximum of 3 hours driving time to attend site.~~ "Off-site operators" are a convenience for the property owner; it should not be paid for by the loss of quality of life by neighbours.
I remind you that SCRD Noise Bylaw specifically aims to protect residents against *"any noise which disturbs the quiet, peace, rest, enjoyment, comfort, or convenience of any person or persons"*. SCRD residents have not had this protection for far too long already.

Thank you for your consideration.

Further notes:

1. B&B HISTORY: However the amendment is finalized I would encourage SCRD to take into consideration the bylaw infraction history of B&Bs, especially those known as "party houses" where owners have a history of blatant and repeated disregard for the SCRD bylaws, SCRD bylaw officers, attending RCMP officers and neighbours. Leopards do not change their spots.

2. SCRD NOISE BYLAW: Of complaints received for B&B infractions, excessive noise is probably the most frequent. I believe an amendment to the noise bylaw would help to clarify interpretation and set mutual expectations.

- In my experience over the past 4 years I found that the B&B owner, former guests, one SCRD bylaw officer and an RCMP officer were confused by the wording; most commonly related to the differing intentions of General Regulations 3.a and b., and Specific Regulations 4.c. My experience is that owners and renters feel any degree of noise is acceptable except during 11PM – 7PM.

- I also believe there should be wording which imparts a common understanding of what encompasses excessive noise; many municipality and regional district bylaws do this by providing examples of what is, and is not, excessive noise.

- Quiet Hours. Current research clearly indicates that not enough, or disturbed sleep, has negative affects on our health. Adults require 7 – 8 hours sleep on average, children more. The current SCRD Noise bylaw 'quiet hours' is too restrictive as to when this required sleep is protected. Many people retire earlier than 11 PM; children even earlier. Although it is near impossible to satisfy all schedules, SCRD Noise bylaw "Quiet Hours" should be extended to provide protections for undisturbed sleep reflecting the schedules of a 'majority' of residents. IE: 'quiet time' begin at 10 PM (common among municipalities) or even 8PM or 9PM (some municipalities).

SCRD Public Hearing re: Shot Term Rental Accommodations – Bylaws 310 and 337 amendments

June 18, 2019

Presenter

Ian Winn

Owner/Operator

Marian's On The Coast Seaside Retreat

Thornbrough Rd.

Williamsons Landing, B.C.

V0N 1V6

(

Experience

Along with my wife we've been B&B owner/operators for 12 years on the Sunshine Coast. 3 years in Tuwanek, and 9 years at Williamsons Landing. One suite with sleeping accommodations for 4 people, and well suited for a family. Only one rental at a time.

Started off as a traditional B&B serving full breakfasts from a menu. Has now evolved to providing continental breakfasts.

We are extremely pet friendly and cater to that market of people wishing to bring their pets along. We have a very high occupancy rate and approximately 90% of our guests bring a dog with them.

We are on-site in the same building at all times during the rental, and have never had any issues with noise or parking or cause for our neighbours to have any concerns. No complaints in 12 years.

History

The history of what the SCRD has been doing in regards to bylaw amendments to regulate B&B operations dates back 7 years to 2012 and has been most active since 2016. The staff report of May 9th, 2019 provided details and a timeline of those activities. No amendments have yet happened but are before you for consideration now.

Where are we today

With the advent of on-line booking platforms, such as Air BnB, VRBO, Booking.com etc., over the last 8 years, the business of and the market demands for B&Bs and short term rental accommodations has changed dramatically.

Many local government jurisdictions in the province, including the SCRD, are struggling to catch up with the regulations needed to provide the balances required to enhance the economic benefits that this type of business provides to the tourism industry and respect the values of the neighbourhoods in which the rentals take place.

The SCRD is no exception. We are in catch up mode, and the bylaw amendments before you today are intended to address the issues and concerns that are happening now and evolving rapidly in our communities.

What the proposed amendments don't address are the changing short term rental market and the significant economic benefits that this type of business brings to the Sunshine Coast.

However, we need to start a process of amending the bylaws to meet the current state of the business and continue to review this rapidly evolving business and the challenges that it presents in order to achieve balance in our communities.

The Proposed amendments

The proposed amendments are reflective of much public engagement and consultation and staff are to be commended for listening to and responding to much of that feedback.

However, there are proposed amendments that are too restrictive, don't address the needs of the current market, or require some clarification.

