Capital Regional District

625 Fisgard St.,
Victoria, BC V8W 1R7

Notice of Meeting and Meeting Agenda
Regional Parks Committee

Wednesday, February 22, 2023 | **9:30 AM** | **6th Floor Boardroom, 625 Fisgard St., Victoria, BC V8W 1R7**

C. McNeil-Smith (Chair), J. Brownoff (Vice Chair), C. Coleman, S. Goodmanson, G. Holman, L. Szpak, M. Tait, S. Tobias, K. Williams, R. Windsor, C. Plant (Board Chair, ex officio)

The Capital Regional District strives to be a place where inclusion is paramount and all people are treated with dignity. We pledge to make our meetings a place where all feel welcome and respected.

1. Territorial Acknowledgement

2. Approval of Agenda

3. Adoption of Minutes

3.1. 23-140 Minutes of the June 22, 2022 Regional Parks Committee Meeting

Recommendation: That the minutes of the Regional Parks Committee meeting of June 22, 2022 be adopted as circulated.

Attachments: Minutes - June 22, 2022

4. Chair's Remarks

5. Presentations/Delegations

The public are welcome to attend CRD Board meetings in-person.

Delegations will have the option to participate electronically. Please complete the online application at www.crd.bc.ca/address no later than 4:30 pm two days before the meeting and staff will respond with details.

Alternatively, you may email your comments on an agenda item to the CRD Board at crdboard@crd.bc.ca.

6. Committee Business

6.1. 23-167 2023 Regional Parks Committee Terms of Reference

Recommendation: There is no recommendation. This report is for information only.

Attachments: Staff Report: 2023 Regional Parks Committee Terms of Reference

Appendix A: 2023 Regional Parks Committee Terms Of Reference

6.2. 23-141 Island View Beach Regional Park - Ditch Maintenance

Recommendation: There is no recommendation. This report is for information only.

Attachments: Staff Report: Island View Beach Regional Park - Ditch Maintenance
Appendix A: IVBRP - Ditch Maintenance Staff Report to CRD Brd - Aug 2022
Appendix B: Ditch Maintenance 2022 - Island View Beach Regional Park
Appendix C: Aqua-Tex Ditch Maintenance Assessment

7. Notice(s) of Motion

8. New Business

9. Adjournment

The next meeting is March 22, 2023.

To ensure quorum, please advise Tamara Pillipow (tpillipow@crd.bc.ca) if you or your alternate cannot attend.

Meeting Minutes

Regional Parks Committee

Wednesday, June 22, 2022 **9:30 AM** **6th Floor Boardroom**
625 Fisgard St.
Victoria, BC V8W 1R7

PRESENT
Directors: R. Mersereau (Chair), G. Young (Vice Chair), G. Holman (EP), B. Isitt, R. Martin (EP), J. Ranns, D. Screech, L. Seaton (EP), M. Tait (9:39 am) (EP), N. Taylor (EP), C. Plant (Board Chair, ex officio)

Staff: L. Hutcheson, General Manager, Parks and Environmental Services; J. Leahy, Senior Manager, Regional Parks; M. MacIntyre, Manager, Plan and Dev., Regional Parks; J. Mooney, Acting Manager, Park Operations, Regional Parks; T. Moss, Manager, Visitor Services & Community Dev., Regional Parks; E. Taylor, Planner, Regional Parks; M. Lagoa, Deputy Corporate Officer; T. Pillipow, Committee Clerk (Recorder)

EP - Electronic Participation

The meeting was called to order at 9:31 am.

1. Territorial Acknowledgement

Director Isitt provided a Territorial Acknowledgement.

2. Approval of Agenda

MOVED by Director Isitt, SECONDED by Director Ranns,
That the agenda for the June 22, 2022 Regional Parks Committee meeting be approved as amended to add delegation 5.2.
CARRIED

3. Adoption of Minutes

3.1. 22-234 Minutes of the March 23, 2022 Regional Parks Committee Meeting

MOVED by Director Isitt, SECONDED by Director Ranns,
That the minutes of the Regional Parks Committee meeting of March 23, 2022 be adopted as circulated.
CARRIED

4. Chair's Remarks

Chair Mersereau thanked staff for working diligently to bring the Strategic Plan to the committee on schedule.

5. Presentations/Delegations

5.1. 22-425 Delegation - Daniel Cammiade; Representing Nature Trails Society: Re: Agenda Item 6.1.: Renewed Regional Parks and Trails Strategic Plan

D. Cammiade spoke to Item 6.1.

5.2. 22-433 Delegation - Yvonne Mendel; Representing South Island Mountain Biking Society: Re: Agenda Item 6.1.: Renewed Regional Parks and Trails Strategic Plan

Y. Mendel spoke to Item 6.1.

6. Committee Business

6.1. 22-409 Renewed Regional Parks and Trails Strategic Plan

L. Hutcheson spoke to Item 6.1.

Discussion ensued on the following:
- the advantages to the interim approval of this plan
- building an East-Westbound trail connector
- First Nations engagement
- the revised land acquisition strategy
- the trail standard for rural areas
- indicating specific user groups within the strategic plan
- completing a service level review of trails to inform the plan
- stating more specific actions around climate change
- the language used in classification of trails

Director Tait left the meeting at 11:03 am.

MOVED by Director Young, SECONDED by Director Screech,
That the Regional Parks Committee recommends to the Capital Regional District Board:
1. That the Capital Regional District Regional Parks and Trails Strategic Plan 2022-2032 be approved on an interim basis for one year while engagement with First Nations continues.
CARRIED
OPPOSED: Isitt

MOVED by Director Screech, SECONDED by Director Martin,
That the Regional Parks Committee recommends to the Capital Regional District Board:
2. That bike parking and e-bike charging stations be added to priority action 4-2e.
CARRIED

Motion Arising:
MOVED by Director Isitt, SECONDED by Director Taylor,
The Regional Parks Committee direct staff to report back, as part of the review, on the advisability of including the following target in the plan:
"That the Capital Regional District work with indigenous, federal, provincial, and philanthropic partners to expand protected areas of the region to 25% of the region's land base by 2032."
CARRIED

Motion Arising:
MOVED by Director Isitt, SECONDED by Director Young,
That staff be directed to consider the expansion of camping opportunities as part of the development of the Outdoor Recreation Plan as well as the report back on the Regional Parks and Trail Plan.
CARRIED

7. Notice(s) of Motion

There were no notice(s) of motion.

8. New Business

There was no new business.

9. Adjournment

MOVED by Director Ranns, SECONDED by Director Screech,
That the June 22, 2022 Regional Parks Committee meeting be adjourned at 11:24 am.
CARRIED

_____
CHAIR

_____
RECORDER

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REPORT TO REGIONAL PARKS COMMITTEE
MEETING OF WEDNESDAY, FEBRUARY 22, 2023

SUBJECT **2023 Regional Parks Committee Terms of Reference**

ISSUE SUMMARY

This report is to provide the 2023 Regional Parks Committee Terms of Reference for the Committee's review.

BACKGROUND

Under the *Local Government Act* and the CRD Board Procedures Bylaw, the CRD Board Chair has the authority to establish standing committees and appoint members to provide advice and recommendations to the Board.

On December 14, 2022, the Regional Board approved the 2023 Terms of Reference for standing committees. Terms of Reference (TOR) serve to clarify the mandate, responsibilities and procedures of standing committees and provide a point of reference and guidance for the Committees and members.

This year there were no changes to the defined purpose of the Committee's TOR, attached as Appendix A.

The TOR are being provided for review by the Committee. Any proposed revisions to the TOR will require ratification by the Board.

CONCLUSION

Terms of Reference serve to clarify the mandate, responsibilities and procedures of committees and provide a point of reference and guidance for the committees and their members.

RECOMMENDATION

There is no recommendation. This report is for information only.

Submitted by:	Marlene Lagoa, MPA, Manager, Legislative Services & Deputy Corporate Officer
Concurrence:	Larisa Hutcheson, P. Eng., General Manager, Parks & Environmental Services
Concurrence:	Ted Robbins, B. Sc., C. Tech., Chief Administrative Officer

ATTACHMENT

Appendix A: 2023 Regional Parks Committee Terms of Reference

REGIONAL PARKS COMMITTEE

PREAMBLE

The Capital Regional District (CRD) Regional Parks Committee is a standing committee established by the CRD Board and will oversee and make recommendations to the Board regarding regional parks.

The Committee's official name is to be:

Regional Parks Committee

1.0 PURPOSE

a) The mandate of the Committee includes overseeing and making recommendations to the Board regarding the following functions:

i. Regional parks, including land acquisition, management, operations and programs
ii. Regional Parks Strategic Plan, Land Acquisition Strategy

2.0 ESTABLISHMENT AND AUTHORITY

a) The Committee will make recommendations to the Board for consideration; and

b) The Board Chair will appoint the Committee Chair, Vice Chair and Committee members annually.

3.0 COMPOSITION

a) Committee members will be appointed CRD Board Members;

b) All Board members are permitted to participate in standing committee meetings, but not vote, in accordance with the CRD Board Procedures Bylaw; and

c) First Nation members are permitted to participate in standing committee meetings at their pleasure, in accordance with the CRD Procedures Bylaw, where the Nation has an interest in matters being considered by the committee.

4.0 PROCEDURES

a) The Committee shall meet on a monthly basis, except August and December, and have special meetings, as required;

b) The agenda will be finalized in consultation between staff and the Committee Chair and any Committee member may make a request to the Chair to place a matter on the agenda through the Notice of Motion process;

c) With the approval of the Committee Chair and the Board Chair, Committee matters of an urgent or time sensitive nature may be forwarded directly to the Board for consideration; and

d) A quorum is a majority of the Committee membership and is required to conduct Committee business.

5.0 RESOURCES AND SUPPORT

a) The General Manager of Parks & Environmental Services will act as liaison to the committee; and

b) Minutes and agendas are prepared and distributed by the Corporate Services Department.

Approved by CRD Board December 14, 2022

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REPORT TO REGIONAL PARKS COMMITTEE
MEETING OF WEDNESDAY, FEBRUARY 22, 2023

SUBJECT **Island View Beach Regional Park – Ditch Maintenance**

ISSUE SUMMARY

To report on the 2022 ditch maintenance activities at Island View Beach Regional Park (IVBRP).

BACKGROUND

Since 1989, the District of Central Saanich (Central Saanich), the Tsawout First Nation and the Capital Regional District (CRD) have partnered in an annual Mosquito Population Management and Control Program (MPMCP). This work is done under a provincially-approved Integrated Pest Management Plan. The program operates from February 1 to October 31 and focuses on the monitoring and treatment of more than 165 mosquito breeding sites on lands across Central Saanich, including sites in and around IVBRP. The MPMCP is implemented under a contract with Duka Environmental Services Limited – paid for by Central Saanich, the Tsawout First Nation and the CRD.

At its November 10, 2021 meeting, the CRD Board approved the recommendation that staff undertake a drainage study of the ditches at IVBRP, share the results with Central Saanich and Tsawout First Nation, and report back. The purpose of this study was to characterize the drainage system to better understand its function, influences and identify ways to improve drainage. Great Pacific Engineering and Environment was retained to complete the drainage study and a final report was received on June 30, 2022. The report was shared with Central Saanich and the Tsawout First Nation. The report and a summary of the findings were delivered to the CRD Board on August 10, 2022 (Appendix A).

In 2022, CRD staff began implementing recommendations in the Great Pacific Engineering and Environment report. To improve the drainage within the ditches, the report recommended a phased, incremental approach of addressing the most severely restricted areas by removing dense overgrowth obstructions and vegetation. Due to ground conditions and to reduce the environmental impact of using heavy equipment, staff spent 420 hours hand clearing and removing vegetation on 1.9 kms of ditches. Another 1.1 km of ditches were cleared using heavy equipment on the drier and less sensitive areas (Appendix B).

Water levels in the ditches at IVBRP are influenced by the function of Tsawout First Nation flapper gate and the Central Saanich flapper gate, located on the Lamont Road right of way, as well as precipitation, groundwater levels, surface water levels in adjacent properties, and vegetation in the ditches. The ditches drain water throughout the year and the CRD contracts Aqua-Tex Scientific Consulting Limited (Aqua-Tex) to conduct an annual survey of the ditches. In July 2022, Aqua-Tex surveyed the ditches at IVBRP and found the vegetation growth in the ditches to be minimal, with positive drainage flow evident. No impediments to water flow were observed and there was no evidence of sediment build up in the ditches that prevented water flow (Appendix C). A ditch system that continually conveys water minimizes suitable breeding habitat for mosquitos.

IMPLICATIONS

Intergovernmental Implications

The CRD continues to partner with Central Saanich and the Tsawout First Nation under the MPMCP. The Pest Management Plan is led by Central Saanich and partners with the Tsawout First Nation and the CRD. The CRD continues to fund the portion of the program that treats mosquito breeding sites within IVBRP. The CRD, Central Saanich, and Tsawout First Nation staff are developing updated public information on the partnership and MPMCP.

The CRD also works with Central Saanich and the Tsawout First Nation on maintaining and improving drainage infrastructure to help manage nuisance mosquitoes within the IVB area. Central Saanich has reported that the Lamont Road flapper gate is functioning and is being monitored regularly. In July 2022, the Tsawout flapper gate was repaired as much as possible. The Tsawout First Nation are planning to replace the flapper gate in conjunction with other work planned for the road that contains the flapper gate.

Social Implications

The IVB area provides significant cultural, residential, recreational and agricultural opportunities. Adult mosquito annoyance can have a significant impact on residents, visitors and workers in the area, negatively impacting lifestyles and the ability of people to enjoy being outdoors.