In Particular,

1. The restriction of 2 bedrooms/dwelling, with few exceptions, regardless of the zoning or parcel size does not reflect the needs and reality of today's business operators.
    a. This is especially evident in Bylaw 310 which is more restrictive than Bylaw 337. There must be consistency in the 2 Bylaws.
    b. A workable solution was proposed at first reading with a scalable allowance of bedrooms dependent on parcel size and zoning.
    c. Another option may be to have Bylaw 310 match Bylaw 337 with the addition of the allowance for a bed and breakfast inn
    d. Maintaining the current bylaws is not moving forward to address the current reality and needs of the business
2. The restriction of a maximum of 2 occupants/bedroom is an unacceptable situation for many families. Mum and Dad and 1 older child or even 2 younger children staying in the same room makes the Sunshine Coast an affordable vacation destination. In comparison to the high return ferry fares to Vancouver Island or the high cost of gas to drive to the interior it's easy to understand why the family tourism industry is exploding on the Sunshine Coast. Significant restrictions of 2 occupants/bedroom will be a tourism business killer. This must be opened up to include parents and children in the same room.
3. The TUP process is an exceptable process for off-site management. However, the process is complex and will require a great deal of staff time to manage.
    a. TUP fees must reflect the actual costs to manage this service
    b. Non-compliance to TUP conditions must be significantly fined, eg.
        i. First offence - $500
        ii. Second offence - $1000
        iii. Third offence – TUP revoked
        iv. Fines must be a deterrent to non-compliance, not seen as merely a cost of doing business
    c. Enforcement was a common theme at the public meetings and by APCs. Bylaw enforcement resources could be significant and the taxpayer should not be expected to take on the costs of management and enforcement.
4. Points of clarification are:
    a. A housekeeping unit is vaguely defined in Bylaw 337 but not at all in 310. What is a housekeeping unit and what is an example of it?
    b. 310 Part B 2.b.(c) "The average floor area of ALL bedrooms shall not exceed 28 m2". Is ALL the total of the bedrooms, or should the word be ANY so that any bedroom cannot exceed 28m2. This is also not reflective of current practices where an open space suite might be larger than a conventional bedroom.
5. And finally. In the big picture of tourism in British Columbia, the Sunshine Coast is small but growing rapidly. A point of great confusion to our tourists is the different accommodation offerings with their different respective rules and regulations. They don't understand the 4 local government structure in such a small geographic area, and are confused by what they can rent in different areas of the Coast. The fact that even within the SCRD with differences between regulations in Bylaw 310 and Bylaw 337, is a source of confusion that this Board can remedy

now. Perhaps this a great opportunity for collaboration on Short Term Rental Accomodation bylaws within the control of the SCRD and in fact all jurisdictions on the Sunshine Coast.

6. In my opinion, there should be bylaw amendments made to address the primary cause of citizens concerns with short term rental accommodations, and that is an off-site operator. The TUP process as proposed will work to control and regulate this type of operation.
    a. Fully support Bylaw 310.184 Part B 2 (h) I to viii, and Bylaw 337.118 Part B 2 (g) I to viii.
    b. Have fines set to the maximum allowable by the LGA and Community Charter, and consider petitioning the provincial government to have higher maximums for this type of business non-compliances.
7. However, limiting the size of a bedroom in an accommodation does not reflect the current business model of many successful, with no complaints, accommodation providers on the Sunshine Coast.
    a. Delete Bylaw 310.184 Part B 2.b.(c), and Bylaw 337.118 Part B 2.b.(b)
8. Also, limiting the number of occupants of a bedroom to just 2 people will discourage the family tourism business. This is exactly the type of business we want, not the rowdy party houses.
    a. Delete Bylaw 310.184 Part B 2.b.(d), and Bylaw 337.118 Part B 2.b.(c)

In summary, fix the big problems first and maybe come back later to fine tune the regulations to address other challenges as they continue to evolve.

Thank you for this opportunity to speak to you on this important topic.

SUNSHINE COAST REGIONAL DISTRICT

BYLAW NO. 310.184

A bylaw to amend the *Sunshine Coast Regional District Zoning Bylaw No. 310, 1987*

The Board of Directors of the Sunshine Coast Regional District, in open meeting assembled, enacts as follows:

PART A – CITATION

1. This bylaw may be cited as *Sunshine Coast Regional District Zoning Amendment Bylaw No. 310.184, 2018*.

PART B – AMENDMENT

2. *Sunshine Coast Regional District Zoning Bylaw No. 310, 1987* is hereby amended as follows:

   a. Replace the definition for "bed and breakfast" in Section 201 with the following definition:

      "bed and breakfast" means rental accommodation provided in a dwelling and occupied by the same occupant(s) for not more than 30 consecutive days, which may include an accommodation commonly known as Short Term Rental, but excludes accommodation provided in a campground, a sleeping unit, a housekeeping unit, a motel, a lodge, a hotel or a resort hotel.

   b. Replace Sections 502.11(a) to (f) with the following sections:

      (a) "Bedroom" shall be defined as an enclosed room or a contiguous floor space for the exclusive use of the bed and breakfast occupants.