Financial Implications

In 2022, expenses for the MPMCP and work associated with the maintenance of the ditch system at IVBRP totalled $57,273. Expenses can be itemized as follows:

- Duka Environmental Services Ltd – $14,436
- Aqua-Tex Scientific Consulting – $1,260
- CRD contribution to repairs of the Tsawout First Nation flapper gate – $15,000
- Great Pacific Engineering and Environment drainage assessment – $26,577

Alignment with Existing Plans & Strategies

The actions taken to manage mosquito populations and drainage within Island View Beach Regional Park are consistent with the direction provided in the approved 1989 Island View Beach Regional Park Management Plan.

CONCLUSION

In 2021, Great Pacific Engineering and Environment was retained to undertake a study of the Island View Beach Regional Park ditch system and to make recommendations to improve drainage and advice on maintaining the ditch systems functionality over the next 10 to 20 years. CRD staff spent 420 staff hours implementing the recommendations, which included hand clearing 1.9 km of ditches and mechanically clearing another 1.1 km. The CRD will retain Great Pacific Engineering and Environment to do a follow-up assessment of the recent ditch work in the spring of 2023 and will share the report with Tsawout and Central Saanich. The CRD, Tsawout First Nation and the District of Central Saanich will continue to meet on a regular basis to discuss mosquito management and develop updated and consistent public information.

RECOMMENDATION

There is no recommendation. This report is for information only.

Submitted by:	Jeff Leahy, Senior Manager, Regional Parks
Concurrence:	Larisa Hutcheson, P.Eng., General Manager, Parks & Environmental Services
Concurrence:	Ted Robbins, B. Sc., C. Tech., Chief Administrative Officer

ATTACHMENTS

Appendix A: Island View Beach Regional Park – Drainage Ditch Study Staff Report to the CRD Board – August 10, 2022
Appendix B: Ditch Maintenance 2022 – Island View Beach Regional Park
Appendix C: Aqua-Tex Ditch Maintenance Assessment

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REPORT TO CAPITAL REGIONAL DISTRICT BOARD
MEETING OF WEDNESDAY, AUGUST 10, 2022

SUBJECT **Island View Beach Regional Park – Drainage Ditch Study**

ISSUE SUMMARY

To report back on the results of a drainage ditch study for Island View Beach Regional Park.

BACKGROUND

At its October 27, 2021 meeting, the Regional Parks Committee received a staff report providing an update on the delivery of the annual Mosquito Population Management and Control Program (control program) at Island View Beach Regional Park (IVBRP). The control program is a partnership with the District of Central Saanich (Central Saanich), the Tsawout First Nation and the Capital Regional District (CRD). The CRD covers control program costs for IVBRP.

The October 2021 staff report noted that the flapper gate on the Tsawout First Nation lands was not working properly in 2021 due to a log jam, which allowed seawater to flood the Tsawout salt marsh through its system of drainage ditches. Concurrently, in 2021, there was an increase in reported nuisance mosquitos in and around IVBRP. On September 21, 2021, Central Saanich sent a letter to the CRD Board stating that Council passed a motion at its September 20 meeting requesting the CRD contribute $15,000 towards a feasibility study for the replacement of the Tsawout flapper gate.

The Central Saanich letter also stated that “the management of Island View Beach ditches resulted in (a) situation which did not adequately control and abate mosquito breeding in the engineered ditches within the Regional Park” and it tied the inflow and infiltration of sea water into the IVBRP ditch system to the condition of the Tsawout First Nation flapper gate.

As a result, staff recommended to the Regional Parks Committee that $15,000 be allocated to the District of Central Saanich towards the feasibility study and that staff undertake a study of the IVBRP drainage ditch system and share the results with Central Saanich and the Tsawout First Nation. The recommendation was approved at the November 10, 2021 CRD Board meeting.

The CRD subsequently made $15,000 of funding available to Central Saanich to apply towards the Tsawout First Nation flapper gate replacement feasibility study. Staff also proceeded to award a contract to GreatPacific Engineering & Environment (GreatPacific) to undertake the IVBRP drainage ditch study (Appendix A).

CRD staff identified that the purpose of the study was to characterize and assess the drainage ditch system and to provide advice on maintaining the system over the next 10 to 20 years to maintain its functionality, while also taking into account climate change and key park values.

The project timelines necessitated GreatPacific to complete a compressed field work program during April 2022. GreatPacific’s final report (June 30, 2022) recognizes that the collected data and observations provide a snapshot in time of park conditions. The report conclusions identify that there are opportunities to improve the ditch network to reduce standing water and drainage; that the Central Saanich tidal gate located in IVBRP does not consistently prevent seawater from

entering the ditching network; that regrading of specific areas of the ditching system would prevent some isolated ponding at low tides; and that some vegetation management would benefit accessibility and reduce restrictions within the ditching system. Additionally, it was noted that the adjacent Tsawout lands include some large inundated areas containing saline water and that some overland flow was observed between the two ditching systems during periods of high tides.

The GreatPacific report also noted that based on a time period over the next 20 years, sea level rise is predicted to be in the order of 0.15 m, which could pose an incremental reduction in the hydraulic performance of the drainage system under its existing configuration/size. Changes to the ditch system function and associated ditch maintenance have the potential to change the existing wetland ecology, including for species at risk. The report advises that the potential effects of future actions should be assessed and evaluated as part of the decision-making process.

IMPLICATIONS

Operational Implications

CRD staff have been implementing recommendations in the GreatPacific report as a part of the annual ditch maintenance activities (Appendix B). As of mid-July, 168 hours of staff time have been spent on removing logs, debris and vegetation blocking ditch sections, cutting back overhanging branches, and clearing one side of the ditches to increase access for mosquito control contractor staff. In August, staff will utilize heavy equipment to complete the ditch clearing activities. Completion of the 2022 ditch maintenance program will require a second round of vegetation management before the end of the growing season. It is estimated that over 300 hours of staff time will be spent on IVBRP ditch maintenance activities in 2022.

Duka Environmental Services (Duka) has prepared a summary document of the 2022 mosquito control program (Appendix C). The document includes a graphic portraying the total volumes of VectoBac applied annually for each of the partners between 2019 and 2021. The total volume of VectoBac required at IVBRP has ranged from 10 to 25% of the total treatments required for all three partner areas. The nuisance mosquito *Aedes dorsalis* develops in saltwater habitats, the predominant habitat of the Tsawout First Nation salt marsh. The majority of adult mosquitos collected at IVBRP and adjacent properties over the past several years has been *Aedes dorsalis*, but the predominant species of mosquito larvae collected at IVBRP is *Aedes sticticus*. The data indicates that based on the predominant habitat type and areal extent, the *Aedes dorsalis* mosquito primarily originates from the Tsawout salt marsh.

Intergovernmental Implications

The CRD prioritizes maintenance of good relationships with adjacent landowners. It regularly works with Central Saanich and the Tsawout First Nation to address nuisance mosquitos and to maintain the drainage ditch system. The CRD will collaborate with Central Saanich and the Tsawout First Nation to address priority action items in the GreatPacific report.

Alignment with Existing Plans & Strategies

IVBRP operates under a 1989 management plan that provides direction on maintaining the ditch system and the mosquito control program. A planning process was undertaken between 2011 and 2017 to update the 1989 management plan. During the management planning process, the CRD Board approved policy direction to monitor the effectiveness of the control program and the ditches in reducing mosquito habitat and to assess their impact on the coastal wetland habitat.

Financial Implications

Costs for the annual mosquito control program, contracted ditch monitoring/reporting activities and yearly ditch maintenance by staff and contractors is included in the CRD's Regional Park core budget. Costs for implementing any approved actions arising out of the GreatPacific drainage ditch study will be considered during annual budgeting and capital planning cycles.

Environmental & Climate Implications

IVBRP is home to several species at risk. These species have developed to exploit the characteristics of a dune ecosystem and natural coastal wetland. As inundation by saltwater has been reduced over the years by ditching and drainage, the ecosystem now supports freshwater wetland species. Any changes to the ditch system function and ongoing maintenance may affect ecosystem functions and associated species. An environmental assessment will be needed to fully understand the implications of any proposed changes.

CONCLUSION

In November 2021, the CRD Board approved a recommendation to provide $15,000 towards a feasibility study to replace the Tsawout First Nation flapper gate, to undertake a study of the IVBPR drainage ditch system and report back on it, and to share the results with the District of Central Saanich and the Tsawout First Nation. The CRD provided the requested funding to the District of Central Saanich for the feasibility study and staff contracted with GreatPacific to assess the IVBRP drainage ditch system. The GreatPacific report characterizes and assesses the ditch system and provides management advice for maintaining its functionality over the next 10 to 20 years. The report has been provided to the District of Central Saanich and Tsawout First Nation, and the CRD will work with these partners to address priority actions identified in the report. CRD staff will spend more than 300 hours at IVBRP in 2022 completing ditch maintenance activities.

RECOMMENDATION

There is no recommendation. This report is for information only.

Submitted by:	Mike MacIntyre, Manager, Planning & Development, Regional Parks
Concurrence:	Larisa Hutcheson, General Manager, Parks & Environmental Services
Concurrence:	Robert Lapham, MCIP, RPP, Chief Administrative Officer

ATTACHMENTS

Appendix A: GreatPacific Engineering & Environment – 2022 IVBRP Drainage Ditch Study
Appendix B: CRD Regional Parks – 2022 IVBRP Drainage Ditch Maintenance Activities
Appendix C: Duka Environmental Services – 2022 IVBRP Summary of Conditions

GREATPACIFIC
ENGINEERING & ENVIRONMENT

DRAINAGE DITCH ASSESSMENT

Island View Beach Regional Park

June 30, 2022

Prepared For:
Capital Region District
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Disclaimer

GreatPacific Consulting Ltd. (GPC) has prepared this Report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professional current practicing under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this Report. No other warranty and/or guarantee, whether expressed or implied is made, with respect to the Report, the Information, or any part thereof.

This Report has been prepared for the specific project and/or site, design objective, development and purposes described to GPC by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this Report and are not applicable to any other project or site location. GPC accepts no responsibility for any events or circumstances that may have occurred since the date on which the Report was prepared and, in the case of subsurface, marine, environmental or geotechnical conditions, is not responsible for any variability in such conditions, geographically or over time.

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Report Prepared By:

Brandon Powers, P.Eng. (ON)
Civil Engineer

Reviewed By,

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
J. R. CLARKE
39072
2022-07-18
Permit to Practice #1000737

Jason Clarke, P.Eng.
Director

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ENGINEERING & ENVIRONMENT

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Appendix

1 Introduction

GreatPacific Consulting Ltd. (GreatPacific) was retained by the Capital Region District (the CRD) to complete an assessment of the drainage infrastructure located at Island View Beach Regional Park (the Park; Figure 1) located in the District of Central Saanich in the Greater Victoria Area.

In addition to this drainage study, GreatPacific was also required to complete an assessment of the coastal berm located along the shoreline of the Park. The results of the berm assessment are detailed under separate cover entitled *Coastal Berm Assessment– Island View Beach Regional Park* (GreatPacific, May 2022). It is noted that facets of the drainage network and the coastal berm are interrelated, and the reader is directed to both reports for a fuller understanding of the infrastructure assessment completed by GreatPacific.

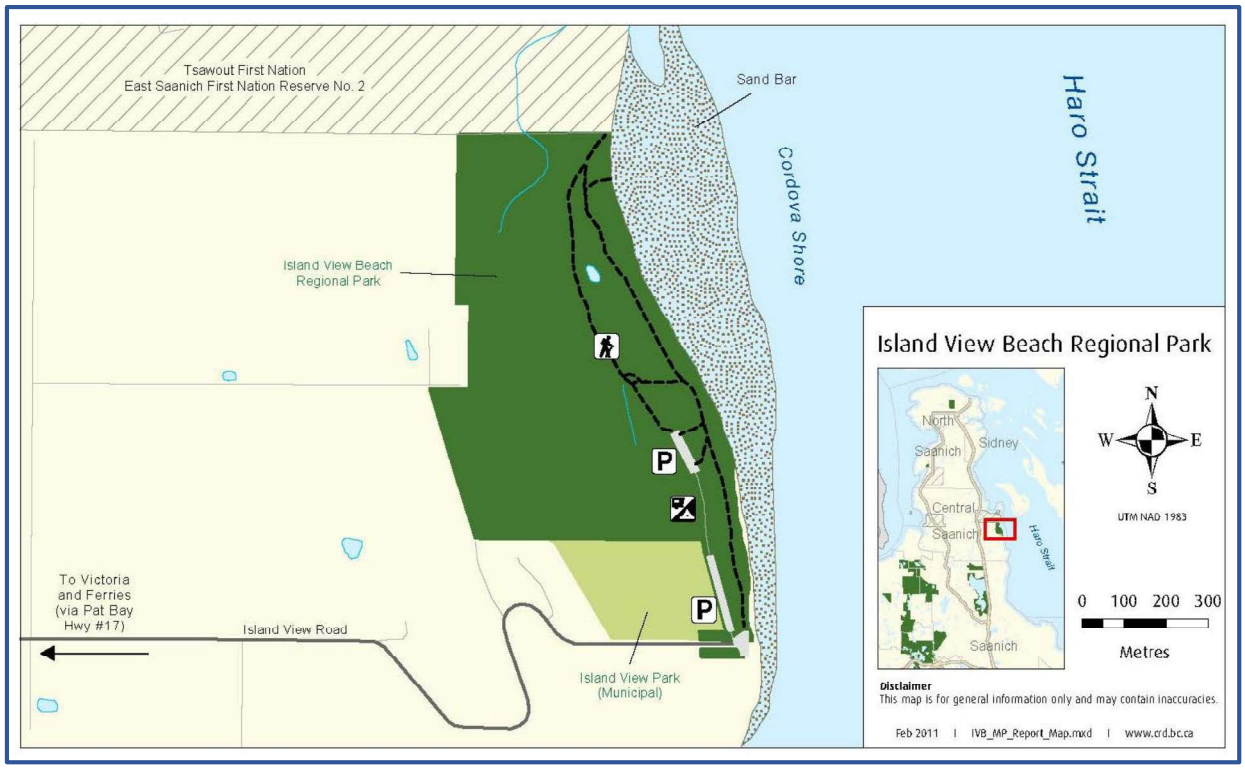


Figure 1 Island View Beach Regional Park – Context Map

2 Background

The Park is a well utilized public recreational area administered and operated by the CRD which also contains of a variety of ecologically valuable spaces, and a series of trails in addition to other Park amenities such as a campground, picnic areas, and marine shoreline.

The Park is a low lying area, partially protected from coastal flooding by an elevated coastal berm. The park also contains a series of drainage ditches intended to drain the Park lands through a tidal gate structure located in the berm. Offshore of the tidal gate, the drainage network discharges through a culvert and second tidal gate at the culvert terminus to the marine environment of Haro Strait.

The ditching system is understood to have been completed circa 1930's, although earlier ditching systems existed in the area including ditching within the adjacent Tsawout First Nation (Tsawout) (refer to Appendix A for air photo circa 1920's showing ditching on Tsawout Lands.). The modern adjacent Tsawout ditching system is not directly connected to the Park's ditching system, and is intended to convey water from the Tsawout lands northward to the marine environment through another tidal gate.

An ongoing issue in the vicinity of the Park has been nuisance mosquitos. A mosquito management plan is implemented within the Park to attempt to manage these insects. Known to thrive in areas of stagnant water, large numbers of mosquitos may be indicative of drainage issues.

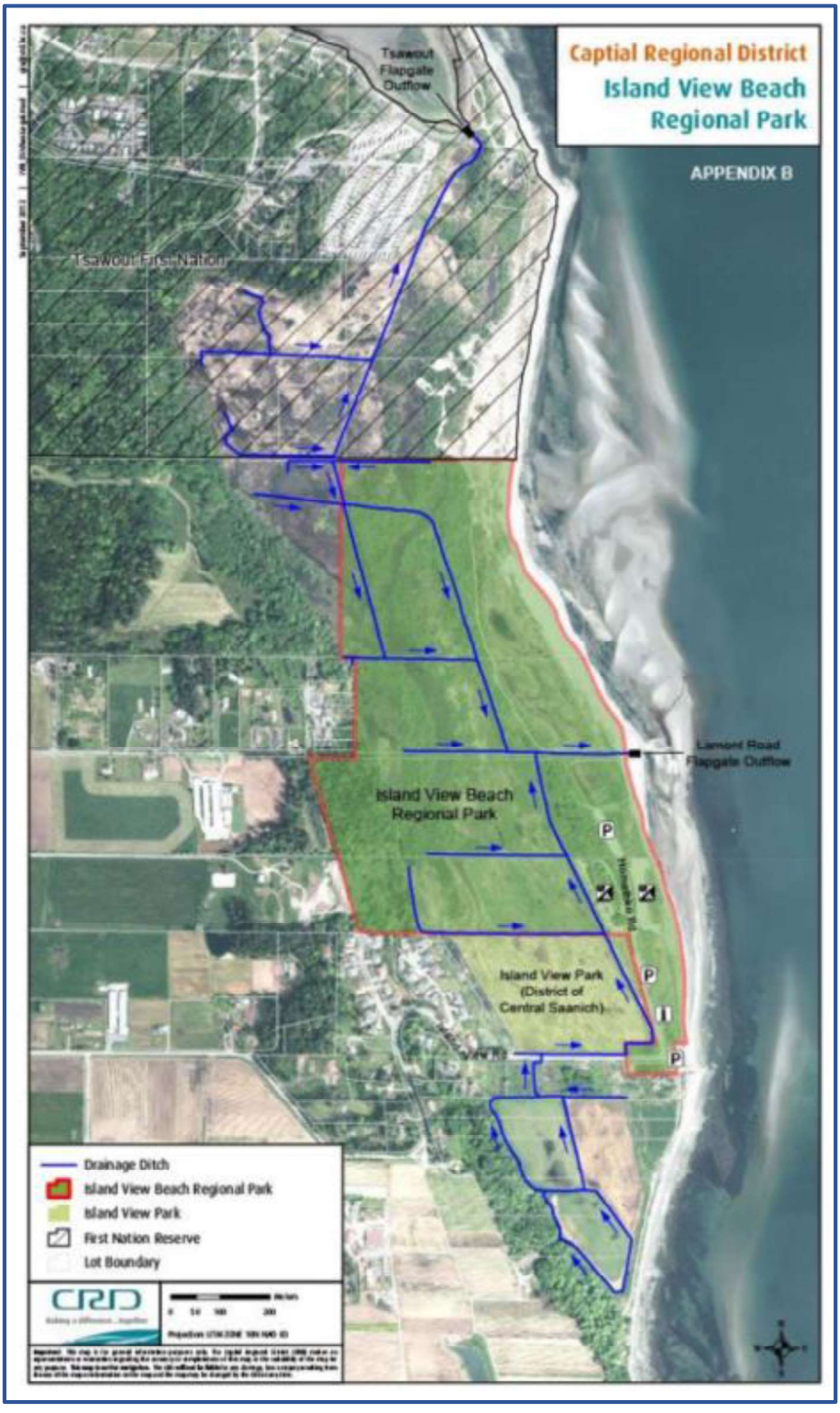


Figure 2 Island View Beach Regional Park – General Configuration of Ditch Drainage System

3 Study Purpose

This study was focussed on the ditch drainage system, of which the following objectives were established:

1. To characterize the drainage system and the key components influencing its functionality (e.g. hydrological, biophysical, structural).
2. Complete a condition assessment and identify factors that could affect future performance
3. Provide advice for maintaining the system for its intended purpose of adequate drainage and flood prevention over the next 10 to 20 years
4. Consider a variety of factors as part of the overall assessment such as government regulatory directives, CRD's sustainable service delivery model, ecological function, climate change, reduction of nuisance mosquitos, park visitor user experience, and relationships with adjacent land owners.

4 Previous Studies

There have been several previous studies directed towards understanding various aspects of the ecological and hydrotechnical characteristics of the Park. This study is intended to supplement previous work, and to provide an updated assessment of the drainage conditions.

A multitude of historical information was reviewed as part of this study. Some of the most pertinent previously completed studies are listed below:

- Hydrologic and Hydrogeologic Site Assessment (Lowen Hydrogeology Consulting Ltd., March 2012)
- Island View Ditch System – CRD Parks Lands (Aquatex Scientific Consulting Ltd., Feb 22, 2013)
- Island View Beach Ditch Maintenance– CRD Parks Lands (Aquatex Scientific Consulting Ltd., Apr 25, 2013)
- Island View Beach Ditch Maintenance– CRD Parks Lands (Aquatex Scientific Consulting Ltd., June 7, 2018)
- Hydrology Characterization of Island View Beach Saltmarsh (Camosun College 208B Project Report, Spring 2013)
- Island View Beach Regional Park Site Visit and Coastal Berm Review (Golder Associates Ltd., January 2013)

The above reports contained useful information and data relating to the hydrotechnical characteristics of the Park. Data and information from the above reports supplemented additional site information collected directly by GreatPacific.

5 Field Investigation Scope

A field investigation was completed to gather pertinent information and data which informed the drainage assessment. Tasks included:

- Topographic survey of the ditch elevations;
- Drilling of shallow monitoring wells in select locations to monitor groundwater water levels;
- Monitoring of water levels within the ditch network to evaluate ditch water elevation levels to tide levels;
- Salinity measurements within the ditch network, at other surface water areas in the Park, and at groundwater monitoring wells;
- Visual inspection of drainage conditions and categorization of observed deficiencies.

Due to the condensed nature of the timeline for this project, field work was completed on an expedited basis, resulting in data being collected over a timeline of a just a few weeks. It is common for these studies to incorporate a substantially longer period of field data collection to further qualify and quantify the hydrotechnical regime of these lands. Of particular value would be the collection of data capturing seasonally variant weather and precipitation conditions in combination with the range of tidal cycles.

6 Results and Discussion

6.1.1 Drainage Survey

6.1.1.1 Ditch System

A topographic survey of accessible areas of the ditch system was completed utilizing a Real-Time Kinematic (RTK) survey instrument on April 22, 2022. The collected data from this survey was supplemented by topographic data previously collected by Andy Blaine Consulting (2011) provided by the CRD.

Based on the topographic survey collected by GreatPacific, there were several areas of poorly graded ditch, where invert/ center of ditch elevations did not exhibit a positive downhill grade towards the outlet.[1] As a result; when downstream sections of the ditch are fully drained, upstream segments would be left with isolated sections of ponded water. These sections would be unable to drain via surface runoff, and would either remain stagnant, or would infiltrate into the underlying substrates. Evaluation of infiltrative capacity within the ditch cross section exceeded the scope of this program. The extent of the surveyed ditches, and profiles of each ditch are presented in Drawings C000 to C002 (Appendix 1).

It was noted that the ditching system was frequently inundated. The main channel (Ditch 5) was inundated at all observed times during the field investigation, which occurred during a time period which was generally absent of significant periods of precipitation. Photos within Appendix 2 illustrate observed conditions.

[1] It is noted that while evaluation based on surveyed inverts provides appropriate insight into ditch conveyance, better accuracy and qualification of flow capacity would be ascertained were the ditch to be surveyed/ evaluated in the dry, which is not currently feasible due to the inflow of tidal waters spoken to in other sections of this report.

Reverse flow (i.e., downstream to upstream, or east to west), was observed during rising tide conditions in the main channel. Flow was directly observed to be entering the ditch from offshore, presumably through the Park's tidal gate structure, which resulted in tidal waters entering the ditch from offshore. Access to the tidal gate for visual inspection could not be arranged during the short duration of this study.

Overgrowth in and around the ditch prevented access to the ditching system in multiple areas, and as such, these areas were unable to be evaluated. Also, in many areas, vegetation and debris within the flow channel was observed to presents an impedance to ditch hydraulics. Areas of substantial overgrowth precluding assessment are summarized in Drawing C000 (Appendix 1)) and within the site photos (Appendix 2).

It is also noteworthy that certain areas of the ditching system contained substantial quantities of sediments, silts, etc. This was most significant in the ditching networks at the southern extremity of the Park.

6.1.1.2 Other Park Lands

During field operations, it was noted that multiple areas of the Park were inundated and did not demonstrate positive drainage connectivity to the ditch system. Some of these areas consisted of substantial surface water area. Poor surface water drainage connectivity from these ponded areas to the drainage ditches may contribute to these areas acting as stagnation ponds suitable for certain mosquito breeding. Refer to Appendix B for photos of these conditions.

Ultimately these areas may be able to drain through the underlying ground substrates and into the drainage ditching system under proper drainage conditions. This is further discussed in Section 6.1.2

6.1.1.3 External Lands

Although outside of the scope of this project, it was noted that hydraulic linkages exist to adjacent properties which impact the overall water regime and characteristics of the Park.

At the northwest of the property, the Park's ditch system conveys water through private property in an area colloquially known as "Puckle Farm". It is noted that this is a low-lying area which appears to have substantial standing water for extended periods of time (evidenced by historic imagery).

Additionally, and perhaps more significantly, is the interconnection of water systems between the Park and the adjacent Tsawout lands. Although it was understood that there is no direct connectivity (i.e., open ditches) between the Tsawout and Park ditching systems, overland flow was observed during the field program from the inundated Tsawout lands (adjacent to the Tsawout ditch) into the Park's ditches at the northern Park boundary (Refer to Photo 23 in Appendix 2). The areal extent of the Tsawout lands draining towards the Park was not evaluated.

It was also understood that the current tidal gate structure at the mouth of the Tsawout ditch network was in a state of malfunction, allowing the Tsawout ditches to flood with seawater. Field observations indicated that during high tide conditions, the Tsawout Nation ditches overtop, flooding adjacent lands,

and spilling over into the Park lands. Groundwater flow pathways may also exist between the flooded lands / ditches on Tsawout lands and the adjacent CRD ditches. High salinity measurements in the ditches near the boundary of the Park and Tsawout lands also indicated hydraulic connectivity of the Tsawout lands and Park ditches (discussed in Section 6.1.3), and seawater intrusion.

6.1.2 Groundwater and Surface Water Level Monitoring

Water levels in select locations for both groundwater and surface waters of the ditch system were monitored utilizing level loggers (Hobo Loggers U20-001-04-02/ U20-001-01-07) placed within perforated monitoring wells. One monitoring well was placed immediately upstream of the CRD tidal gate chamber in the coastal berm (maintained by Central Saanich), and seven groundwater monitoring wells were installed throughout the Park. An onsite logger of atmospheric pressure was installed to provide for barometric correction of all installed level loggers. shows the locations of monitoring equipment. shows the observed variation in water level elevation and corresponding tide heights, both relative to geodetic datum (CGVD28) [2].

[2] It is noted that the precise correlation between Geodetic (CGVD28) and local Chart Datum at this location is unknown. For practical purposes, tidal data evaluated within this report is taken from the Sidney tidal predications. (Sidney (07260) (tides.gc.ca)). In Sidney, the conversation from Geodetic to Chart datum is +2.129 based on Benchmark 16-198: 53C9501, which is located approximately 8 km from the Park's ditch outlet.