      (b) Except as provided for by Section 1001A.4 for the RU1A zone and Section 1001C.3(h) for the RU1C zone or any other parts of this bylaw, the area utilized for bed and breakfast shall not exceed two bedrooms per dwelling.

      (c) The average floor area of all bedrooms used for bed and breakfast shall not exceed 28 m^2.

      (d) The total number of occupants of a bed and breakfast establishment shall not exceed two per permitted bedrooms.

      (e) No external indication associated with a bed and breakfast shall exist except a single sign not exceeding 3500 square centimetres.

(f) Any dwelling utilized for bed and breakfast shall be connected to sewerage disposal and water supply facilities that are in compliance with current regulations pursuant to the *Public Health Act* of British Columbia.

(g) A bed and breakfast shall be operated by an operator who resides on the property where the bed and breakfast is permitted at all times when the bed and breakfast is in operation, or an off-site operator subject to Section 502.11(h).

(h) All zones within this bylaw that permit bed and breakfast are designated as a Temporary Use Permit Area for the consideration of permitting off-site operators for bed and breakfast establishments, subject to the following conditions:

i. An “off-site operator” is defined as an operator of a bed and breakfast who does not reside on the property where the bed and breakfast is operated, but resides within the Sunshine Coast Regional District at all times when the bed and breakfast is in operation.

ii. The maximum duration of a Temporary Use Permit is three years. The permit may be renewed only once. After the renewal expires, a new permit for the same property may be applied for.

iii. Notice regarding a Temporary Use Permit application must be published in a local newspaper and given to owners and residents of properties within a 100-m radius of the subject parcel. If the permit is granted, contact information of the operator shall be given to those owners and residents herein.

iv. An application fee shall be required for a Temporary Use Permit application In accordance with the Planning and Development Procedures and Fees Bylaw in effect.

v. A building inspection shall be required for the bed and breakfast portion of the property, and if upgrades to the building are required in order to meet BC Building Code, such work shall be completed prior to issuance of the Temporary Use Permit.

vi. An off-site operator shall be responsible for all operations of the bed and breakfast and resolve any issues arising from the operations within 24 hours of being notified.

vii. An off-site operator shall ensure that the bed and breakfast occupants comply with all applicable bylaws and regulations, including on-street parking, noise bylaw, garbage disposal, water usage restriction and fire ban when in effect.

viii. Upon a total of three infractions of any terms and conditions of the Temporary Use Permit, the zoning bylaw or any applicable bylaws, the permit shall be revoked.

PART C – ADOPTION

READ A FIRST TIME this	25TH DAY OF	OCTOBER,	2018
READ A SECOND TIME this	23RD DAY OF	MAY,	2019
PUBLIC HEARING HELD PURSUANT TO THE *LOCAL GOVERNMENT ACT* this	DAY OF	MONTH	YEAR
READ A THIRD TIME this	DAY OF	MONTH	YEAR
ADOPTED this	DAY OF	MONTH	YEAR

Corporate Officer

Chair

SUNSHINE COAST REGIONAL DISTRICT

BYLAW NO. 337.118

A bylaw to amend the *Sunshine Coast Regional District Electoral Area A Zoning Bylaw No. 337, 1990*

The Board of Directors of the Sunshine Coast Regional District, in open meeting assembled, enacts as follows:

PART A – CITATION

1. This bylaw may be cited as *Sunshine Coast Regional District Electoral Area A Zoning Amendment Bylaw No. 337.118, 2018*.

PART B – AMENDMENT

2. *Sunshine Coast Regional District Electoral Area A Zoning Bylaw No. 337, 1990* is hereby amended as follows:

   a. Replace the definitions for "bed and breakfast home" and "bed and breakfast inn" in Section 201 with the following definitions:

      "bed and breakfast home" means rental accommodation provided in not more than two bedrooms of a dwelling and occupied by the same occupant(s) for not more than 30 consecutive days, which may include an accommodation commonly known as Short Term Rental, but excludes accommodation provided in a campground, a sleeping unit, a housekeeping unit, a motel, a lodge, a hotel or a resort hotel.