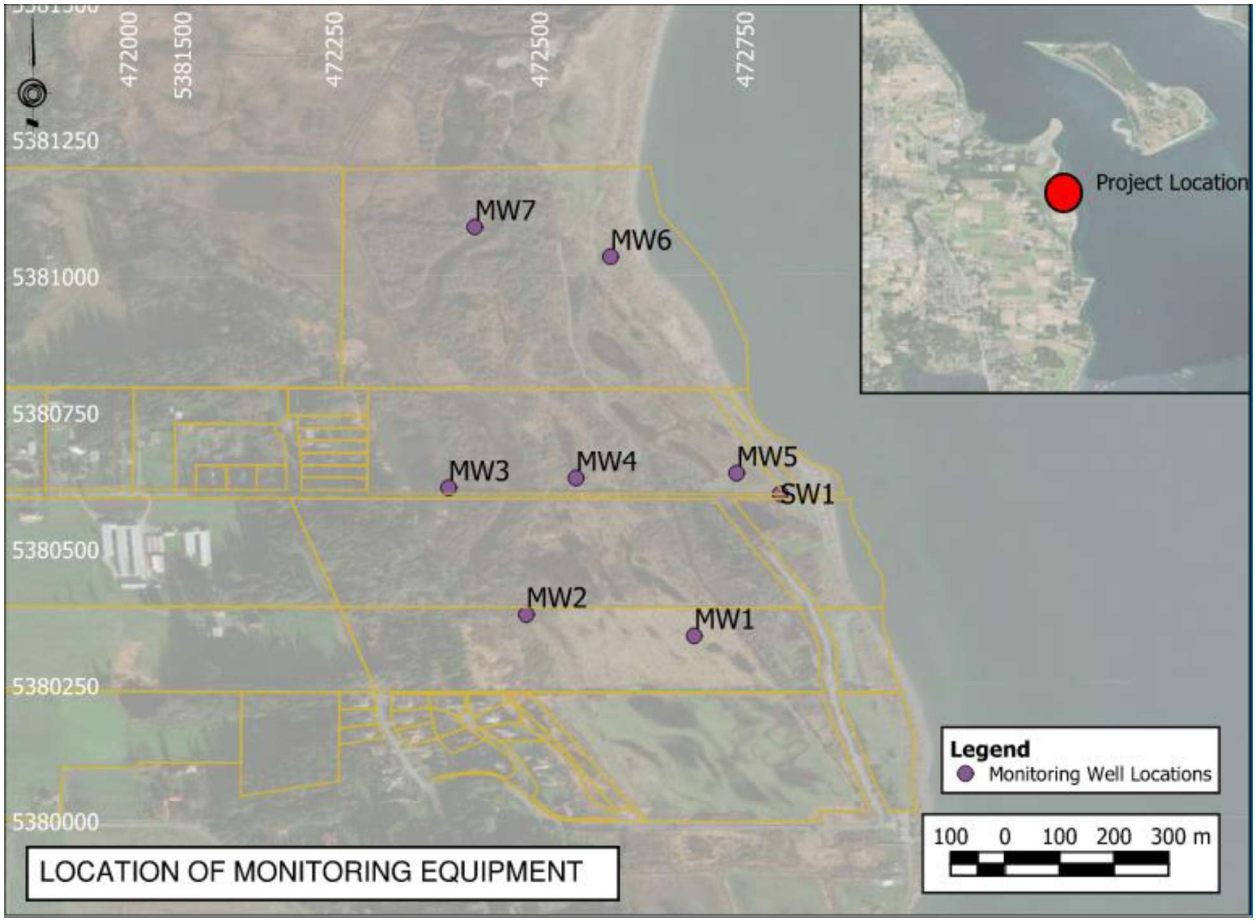


Figure 3 Location of Monitoring Equipment

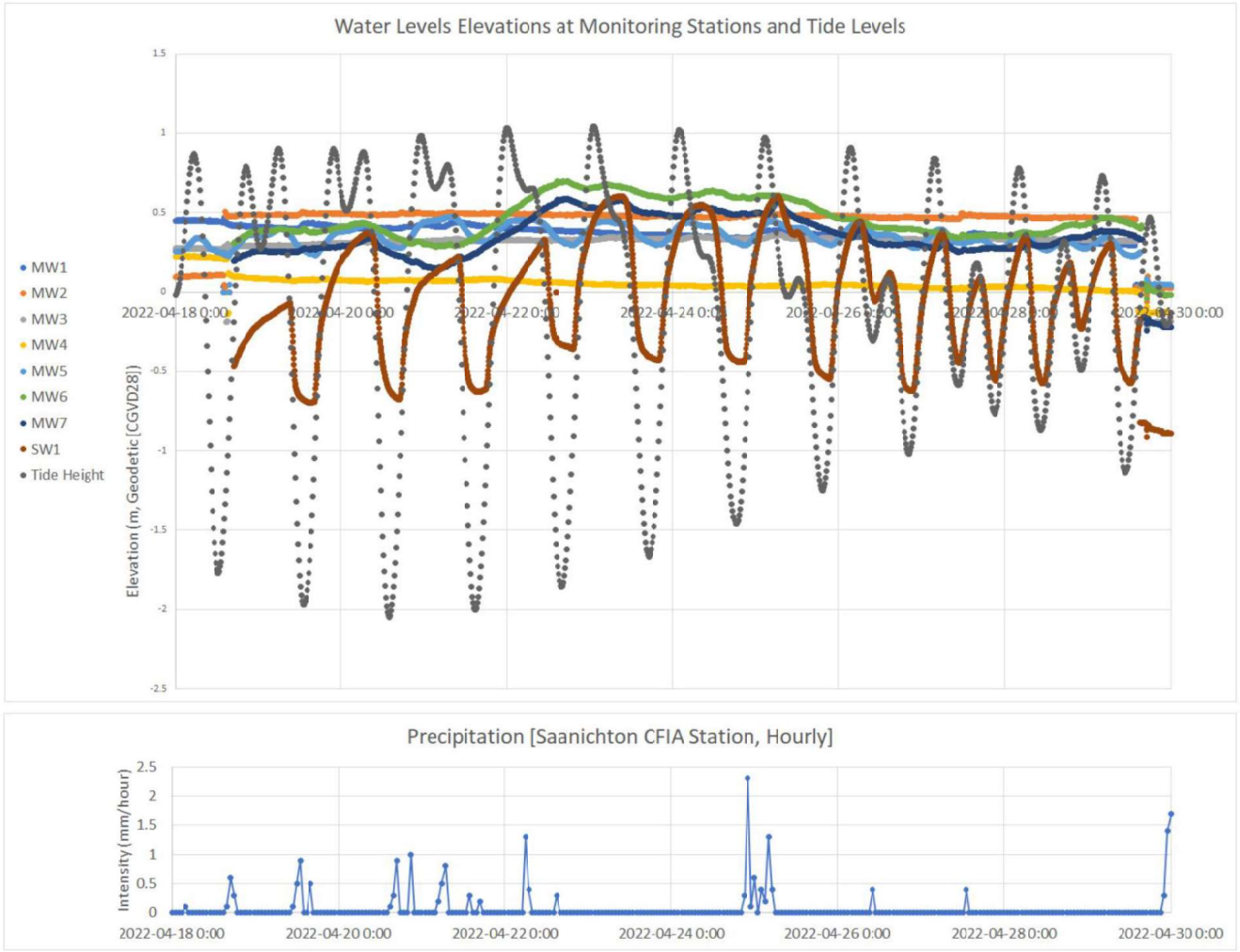


Figure 4 Observed Water Level Elevations at Monitoring Points

Surface Water:

The level logger SW1 monitored water levels in the ditch near the Park's tidal gate between April 18, 2022 and April 29, 2022. It was noted that the levels within the ditch varied in a diurnal pattern, corresponding to the daily tidal pattern. The daily fluctuation of ditch level reached as high as 110 cm crest-to-trough over a single tide cycle. Salinity levels confirmed that the rising water levels were caused by ingress of seawater and not fresh water accumulating behind a closed gate (See section 6.1.3). This water level variation and corresponding salinity suggests that the water levels in the ditch are in direct response to the tide gate allowing the ingress of seawater into the ditch system. During the monitoring period, GreatPacific field staff observed and documented discernable flow moving upstream from the outfall culvert inland into the ditch system during a rising tide.

The maximum elevation of water at SW1 (the surface water monitoring well near the outlet through the coastal berm) was approximately 0.51 m geodetic, which occurred shortly after a tide height of 1.04 m geodetic (3.16 Chart Datum). The peak water level within the ditch was lower than the peak tide level suggesting that the tidal gate/ outfall culvert partially restricts ingress of seawater, while still allowing large quantities through. Also notable is that when observing the geodetic elevations of water level at SW1 is that the troughs of the logged data do not return to the same elevation over the course of the study period. This suggested that the ditching is unable, in some cases, to fully drain the accumulated water over the course of a tide cycle.

The highest observed ditch water level (0.51 m geodetic) was higher than some of the surveyed top of bank elevations of the ditching. Assuming the water level was reached throughout the ditching system, it is possible that ditch banks in some areas may be overtopped as a result of seawater ingress, although this was not directly observed in the field. The highest tides occur during the summer and winter solstices and tides could be as much as 0.4 m higher than tides experienced during the monitoring period (excluding storm surge and based on a Large Tide Higher High Water level of 3.5 m CD, or 1.4 m geodetic). Accordingly, higher tides could further impede drainage resulting in transient overtopping of the upstream ditches.

Groundwater:

Based on visual interpretation of the measurements presented in , groundwater level monitors installed throughout the Park indicated variable levels of correlation between groundwater levels and tide levels. MW5 and MW 7 experienced the highest correlation of tidal influence. MW1, MW2 and MW4 demonstrated little to no correlation, while MW3 and MW6 demonstrated more moderated influence from tidal cycles.

Of note was the correlation between MW7 and SW1. MW7 was placed very near to Ditch 10, and the rising of MW7 in congruence (both in time and peak height) with the rising of SW1 peaks indicated that the groundwater level was affected by the rising water of the ditch system, and as such, seawater ingress was occurring in further upstream reaches of the ditches.

Overall groundwater levels from the monitoring wells were observed to be higher than the ditch bottom elevations across most of the ditching system. This suggested that the groundwater in the vicinity of the ditching will gradually discharge into the ditches when the ditch water level is lower than the nearby groundwater level. The zone of effective influence of the ditching (i.e. the areal extent of adjacent groundwater that the ditches are able to influence) is dependant on multiple factors including the hydraulic conductivity/transmissivity of the substrate material, determination of which was beyond the scope of this investigation.

The process of groundwater draining into the ditching system may play an important role in the reduction of standing water in areas without direct surface connectivity to the ditching system. When the water surface elevation in the ditch is below groundwater level, groundwater may discharge into the ditch, allowing overlying ponded surface water to infiltrate into the substrates. If the water levels in the ditch are too full due to segments of the ditch filling with seawater, this may prevent the discharge of groundwater to the ditches, and in turn preclude infiltration of ponded surface water into the substrates.

6.1.3 Groundwater and Surface Water Salinity

Salinity measurements of groundwater and surface water were conducted at select locations throughout the Park. These measurements were collected in-situ using a multi-sensor Pro DSS YSI Sonde throughout the ditch system, at the installed groundwater monitoring wells, and at select additional locations where surface water expressions were evident, and where additional shallow boreholes were cored to groundwater. Salinity readings for surface water and groundwater is presented in Figure 3 below. In summary, the following observations were found:

- For context, the salinity of nearby ambient seawater was measured to be 29.85 Sal/ PSU
- Salinity measurements within the ditch system ranged from 0.22 SAL/PSU to 29.49 SAL/PSU**.**
- With the exception of SW1 on rising tide**,** the ditch water salinity was highest in the northwest of the Park (close to Tsawout lands), and decreased towards the south.[4]
- Surface water salinity in offline ponding (i.e., surface water not part of the ditches) was substantially lower than the salinity within the ditches. Salinity in “non-ditch” surface water ranged from 0.15 to 0.64 SAL/PSU.
- Groundwater salinity ranged from 0.5 to 11.06. The highest value of 11.06 SAL/PSU was a significant deviation from the mean (2.6 SAL/PSU across 13 measurements), and was located in the northwest of the Park (near Tsawout lands).
- High salinity water (in excess of 20 SAL/PSU) was found within the Tsawout ditches and inundated areas on the Tsawout lands at the Park boundary.

[4] Salinity measurements within a ditch were taken on rising tides on April 29th (15:30, ~0.0 m tide height [Geodetic]), and May 3rd (15:30 to 16:40, ~-1.1 m to -0.7 m tide height [Geodetic]). Only one ditch salinity reading was taken on April 29th, at the surface water monitoring station SW1, which produced a reading of 29.49 SAL/PSU. A subsequent reading in the ditch near this location provided a reading of 4.45 SAL/PSU. It is believed that is effect may be due to tide levels at which measurements were taken, or that salt wedging may have played a factor.

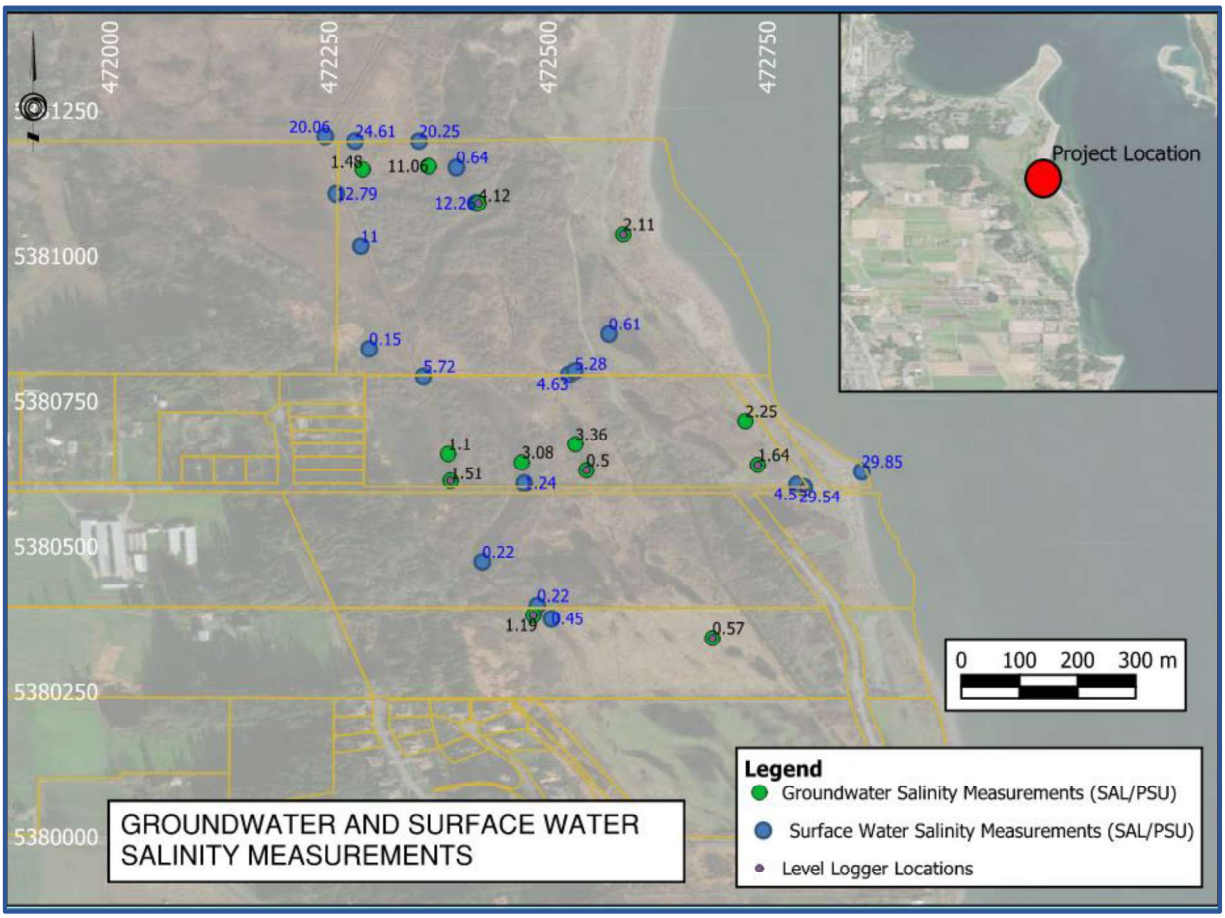


Figure 5 Salinity Measurements of Groundwater and Surface Water

The saline water encountered within the ditching system, generally exceeded groundwater and other disconnected surface ponding, suggesting that marine-origin saline water is entering the ditches. The higher salinity waters recorded within the northwest indicated that in addition to the observed ingress of seawater into the ditching from the malfunctioning tide gate at Island View Beach, seawater ingress is also occurring from the Tsawout ditching network, and adjacent Tsawout flooded lands. These observations were supplemented by field observations of active drainage from the inundated Tsawout lands into the Park ditch during the field program.

The overall observations (high salinity groundwater and surface water in the north of the site, with decreasing salinity trending southwards) correlated with data previously collected in the 2013 Camosun College Study; "*Hydrology Characterization of Island View Beach Saltmarsh"*. The Camosun study by others did not observe as high salinity water near the Central Saanich Tidal Gate during flood tide/high tide conditions, however a minor increase in salinity was observed near this tide gate under the high

tide condition. This suggested that the CRD tidal gate may have functioned more effectively at the time of the 2013 data collection.

It is important to consider the density difference between fresh water and sea water. Not only is sea water more salty, it is heavier than fresh water. This is important because when seawater is introduced into fresh water, it sinks and will settle into the lowest depressions. For example, if seawater is allowed to flood inland, it may do so very quickly, within a few hours during one tide cycle. When the tide drops and allows water to drain seaward, the upper layer of waters in the ditches is what is transported most effectively. Since fresh water "floats" over seawater, assuming no significant mixing, the upper layer of fresh water may drain out, but the deeper saline water may remain inland. It may take weeks or months to mix and drain saline water from just one short term sea water flood event. Later in the summer, when fresh water runoff dries up, what may be left behind in the low lying depressions is the deeper, saline water. This is the type of water tolerated by salt water mosquitos.

7 Ecological Context

The intention of this report has not been to provide a detailed ecological investigation of the ecosystems and interactions in this area, rather, the focus of this report is on drainage. Notwithstanding this, it is recognized that the drainage regime could have significant effects to the ecological systems within the Park. The subsections below provide an ecological context for drainage management.

7.1 Geomorphic Setting

Golder provided a geomorphic setting of the park in their 2013 report to CRD (Golder 2013). In summary, the park is situated on the western shore of Haro Straight. The shoreline of the park is part of a littoral system that transports sediments from eroding coastal bluffs south of the park, northward to Cordova Spit. Winds in Haro Strait are typically from the southeast in winter, which drives the transport of sands and gravels northward.

The natural shoreline formed from a balance of tidal water levels, waves and sediment supply. The position of the shoreline likely developed from a spit that was initiated near the source of the sediment supply (south of the park) and elongated northward as these sediments were dragged by wind and wave energies. As the spit advanced northward (to present location of Cordova Spit) it would have gradually enclosed a low lying area between the steeper upland slope and the shoreline, creating a wetland. The wetland would have been forced to drain further and further northward towards the tip of the spit.

Coastal dunes form behind the shoreline where wave transport of sands and gravels decreases and onshore wind transport of sand dominates. The accumulation of driftwood at the shoreline would have helped trap wind-blown sands on shore, enabling plants to establish and aiding in the dune formation.

7.2 General Habitat

Island View Beach Park is located within the Cordova Shore, a unique coastal landscape composed of rich intertidal and subtidal marine areas including a sandspit, dunes, eroding bluffs, coastal wetlands and rock outcrops. This area supports species at risk, as well as abundant marine bird and shellfish

populations. The Cordova Shore is part of the Sidney Channel Important Bird Area (IBA) and is recognized internationally for its diverse bird populations (Raincoast Applied Ecology, 2010).

Island View Beach is dominated by dune, coastal marsh and old field habitats (CRD, n.d (a)). The dune habitat dominates the foreshore at Island View Beach, however most of the park is low lying wetland and fields. Under the current drainage regime at Island View Beach most of the landscape is wet meadow habitat. Wet meadows occur on the land between shallow marshes and upland areas and often have high plant diversity (CRD, n.d.(a)).

7.3 Unique Biological Features

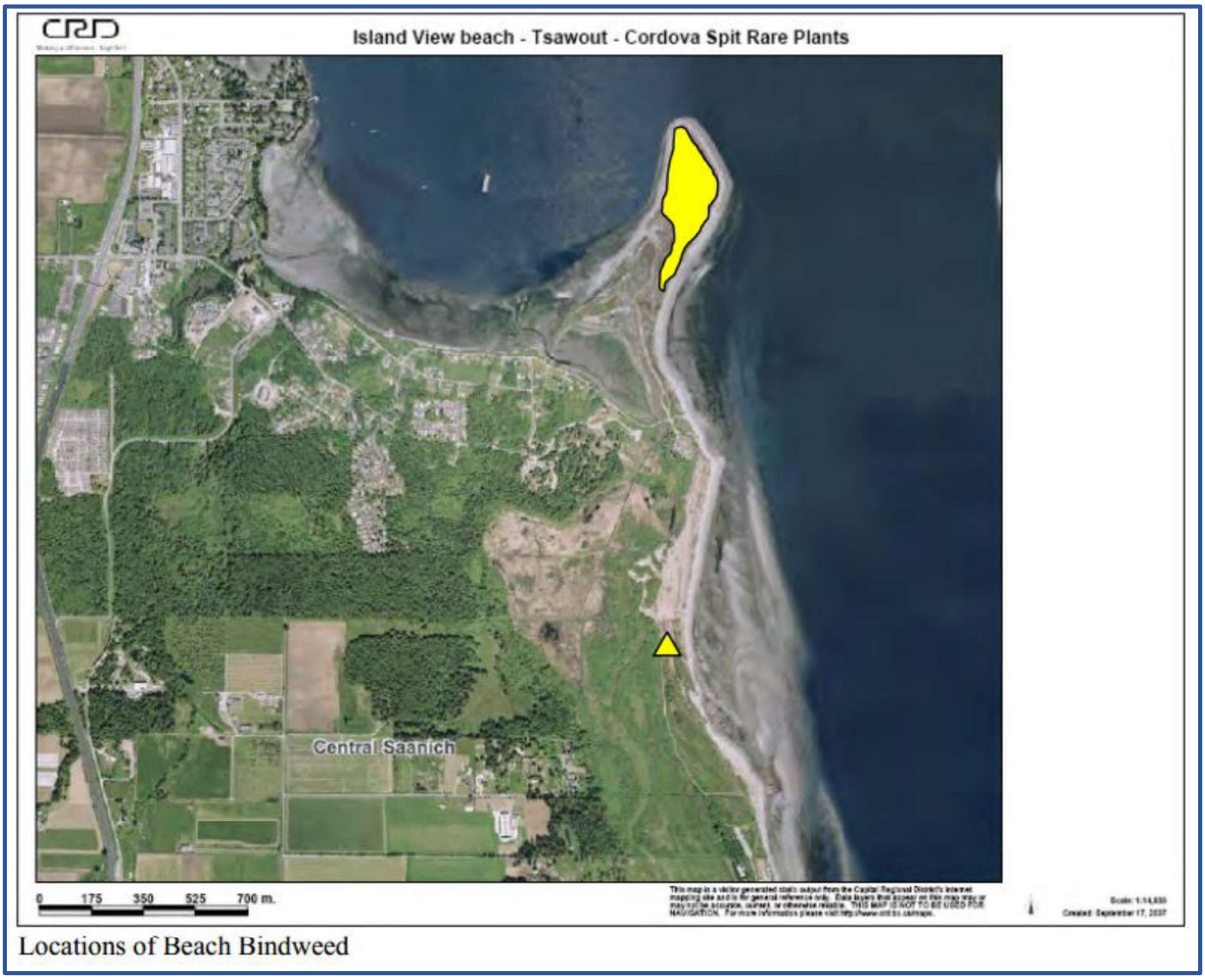
Island View Beach Park supports a complex of habitats that are in limited supply across the region. These habitats are important for rare species and species at risk, and a wide range of resident and migratory species (CRD, n.d. (b)). Species at risk documented at Island View Beach and surrounding areas are identified in Table 1.

Table 1 Species at Risk Confirmed within Island View Beach Park Boundaries and/or in Adjacent Habitat (current or historic).

Common Name	Scientific Name	Habitat Type	Provincial Status (CDC[1])	Federal Status (COSEWIC[2])
Plants				
Beach Bindweed	*Calystegia soldanella*	Coastal Sand	Blue	
Black Knotweed	*Polygonun paronychia*	Coastal Sand	Blue	
Contorted-pod Evening-primrose	*Camissonia contorta*	Coastal Sand	Red	Endangered
Yellow Sand-verbena	*Abronia latifolia*	Coastal Sand	Blue	
Invertebrates				
Common Ringlet	*Coenonympha tullia insulana*	Moist Meadow	Red	
Georgia Basin Bog Spider	*Gnaphosa Snohomish*	Wetland	Red	Special Concern
Sand-verbena Moth	*Copablepharonfuscum*	Coastal Sand	Red	Endangered
Western Branded Skipper	*Hesperia colorada oregonia*	Dry meadow	Red	Endangered
Birds				
Barn Swallow	*Hirundo rustica*	Generalist	Blue	Threatened
Common Nighthawk	*Chordeiles minor*	Coastal Sand	Yellow	Threatened
Great Blue Heron.	*Ardea herodias fannini*	Generalist	Blue	Special Concern
Short-eared Owl	*Asion flammeus*	Moist Meadow	Blue	Threatened
Other Vertebrates				
Red-legged Frog	*Rana aurora*	Wetland	Blue	Special Concern

Reference: BC CDC (2022), Raincoast Applied Ecology 2010.
1. CDC – British Columbia Conservation Data Center
2. COSEWIC – Committee on the Status of Endangered Wildlife in Canada