      "bed and breakfast inn" means rental accommodation provided in not more than five bedrooms of a dwelling and occupied by the same occupant(s) for not more than 30 consecutive days, which may include an accommodation commonly known as Short Term Rental, but excludes accommodation provided in a campground, a sleeping unit, a housekeeping unit, a motel, a lodge, a hotel or a resort hotel.

   b. Replace Section 509 Bed and Breakfast Homes and Section 510 Bed and Breakfast Inns with the following section:

      Bed and Breakfast Homes and Bed and Breakfast Inns

      509 Bed and breakfast homes and bed and breakfast inns, where permitted and herein referred to as bed and breakfast, are subject to the following conditions:

(a) "Bedroom" shall be defined as an enclosed room or a contiguous floor space for the exclusive use of the bed and breakfast occupants.

(b) The average floor area of all bedrooms used for bed and breakfast shall not exceed 28 m^2.

(c) The total number of occupants of a bed and breakfast establishment shall not exceed two per permitted bedrooms.

(d) No external indication associated with a bed and breakfast shall exist except a single sign not exceeding 3500 square centimetres.

(e) Any dwelling utilized for bed and breakfast shall be connected to sewerage disposal and water supply facilities that are in compliance with current regulations pursuant to the *Public Health Act* of British Columbia.

(f) A bed and breakfast shall be operated by an operator who resides on the property where the bed and breakfast is permitted at all times when the bed and breakfast is in operation, or an off-site operator subject to Section 509(g).

(g) All zones within this bylaw that permit bed and breakfast are designated as a Temporary Use Permit Area for the consideration of permitting off-site operators for bed and breakfast establishments, subject to the following conditions:

i. An “off-site operator” is defined as an operator of a bed and breakfast who does not reside on the property where the bed and breakfast is operated, but resides within the Sunshine Coast Regional District at all times when the bed and breakfast is in operation.

ii. The maximum duration of a Temporary Use Permit is three years. The permit may be renewed only once. After the renewal expires, a new permit for the same property may be applied for.

iii. Notice regarding a Temporary Use Permit application must be published in a local newspaper and given to owners and residents of properties within a 100-m radius of the subject parcel. If the permit is granted, contact information of the operator shall be given to those owners and residents herein.

iv. An application fee shall be required for a Temporary Use Permit application In accordance with the Planning and Development Procedures and Fees Bylaw in effect.

v. A building inspection shall be required for the bed and breakfast portion of the property, and if upgrades to the building are required in order to meet BC Building Code, such work shall be completed prior to issuance of the Temporary Use Permit.

vi. An off-site operator shall be responsible for all operations of the bed and breakfast and resolve any issues arising from the operations within 24 hours of being notified.

vii. An off-site operator shall ensure that the bed and breakfast occupants comply with all applicable bylaws and regulations, including on-street parking, noise bylaw, garbage disposal, and water usage restriction and fire ban when in effect.

viii. Upon a total of three infractions of any terms and conditions of the Temporary Use Permit, the zoning bylaw or any applicable bylaws, the permit shall be revoked.

PART C – ADOPTION

READ A FIRST TIME this	25TH DAY OF OCTOBER,		2018
READ A SECOND TIME this	23RD DAY OF MAY,		2019
PUBLIC HEARING HELD PURSUANT TO THE *LOCAL GOVERNMENT ACT* this	DAY OF	MONTH	YEAR
READ A THIRD TIME this	DAY OF	MONTH	YEAR
ADOPTED this	DAY OF	MONTH	YEAR

_____

Corporate Officer

_____

Chair

SUNSHINE COAST REGIONAL DISTRICT
TRANSPORTATION ADVISORY COMMITTEE
October 17, 2019

RECOMMENDATIONS FROM THE TRANSPORTATION ADVISORY COMMITTEE MEETING HELD IN THE BOARD ROOM OF THE SUNSHINE COAST REGIONAL DISTRICT AT 1975 FIELD ROAD, SECHELT, BC

PRESENT:		
(Voting Members)	Director, Electoral Area E, Chair	Donna McMahon
	Director, Electoral Area A, Vice-Chair	Leonard Lee
	Director, Electoral Area B	Lori Pratt
	Director, Electoral Area F	Mark Hiltz
	Director, District of Sechelt	Darnelda Siegers
	Director, District of Sechelt	Tom Lamb
	Transportation Choices (TraC)	Alun Woolliams
	Trustee, School District No. 46	Sue Girard
ALSO PRESENT:		
(Non-Voting)	Interim Chief Administrative Officer	Mark Brown
	GM, Planning and Community Development	Ian Hall
	GM, Infrastructure Services	Remko Rosenboom
	Manager, Planning & Development	Dave Pady
	Transportation Superintendent	Steven Sears
	RCMP	Sgt. Mike Hacker
	Seniors Planning Table	Michelle Bruecker
	Sunshine Coast Highway Society	Maureen Bryce
	SCRD Administrative Assistant / Recorder	T. Ohlson
	SCRD Infrastructure Assistant	C. Cotton
	Public	3
	Media	2

CALL TO ORDER 2:45 p.m.