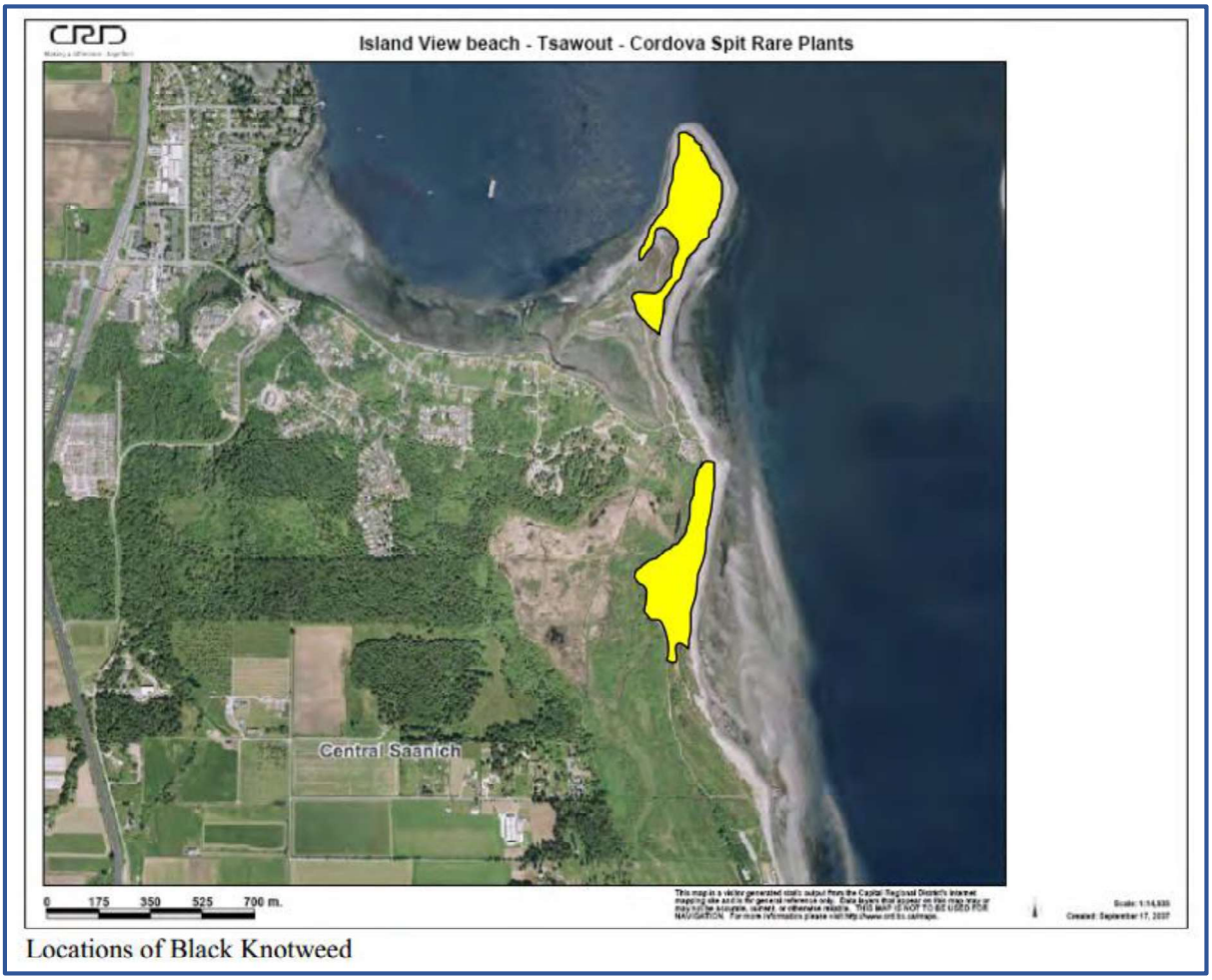
Beach bindweed (beach morning glory) is a sprawling, long-lived perennial plant found on sand beaches and dunes (Raincoast Applied Ecology, 2010). The documented locations of beach bindweed at Island View Beach are illustrated in Figure 6.



Locations of Beach Bindweed

Figure 6 Locations of Beach Bindweed at Island View Beach (Raincoast Applied Ecology, 2010)

Black knotweed (Polygonum paronychia): long-lived low shrub is a characteristic species in dunes both in Georgia Basin and west coast (Raincoast Applied Ecology, 2010). The documented locations of black knotweed at Island View Beach are illustrated in Figure 7.



Locations of Black Knotweed

Figure 7 Locations of Black Knotweed at Island View Beach (Raincoast Applied Ecology, 2010)

Contorted – pod evening -primrose (*Camissonia contorta*) is a plant found on open, dry, sandy sites. Within the Province it is restricted to seven small patches on the coastal sand dunes of Southern Vancouver Island and Savary Island. There is one small population of contorted pod evening primrose documented on Island View Beach (CRD, n.d.(c)). The location is illustrated in Figure 8.

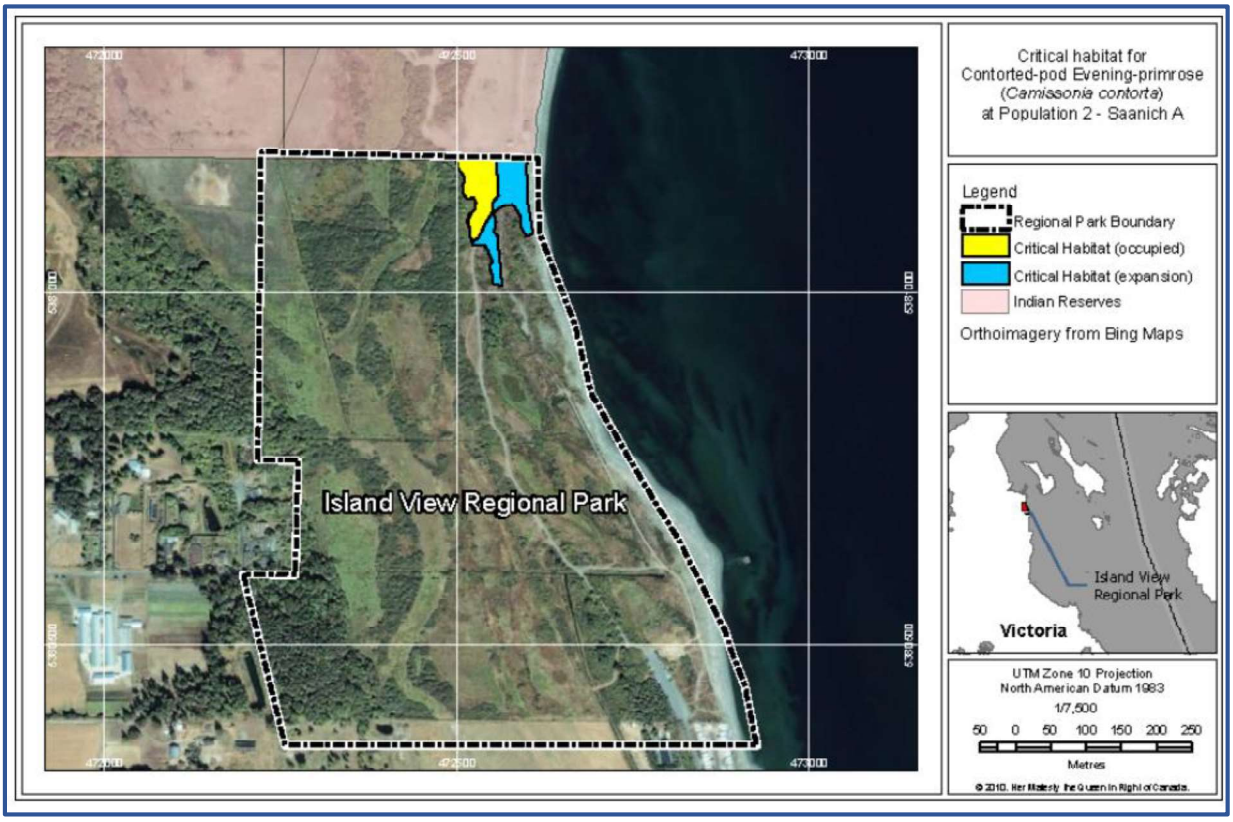
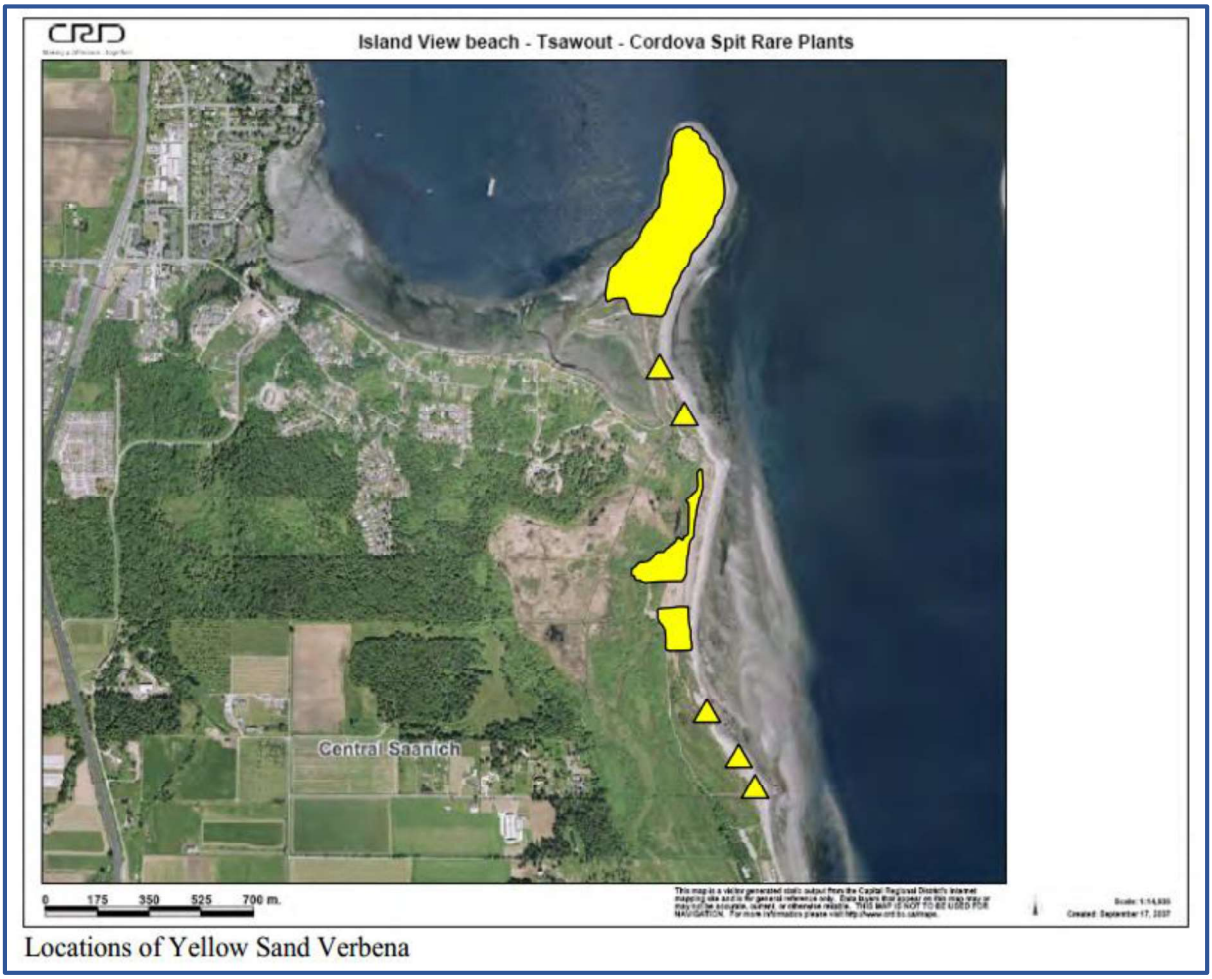


Figure 8 Locations of Contorted-pod Evening Primrose at Island View Beach (Parks Canada 2011)

Yellow sand verbena is a plant that is important for the survival of the sand-verbena moth. Only coastal sand features, such as dunes, beaches and spits along the Pacific Coast support this plant (CRD, n.d.(c)). The sand- verbena moth is dependent on the yellow sand verbena for several life stages. Adult moths feed on the nectar and lay eggs on the flowers (CRD, n.d.(c)). Documented locations of yellow sand verbena at Island View Beach are illustrated in Figure 9.



Locations of Yellow Sand Verbena

Figure 9 Locations of Yellow Sand Verbena at Island View Beach (Raincoast Applied Ecology, 2010)

Invertebrates, birds and other vertebrates identified in Table 1 were historically observed at Island View Beach or adjacent habitats (Raincoast Applied Ecology, 2010). These species are mobile and mapped locations have not been identified for Island View Beach.

7.4 Nuisance Mosquitos

Mosquitos can be a nuisance in that their bites are irritating, and they can transmit disease. Mosquitos also provide food sources for many birds, fish, amphibians and other species. To provide context for how drainage effects mosquito populations, two specialists in mosquito biology and management were contacted, Ms. Cheryl Phippen and Mr. Curtis Fediuk. There is also an Integrated Pest Management Plan for Central Saanich, CRD and Tsawout First Nation that is implemented for controlling mosquito populations (Duca 2021).

1. Over 10 different species of mosquitos have been found at Island View Beach due to the range of water salinities present. Salt water tolerant mosquitos are the most aggressive biters.

2. Mosquitos prefer stagnant, standing water, with no flow, and prefer water depths of less than 0.3 m (1 ft).
3. There were noticeable reductions in the need to deploy VectoBac® (because of fewer mosquito larvae) after ditch cleanings in 2011, 2017.
4. When woody debris was lodged in the Tsawout flag gate, the wetland was flooded to a greater degree and more VectoBac® was needed.
5. The salt tolerant mosquito *Aedes dorsalis* can lay eggs on moist soil near water, the eggs will remain viable for many years, triggered by a flood event to hatch.
6. The salt tolerant mosquito can tolerate salinities of full strength seawater.

The offline ponded waters within the Park during this field program were generally found to be non-saline.[5] Given this finding, these areas of fresh water may not be the worst offenders contributing to the issue of the most aggressive, salt tolerant, nuisance mosquitos.

Salinity measurements along the boundary of the inundated Tsawout lands indicated a large area of high salinity water, which may be well suited to the propagation of salt tolerant mosquitos. It is speculated that the flooded Tsawout lands may be a significant source of saline water and contributor to nuisance mosquitos, as evidenced by mosquito larvae counts and associated higher levels of VectoBac® that has been applied to that area by the mosquito management contractor (pers comm Fediuk 2022).

7.5 Linkages With Drainage

Drainage management is a multifaceted topic, which in some cases requires a balance of interests between different disciplines and stakeholders. Certain approaches which may be ecologically beneficial may have detrimental effects on other aspect. For example, the presence of vegetation within the channels may provide ecological benefits such as augmenting aquatic habitat, providing shade to reduce algae and grasses growth, and providing water quality improvements via sedimentation and filtration caused by slower flow. These ecological benefits may compromise efficient and effective drainage, leading to other unintended problems.

The specific unique biological features and associated plant species at risk described above are primarily associated with the coastal sand dune ecosystem along the shoreline. These locations are generally not located directly within the inland ditching system nor closely associated with inland wetland areas. Changes to the landscape of the park, including the drainage management may have the potential to affect the coastal sand dune ecosystem if interactions and linkages with the open ocean coastal processes along the foreshore are changed.

Prior to non-indigenous settlement, modification of the landscape (ditching, berming, farming) and creation of the park, inland areas may have functioned more dominantly as a coastal wetland rather

[5] The limitation of this observation needs to be recognized in that salinity measurements of offline pools were taken on a single day given the scope and compressed schedule of the field program. It is recognized that this provides a snapshot in time, which may not be representative of conditions across seasons, tide cycles or other temporally variable parameters.

than a freshwater wetland. Historic photos reported large inland areas having been inundated by high ocean water levels from combined tide and storm surge (Friends of Island View Beach 2022). A natural coastal wetland relies on episodic flooding by saltwater plus tidally induced variation in water levels to create the unique conditions suitable for coastal wetland flora and fauna (Golder 2013). Since the start of modifications to the landscape over a century ago, including the installation of drainage ditching, coastal wetland areas have likely been primarily converted to freshwater wetlands and or non flooded ground. In consideration of species at risk that are associated with the present day wetland habitats, namely the northern red-legged frog and the Georgia basin bog spider, neither species was reported to be tolerant of saline conditions (Environment Canada 2016; Environment and Climate Change Canada 2021); therefore seawater intrusion inland, into the existing wetland habitats, potentially poses a threat to these species.

Changes to the ditch system function and associated ditch maintenance activities (e.g. new, reduced or increased maintenance practices) have the potential to change the existing species assemblage that presently occupy the park area. To fully understand the implications of proposed actions, an assessment of potential environmental effects should be conducted.

8 Climate Change Sea Level Rise and Seismic Events

The Park will be affected by climate change, and in particular sea level rise given that some inland areas are below present day high water sea levels. Over the next 20 years, relative sea level rise was estimated to be 0.15 m (AECOM 2015) for the Victoria coastline, including Island View Beach. The future extreme high water sea levels for the Victoria coastline were estimated to be 3.25 m, 3.69 m, and 4.58 m GD for the years 2050, 2100 and 2200 respectively (AECOM 2015).

Seismic events can also affect the flood risk of upland areas. Earthquakes can cause liquefaction of ground substrates, causing subsidence of the ground, which if the shoreline, or portions of the shoreline of the Park suddenly drop as a result of a locally based earthquake, this could pose a flood risk to the Park. Also, tsunamis can be generated from earthquakes and can travel great distances, affecting areas several hundreds of km away. A report prepared for the CRD presented potential tsunami scenarios where Island View Beach Park lands could be inundated with 2 m to 4 m of water depth (Associated *et al* 2021).

As a long-term planning decision, the CRD in conjunction with its partners, will need to determine whether the management strategy will be to continue to attempt to protect this area from inundation, or to allow nature to run its course which may result in more frequent inundation of the Park lands and associated effects (eg. Alteration/elimination of habitats and species to those tolerant of higher salinities, greater numbers of salt tolerant mosquitos). Sea level rise is further discussed under separate cover within the coastal berm assessment completed by GreatPacific.

9 Summary Conclusions

Island View Beach Regional Park is host to a complex hydrodynamic system which has been investigated, in part, by other previous studies. The conclusions derived from this study of the drainage network include the following:

- The drainage network demonstrated deficiencies and there are opportunities for improvement to reduce standing water and improve drainage conveyance from the low-lying Park areas to the marine environment.
- The tide gate located within the coastal berm at Island View Beach was not functioning effectively to prevent substantial quantities of seawater from entering the ditching network.
- The grading of the ditch network was not positively sloped downhill from all upstream areas to the ditch's outfall. This condition will result in hydraulically isolated (ponded) areas of the ditch when downstream areas are drained. In the current condition (non-functional tide gate at Island View Beach), dependant on tide heights, certain (but not all) areas may be prevented from becoming hydraulically isolated due to the daily inflow and outflow of tidal water.
- The ditches exhibited substantial areas of vegetation overgrowth and debris extending into the channel, preventing accessibility, and resulting in restrictions to hydraulic ditch conveyance capacity.
- Adjacent to the site, on the Tsawout lands, is a large, inundated area containing saline water. The Park ditches had indirect connectivity to portions of these areas as observed by overland flow from the Tsawout Lands into the Park. Furthermore, the high salinity values of water in the Park's ditching immediately adjacent to the Tsawout lands corresponds to the high salinity values also observed within the Tsawout ditching.
- There were multiple areas of the Park (and external lands i.e. Puckle Farm) which do not exhibit positive drainage connectivity to the Park ditching system. It may be the case that these areas infiltrate into the substrates and eventually discharge into the Park's ditch system as groundwater when the ditch is in a low water state.
- Due to the heavier nature of seawater over freshwater, seawater intrusion inland will tend to occupy the lowest lying areas and may take a prolonged period of time to evacuate the salts. The saline waters are linked to the most aggressive biting mosquito species.
- Based on a time period over the next 20 years, sea level rise was predicted to be on the order of 0.15 m, which could pose an incremental reduction in hydraulic performance of the drainage system under its existing configuration/size.
- Changes to the ditch system function and associated ditch maintenance, whether it be new practices, increased frequency or reduced efforts or actions, have the potential to change the existing wetland ecology, including Species At Risk.

10 Management Advice

With the objective of maintaining the functionality of the drainage system to provide effective drainage of the Park lands, the following items are presented for consideration by the CRD, in conjunction with

their partners in drainage management for the Park (e.g. District of Central Saanich, Tsawout First Nation, other stakeholders). It is recognized that the responsibility for addressing drainage involves multiple organizations, and as such remedial actions would likely require communications amongst multiple interest groups. Also, new actions have the potential to affect the ecology within the park, and the potential effects of future actions should be assessed and evaluated. The items below are generally presented in a suggested order of priority.

1. Improve the effectiveness and reliability of the tidal gate at Island View Beach Park such that it precludes the ingress of seawater into the ditching system. To accomplish this, consideration of the following potential aspects should be given:
    a. A change to the type or frequency of routine maintenance activities may be needed
    b. The gate may be damaged and repairs to the gate may be needed
    c. There may be excessive debris transported downstream by the ditch system that is fouling the tidal gate and preventing it from sealing
    d. The style and/or installed configuration of the current tidal gate may have inherent issues and alternative devices should be considered.
2. Preclude ingress of seawater from the Tsawout lands into the Park ditches via the repair/ replacement of the Tsawout tidal gate.
3. Improve the conveyance of waters within the ditch and provide for access along the full ditch network to facilitate effective maintenance and to allow for future monitoring / assessment of the system. This could be achieved by removing dense overgrowth, vegetation and/or debris from within the conveyance area of the ditch, as well as areas along at one side of the ditch bank. This could likely be implemented in spot locations balanced with an objective of causing minimal disturbance and maintaining as much vegetation as practicable. A phased, incremental approach of addressing the most severely restricted areas first should also be considered.
4. If, subsequent to the above, unwanted ponding is occurring in hydraulically isolated areas of the ditching system, the ditch inverts could be reconditioned/regraded such that positive (downhill) conveyance is provided to the ditch outlet, such that reverse grades and/or unwanted ponding within the ditch is avoided.
5. In the event that large areas of unwanted surface water ponding (offline of the ditches) remain without direct connectivity to the ditching system, and there are adverse issues with these areas (e.g. high mosquito production), consider the installation of additional lateral ditches and/or a tile drainage system to drawdown standing surface water in these areas.

11 Potential Future Activities

Additional studies could be completed to further describe and document the water and drainage regime with greater precision. The following future activities are offered for consideration as they would lead to a more informed understanding of the factors affecting the park drainage infrastructure and ecology within the park. This is intended to be a list of options that could be completed as budgets allow.

1. Investigate technologies (alternatives to the existing tidal gate) for effectively preventing seawater intrusion into the ditching system and complete a more detailed assessment of the existing flap gate.
2. Collect drainage system data over an extended period of time to further qualify and quantify the hydrotechnical regime of these lands. Collect data to capture seasonally variant weather and precipitation conditions in combination with the range of tidal cycles.
3. Survey and evaluate the infiltrative capacity of the ditches to drain surface waters. Extend this study into the dry season to improve understanding of flow capacity.
4. Evaluate the areal extent of the Tsawout lands draining towards the park, hydraulic linkages, and seawater intrusion, and compare before and after results in relation to the condition of the tidal gate on Tsawout lands.
5. Monitor and evaluate the ingress of seawater through the Park tidal gate into the ditch system during a rising tide, and ability of ditching system to fully drain the accumulated water over the course of a tidal cycle. Compare before and after results in relation to the condition of the tidal gate/outfall culvert.
6. Monitor and evaluate if/how high tides may impede drainage resulting in transient overtopping of the upstream ditches.
7. Characterize the zone of effective influence of the ditching (i.e. the areal extent of adjacent groundwater that the ditches are able to influence), taking into account multiple factors including the hydraulic conductivity/transmissivity of the substrate material.
8. Collect data on salinity measurements in low-laying, non-draining ditch depressions to document whether seawater is trapped in these sections of ditches, and correlate to saltwater mosquito habitat.
9. Investigate if a correlation exists between the presence of *Aedes dorsalis* saltwater mosquitos and areas of high salinity measurements, particularly along the boundary of the inundated Tsawout lands and other areas near the Park tidal gate.
10. Undertake an environmental assessment to identify and evaluate the potential effects of a changed ditch management regime on Species at Risk identified in the park, and on current ecosystem function and species assemblages.

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Personal Communications:

Curtis Fediuk. 2022. President. Duca Environmental Services Ltd.

Cheryl Phippen, 2022. Field Coordinator. BWP Consulting Inc.

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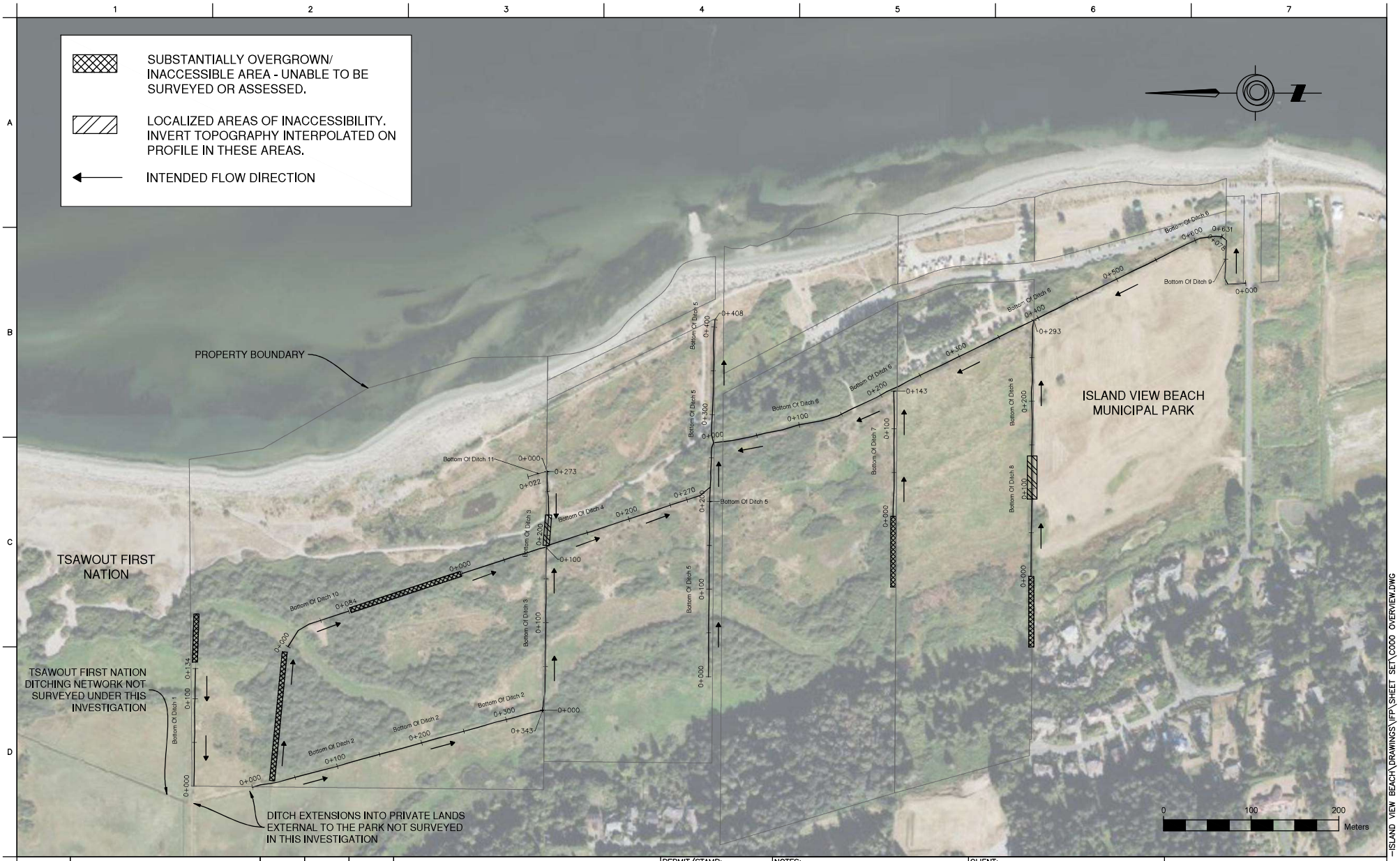
Appendix 1 Drawings C000 – C002



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22-05-13	PRELIMINARY	ECL		

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NOTES:
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2. ALL ELEVATIONS MEASURED IN METERS FROM GEODETIC (CGVD 28) DATUM.