AGENDA The agenda was adopted as amended to add to following items of New Business:

- Appointment of New Operations Manager, Ministry of Transportation and Infrastructure (MOTI)
- Update on UBCM
- Update on free bus passes for students
- Annual Project Review Meeting SCRD and MOTI

PRESENTATIONS AND DELEGATIONS

Brian Green presented to the Transportation Advisory Committee regarding Horseshoe Bay Terminal Development Plan.

Discussion included the following points:

- Terminal design and building compliance with net zero, seismic requirements and sustainable building practices
- Changing passenger trends and an increase in public transit use
- Concerns expressed about emergency vehicle access
- Financing from BC Ferries Capital Plan

MINUTES

Recommendation No. 1 *Transportation Advisory Committee Meeting Minutes of July 18, 2019*

The Transportation Advisory Committee recommended that the Transportation Advisory Committee meeting minutes of July 18, 2019 be received.

COMMUNICATIONS

Recommendation No. 2 *Update on MOTI Corridor Review*

The Transportation Advisory Committee recommended that correspondence from Kim Tournat, Constituency Assistant for MLA, Nicholas Simons regarding update on MOTI Corridor Review be received;

AND THAT the SCRD write a letter to the Ministry of Transportation and Infrastructure requesting that the seasonality of both traffic volumes and use by cyclists and pedestrians be taken into consideration when conducting the Corridor Review during the slowest months of the year.

NEW BUSINESS

Director Hiltz advised the Committee that Michael Braun is the new Operations Manager for Ministry of Transportation and Infrastructure for this area.

Recommendation No. 3 *New MOTI Operations Manager*

The Transportation Advisory Committee recommended that a letter be sent to the new Ministry of Transportation and Infrastructure (MOTI) Operations Manager inviting him to attend the quarterly Transportation Advisory Committee meetings.

Director Pratt provided the Committee with an overview of the meeting at UBCM between the SCRD Board and Minister Trevena regarding highway safety and the yearly meeting between SCRD and MOTI.

Recommendation No. 4 *MOTI Annual Project Plan*

The Transportation Advisory Committee recommended that SCRD prepare a letter to the Ministry of Transportation and Infrastructure (MOTI) requesting a meeting between Sunshine

Coast local governments and Ministry of Transportation and Infrastructure (MOTI) to discuss the MOTI Annual Project Plan.

The General Manager of Infrastructure Services indicated that BC Transit will attend as a delegation at the November 28, 2019 Corporate and Administrative Services Committee meeting.

Recommendation No. 5 *Infrastructure Services Quarterly Report*

The Transportation Advisory Committee recommended that transportation-related items from the Infrastructure Services Quarterly report be added to the TAC Agenda.

Recommendation No. 6 *Parcels Accessible from Highway 101*

The Transportation Advisory Committee recommended that the email and map of parcels accessible from Highway 101 circulated at the meeting be received.

Discussion included the following points:

- Speed limit reduction on this section of the highway to 60 km per hour
- Status of Poplars Mobile Home Park having only one exit

ROUNDTABLE

Committee members provided roundtable updates as follows:

Sgt. Mike Hacker (RCMP) – There have been zero fatal collisions and the non-fatal collision rates for the entire Sunshine Coast for this quarter have remained steady. There were 47 impaired driving investigations, 352 violations resulting in 37 Notice in Orders. Noted traffic congestion remains an issue.

Director Siegers (District of Sechelt) – The Derby Road extension is open to the public and, as of October 15th, transit services Chatelech Secondary. Noted Cowrie at Trail Avenue construction will begin soon to update sewer and separate bike and walking paths from the road.

Director Lee (Egmont/Pender Harbour) – Noted that work continues with MOTI and the RCMP on abandoned vehicles.

Alun Woolliams (TraC) – Indicated that in the new MOTI maintenance contract inquiries from the public using social media (Instagram or Twitter) will be addressed within 24 hours but they are not complying with an automated or human response. TraC will follow up.

Director Pratt (Halfmoon Bay) – Noted ongoing road maintenance issues, particularly the section of the shoulder paved at Brooks Road and Stephens Road. Concern regarding flooding in ditches.

Sue Girard, Trustee (SD46) – Concern about speed on Chaster Road, RCMP have been more visible. Inquired whether there are parking lot restrictions at Frank West Hall and if people are being discouraged to use? A new portable has been added to Cedar Grove Elementary which is blocking access to some parking spaces.

Director Hiltz (West Howe Sound) – Noted the Marine Drive levy is in place for flooding. There has been paving completed on Port Mellon Highway. The intersection at Stewart and North

Road has been pressure washed. The MOTI webcam at the top of the bypass is installed and drainage issues at the base of the bypass continue to be of concern.

Director McMahon (Elphinstone) – Noted concerns about the engineering and no paving where the Russell Road culvert was washed out. Reed Road continues to have heavy use and still has no shoulder paving. The blind spot between North Road and Payne Road needs to be addressed, the Town of Gibsons is working on their side, a solution is needed.

Recommendation No. 7 *2011 Integrated Transportation*

The Transportation Advisory Committee recommended that the 2011 Integrated Transportation Study be circulated to TAC members and included as an agenda item for discussion at the January 2020 TAC meeting.

ADJOURNMENT 4:05 p.m.

Committee Chair

SUNSHINE COAST REGIONAL DISTRICT

SOLID WASTE MANAGEMENT PLAN MONITORING ADVISORY COMMITTEE

November 5, 2019

MINUTES FROM THE SOLID WASTE MANAGEMENT PLAN MONITORING ADVISORY COMMITTEE MEETING HELD IN THE CEDAR ROOM AT THE SUNSHINE COAST REGIONAL DISTRICT OFFICES, 1975 FIELD ROAD, SECHELT, BC

PRESENT: (Voting)	Members	Jann Boyd Barb Hetherington Silas White Peter Robson Gareth Bennett Marie Cambon David New-Smalls Shirley Higginson Ian Winn
ALSO PRESENT: (Non-voting)	Electoral Area E Director Electoral Area A Director Manager, Solid Waste Programs Recording Secretary Solid Waste Programs Coordinator	Donna McMahon Leonard Lee Robyn Cooper Chelsea Cotton Andrea Patrao
REGRETS:	Members	Rebecca Stewart

CALL TO ORDER 11:03 a.m.

Robyn Cooper assumed the role of Chair for the meeting.

WELCOME & ROUNDTABLE

Members were given an opportunity to introduce themselves and a brief explanation of their goals for PMAC.

AGENDA The agenda was adopted as presented

MINUTES

PRESENTATION

Manager, Solid Waste Programs provided a presentation regarding background of Solid Waste Management Plan (SWMP), the role of Solid Waste Management Plan Monitoring Advisory Committee (PMAC) and conduct of PMAC members, current Sunshine Coast Regional District (SCRD) solid waste services and upcoming SCRD initiatives.

Recommendation No.1 *2020 Budget Report*

The Solid Waste Management Plan Advisory Committee recommended that a copy of the 2020 budget report be provided to PMAC members.

Recommendation No. 2 *2018 Sechelt Landfill Report*

The Solid Waste Management Plan Advisory Committee recommended that a copy of the 2018 Sechelt Landfill annual report be provided to PMAC members.

Recommendation No.3 *Marine Debris Background Information*

The Solid Waste Management Plan Advisory Committee recommended that background information about marine debris be provided to PMAC members.

APPOINTMENT OF PMAC CHAIR AND VICE CHAIR

Ian Winn was elected as Chair

Silas White was elected as Vice Chair

FUTURE MEETING TOPICS

The following topics were listed as possible future PMAC meeting topics; Recycle BC, Extended Producer Responsibility (EPR) in BC, SCRD processes, commercial vs. residential recycling, SCRD board resolutions related to solid waste.

NEXT MEETING December 10, 2019 @ 11:00 a.m.

ADJOURNMENT 12:40 p.m.

Tracey Hincks

From: AVICC <avicc@ubcm.ca>
Sent: Tuesday, October 22, 2019 9:18 AM
To: avicc@ubcm.ca
Subject: Your Invitation to Participate in BC's "Old Growth Strategic Review"
Attachments: Old Growth ToR.pdf

Please forward to elected officials, the CAO and Corporate Officer:

AVICC is advising our members of this invitation from the Ministry of Forests, Lands, Natural Resource Operations and Rural Development to take part in an Old Growth Strategic Review.

AVICC members have passed several resolutions regarding old-growth protection and forestry. Information on previous resolutions and the responses from the Province are available on the UBCM website under the resolutions tab at https://www.ubcm.ca/resolutions/default.aspx

Your Invitation to Participate in BC's "Old Growth Strategic Review"

Garry Merkel, a forester and natural resource expert, and member of the Tahltan Nation, and **Al Gorley**, a professional forester and former chair of the Forest Practices Board have been appointed as an independent panel to engage with First Nations, industry, stakeholders and communities to hear perspectives on the ecological, economic, social and cultural importance of old-growth forests. Reporting back to government in spring 2020, their recommendations are expected to inform a new approach to old-growth management for British Columbia.

You're invited to participate in this strategic review by applying to meet with the independent panel to share your thoughts. Al and Garry are interested to hear:

- *What old growth means to you and how you value it*
- *Your perspective on how old growth is managed now*
- *How you think old growth could be managed more effectively in the future*

Subject to demand and availability, the panel expects to be in your area on the following dates.

- Oct 24/25 – South Central Van Island
- Oct 28-31 – Skeena / Nechako
- Dec 4-6 – Vancouver / Sunshine Coast
- Dec 9 – Haida Gwaii

- Nov 7/8 – North Vancouver Island
- Nov 12-15 – Thompson / Shuswap
- Nov 18 and 21 - Vancouver
- Dec 2/3 – Northeast BC
- Dec 12/13 – Vancouver / Victoria
- Dec 16 – Sea to Sky
- Dec 17-20 – Cariboo / Okanagan

Please express your interest in setting up a meeting with the panel by completing an on-line expression of interest.

Every effort will be made to accommodate in-person meeting requests, however if a suitable time cannot be found, a meeting by phone may be offered.

Please note the weblink at the bottom of the attached Terms of Reference may not be live until Oct 21st.

Regards

Steve Kachanoski

Project Manager | **Old Growth Strategic Review**

Email: oldgrowthbc@gov.bc.ca

Phone: 778.974.2416

PROCEDURES AND TERMS OF REFERENCE

Old Growth Strategic Review

OLD GROWTH STRATEGIC REVIEW PANEL

On July 17, 2019, the Government of British Columbia announced that Garry Merkel and Al Gorley had been appointed to lead an Old Growth Strategic Review and provide a report to the Minister of Forests, Lands, Natural Resource Operations and Rural Development.

OVERVIEW

Old growth forests are important to British Columbians. They drive a significant portion of the forest industry, supply high quality products, and support forestry employment. They are attractive sites for tourism and recreation, and provide important habitats for wildlife. They are important for climate change mitigation. Old growth forests and trees are culturally and socially significant to Indigenous Peoples.

Merkel and Gorley will gather input by developing an online questionnaire, receiving written submissions, leading community engagement and meeting with key governments and organizations, including:

- Indigenous governments and communities
- Local governments and communities
- The forest industry
- The tourism and recreation industries
- Environmental non-government organizations
- Professional associations
- Professionals, academics and other experts
- Forest and resource stewardship organizations
- Stakeholder groups
- Members of the public

Merkel and Gorley will consider how other jurisdictions manage old growth forests.

Based on what they gather through engagement, Merkel and Gorley will develop a report to the Government to inform the development of broad public policy regarding old growth forests. The report will include a summary of what they heard.

Upon receiving the report, the Government will consider the recommendations and, through consultation, develop new policies and strategies for the management of old growth forests.

ENGAGEMENT PRINCIPLES

Balance

Examine old growth management from a variety of perspectives including employment, economic, social, cultural, environmental and climate change values. Considering all input, including potential tradeoffs and impacts amongst the various interests and values, will be a key element of deliberations and work.

Transparency

Make all information relating to the review available to the public, except for information that must be withheld to comply with privacy legislation.

Independence

Independently set direction on the processes, topics and approach for engaging with the public and drafting recommendations. To facilitate an effective process, the Government will provide assistance as requested.

First Nations Consultation

The B.C. Government will engage in Government-to-Government consultation with First Nations before setting policy direction in response to the report.

Open-mindedness

Maintain open minds with respect to who will provide input and how input is provided. Maintain a discipline of not pre-determining outcomes.

Inclusiveness

Provide every British Columbian with an opportunity to express their views, as almost all old growth forests are on public land.

TIMING

Merkel and Gorley will provide a final report to the Minister by April 30, 2020. The report will be released to the public within six months of its submission.

BRITISH COLUMBIA

Ministry of Forests, Lands, Natural Resource Operations and Rural Development

LEARN MORE ONLINEAT:
engage.gov.bc.ca/oldgrowth

BRITISH COLUMBIA

OCT 2 2 2019

Lori Pratt, Chair
Sunshine Coast Regional District
1975 Field Road
Sechelt BC V0N 3A1

Reference: 288749

Dear Chair Pratt,

Re: Thank you for meeting at UBCM 2019

Thank you for taking the time to meet with me at the Union of British Columbia Municipalities (UBCM) Convention in Vancouver. I was glad to have the opportunity to discuss the Highway 101 corridor, as well as BC Ferries' service levels and your interest in a passenger-only ferry service. I also appreciated receiving your letter regarding the Highway 101 corridor.

This convention is an essential part of my year, because I can connect face-to-face with leaders like you who know their communities better than anyone. Your neighbours and local businesses come to you first with their ideas and frustrations. The provincial government relies on your insight to guide our plans, and I want you to know how much I appreciate the work you do.

This year's theme of resiliency and change brought home how important it is for governments to collaborate so that we are ready for the unexpected challenges that can face us. We will always accomplish more together. As my ministry works to build a healthy and lasting transportation network with new options and new directions, consultation and partnership will continue to be at the heart of our approach.

As discussed during our meeting, I have asked local ministry staff to contact you directly to arrange an annual meeting to discuss priority areas and plans for Highway 101. I have also asked local ministry staff to explore potential safety measures for Wood Creek and Oceanview Drive, including a potential speed survey and crosswalk installation. Please do not hesitate to contact Elena Farmer, Associate District Manager, Lower Mainland District, should you have any questions in the meantime. She can be reached by telephone at 236 468-1935 or by email at Elena.Farmer@gov.bc.ca and would be pleased to assist you.

.../2

Ministry of Transportation and Infrastructure

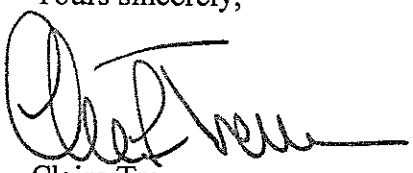
Office of the Minister

Mailing Address:
Parliament Buildings
Victoria BC V8V 1X4

As was mentioned during the meeting, the provincial government is developing a long-term vision for ferry service and is engaging with stakeholders this fall to seek their feedback and ideas. Through this process, we will be able to identify what improvements could be made over the long term and how the ministry can better integrate ferry services within the existing transportation network. We will ensure your comments about ferry service to the Sunshine Coast are kept in mind during this process.

Thank you again for taking the time to meet with me, and thank you for everything you do to support your community.

Yours sincerely,



Claire Trevena
Minister

Copy to: Grant Main, Deputy Minister

Kevin Richter, Associate Deputy Minister

Deborah Bowman, Assistant Deputy Minister
Transportation Policy and Programs Department

Renée Mounteney, Assistant Deputy Minister
Highway Services

Ashok Bhatti, Executive Director
South Coast Region

Kirk Handrahan, Executive Director
Marine Branch

Elena Farmer, Associate District Manager
Lower Mainland District

Sechelt

COPY

November 7, 2019

File No. 5331-108

Sunshine Coast Regional District
Chief Administrative Officer
1975 Field Road
Sechelt, BC
V0N 3A1

Dear Mr. Brown,

Re: District of Sechelt Liquid Waste Management Plan Stage 2 Updates - Steering Committee and Technical Advisory Committee Nomination

The District of Sechelt is in the process of updating our Liquid Waste Management Plan Stage 2. As part of this process, the Ministry of Environment requires that two committees be established to assist the Liquid Waste Management Plan Stage 2 process. The Ministry also advised that the committees consist of stakeholders and representatives from the community as well as technical experts. The District has recognized stakeholders as:

1. Sunshine Coast Regional District, and
2. Sechelt Indian Government District.

These proposed committees are:

1. A Steering Committee, and
2. A Technical Advisory Committee

Please nominate one member of your elected board to sit on the Steering Committee and one staff member for the Technical Advisory Committee.

Once the committee members are established from all stakeholders and the District of Sechelt, these committees will be brought forward to the District of Sechelt Council for endorsement.

The meeting frequency has not yet been established, however, we anticipate these meetings to take place during regular working hours at the District of Sechelt office. The proposed meeting frequency is anticipated as follows:

- Steering Committee Meeting January 2020
- Technical Advisory Committee Meeting after first Steering Committee Meeting
- Public Open House February 2020
- Steering Committee Meeting March 2020
- Technical Advisory Committee Meeting after Second Steering Committee Meeting
- Public Open House April 2020
- Other meetings assigned as necessary depending on the complexity of the required updates to the plan and feedback from the committees and the public.

We appreciate your prompt response, and look forward to hearing from you.

Sincerely,

Darwyn Kutney,
Director of Engineering and Operations