CLIENT: CAPITAL REGIONAL DISTRICT

PROJECT NUMBER: 1039–004

ISLAND VIEW BEACH SURVEY DATA OVERVIEW

DRAWING NUMBER: C000

SCALE: 1:2000

REV: REVA

FILE: W:\1039-004-CRD -ISLAND VIEW BEACH\DRAWINGS\FPP\SHEET SET\C000 OVERVIEW.DWG

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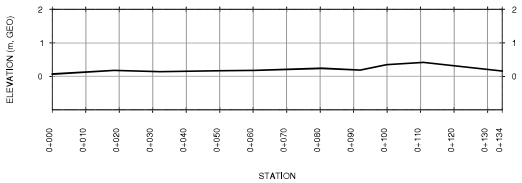

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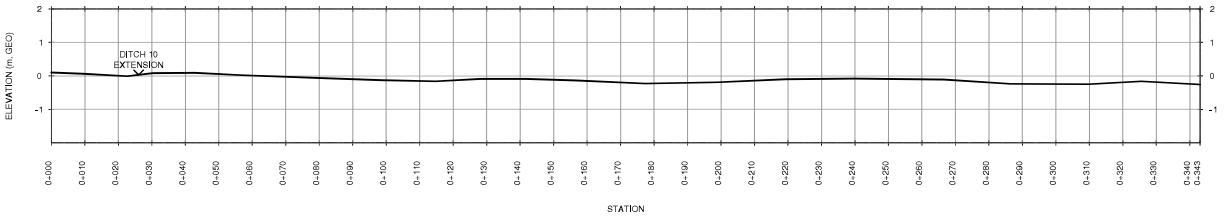

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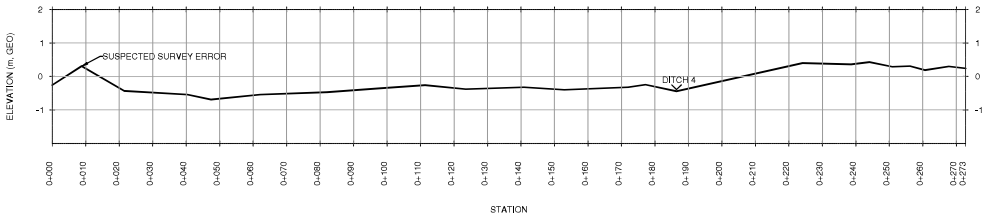

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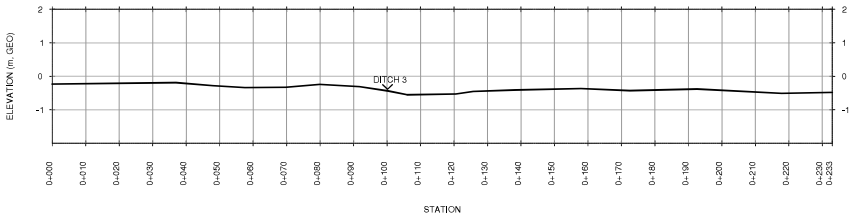

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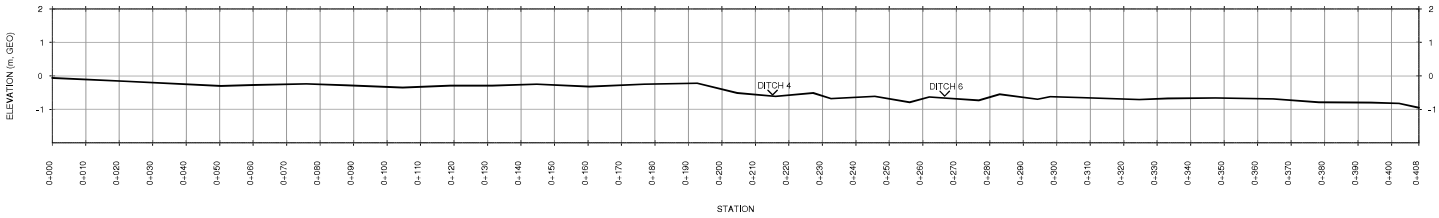

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2. ALL ELEVATIONS MEASURED IN METERS FROM GEODETIC (CGVD 28) DATUM.

CLIENT:
CAPITAL REGIONAL DISTRICT

PROJECT NUMBER: 1039–004

ISLAND VIEW BEACH
SURVEY DATA
PROFILE VIEWS 1

DRAWING NUMBER: C001

SCALE: 1:750, 10V:1H

REV: REVA

FILE: W:\1039-004-CRD -ISLAND VIEW BEACH\DRAWINGS\FP\SHEET SET\M001 PROFILE VIEWS 1.DWG

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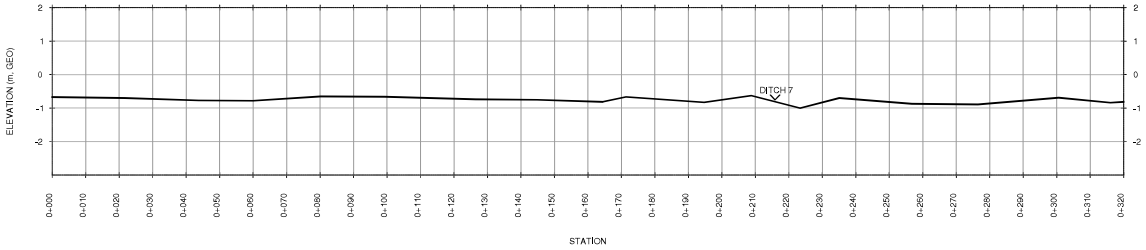

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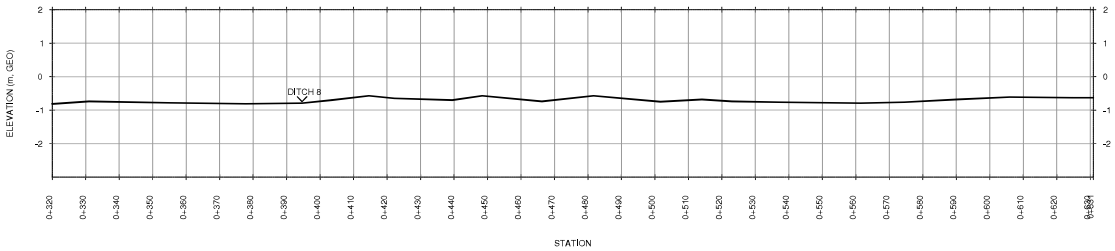

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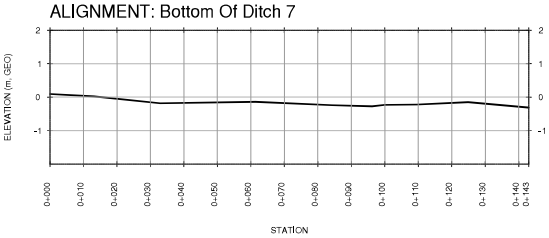

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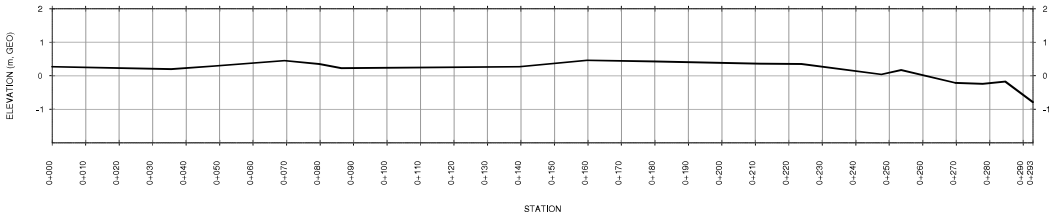

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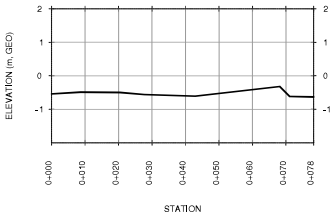
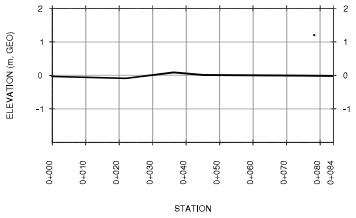


ALIGNMENT: Bottom Of Ditch 10



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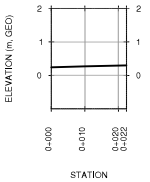

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2. ALL ELEVATIONS MEASURED IN METERS FROM GEODETIC (CGVD 28) DATUM.

CLIENT:
CAPITAL REGIONAL DISTRICT

ISLAND VIEW BEACH
SURVEY DATA – DITCHING SYSTEM
PROFILE VIEWS 2

DRAWING NUMBER: C002

PROJECT NUMBER: 1039–004

SCALE: 1:750, 10V:1H

REV: REVA

FILE: W:\1039-004-CRD -ISLAND VIEW BEACH\DRAWINGS\FP\SHEET SET\C002 PROFILE VIEWS 2.DWG

Appendix 2 Site Photos

Photo 1:

Description: Terminus of ditch network outfall. Outfall culvert terminates in an antiquated flap gate. Approximately 115 m upstream of this point, a separate tidal gate is understood to lie within a chamber in a coastal berm.

Photo 2:

Description: Inlet to storm culvert at coastal berm. Valve chamber is approximately 10 m downstream of this location.

A substantial quantity of debris is present on the inlet cage of this culvert (to approximately pipe springline) resulting in reduced hydraulic capacity.

During high/flood tide conditions, noticeable flow through the culvert from downstream to upstream (i.e. from the marine environment to upland) was observed

Photo taken on the rising limb of a low tide. Tide: ~0.55 m Chart Datum (CD)

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PROJECT NAME: IVBRP DRAINAGE ASSESSMENT	**ISLAND VIEW BEACH REGIONAL PARK**
PROJECT No. 1039-004 / PREPARED BY: BP	**DRAINAGE ASSESSMENT**
DATE: 2022-05-13 / REVIEWED BY: JC	**PHOTOS: 2022.04.14/18/22/28/30, 2022.05.03**
Photo 1 and 2	"This Figure is prepared solely for the use of our customer as specified in the accompanying report. GreatPacific Consulting Ltd. assumes no liability to any other party for any representations contained in this Figure."

Photo 3:

Description: Section of ditch line within Ditch Section 9.

Photo 4:

Description: Top of ditch bank along portion of Ditch Section 9. Top of bank is elevated above adjacent lands.

GREATPACIFIC ENGINEERING & ENVIRONMENT	CLIENT: CRD
PROJECT NAME: IVBRP DRAINAGE ASSESSMENT	**ISLAND VIEW BEACH REGIONAL PARK**
PROJECT No. 1039-004 / PREPARED BY: BP	**DRAINAGE ASSESSMENT**
DATE: 2022-05-13 / REVIEWED BY: JC	**PHOTOS: 2022.04.14/18/22/28/30, 2022.05.03**
Photo 3 and 4	

Photo 5:

Description: View of Section 8 ditch, demonstrating generally shallow/ poorly defined swale with vegetated grasses within depression.

Photo 6:

Description: Ponded water in an up-stream segment of Section 8 ditching.

GREATPACIFIC ENGINEERING & ENVIRONMENT	CLIENT: CRD
PROJECT NAME: IVBRP DRAINAGE ASSESSMENT	**ISLAND VIEW BEACH REGIONAL PARK**
PROJECT No. 1039-004 / PREPARED BY: BP	**DRAINAGE ASSESSMENT**
DATE: 2022-05-13 / REVIEWED BY: JC	**PHOTOS: 2022.04.14/18/22/28/30, 2022.05.03**
Photo 5 and 6	

Photo 7:

Description: Overgrowth of vegetation in along Section 5 ditch. Ponded water visible in foreground.

Photo 8:

Description: Upstream extent of Ditch 7 extending into overgrown vegetation.

GREATPACIFIC ENGINEERING & ENVIRONMENT	CLIENT: CRD
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PROJECT No. 1039-004 / PREPARED BY: BP	**DRAINAGE ASSESSMENT**
DATE: 2022-05-13 / REVIEWED BY: JC	**PHOTOS: 2022.04.14/18/22/28/30, 2022.05.03**
Photo 7 and 8	

Photo 9:

Description: View of Section 6 ditching.

Photo 10:

Description: Debris obstruction within ditching at intersection of Sections 5 and 6.

GREATPACIFIC ENGINEERING & ENVIRONMENT	CLIENT: CRD
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PROJECT No. 1039-004 / PREPARED BY: BP	**DRAINAGE ASSESSMENT**
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Photo 9 and 10	"This Figure is prepared solely for the use of our customer as specified in the accompanying report. GreatPacific Consulting Ltd. assumes no liability to any other party for any representations contained in this Figure."

Photo 11:

Description: Substantial ponded water without direct surface discharge linkage to ditching, located in the west of the Park between Section 5 and 7 ditches.

Photo 12:

Description: Main channel of ditch Section 6.

Long grasses are observed within the channel thalweg.

GREATPACIFIC ENGINEERING & ENVIRONMENT	CLIENT: CRD
PROJECT NAME: IVBRP DRAINAGE ASSESSMENT	ISLAND VIEW BEACH REGIONAL PARK
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Photo 11 and 12	"This Figure is prepared solely for the use of our customer as specified in the accompanying report. GreatPacific Consulting Ltd. assumes no liability to any other party for any representations contained in this Figure."

Photo 13:

Description: Overgrown vegetation within upstream areas of Section 5 ditch.

Photo 14:

Description: Large area of standing water located in the western segment of the Park between Section 3 and 5 ditches.

GREATPACIFIC ENGINEERING & ENVIRONMENT	CLIENT: CRD
PROJECT NAME: IVBRP DRAINAGE ASSESSMENT	**ISLAND VIEW BEACH REGIONAL PARK**
PROJECT No. 1039-004 / PREPARED BY: BP	**DRAINAGE ASSESSMENT**
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Photo 13 and 14	"This Figure is prepared solely for the use of our customer as specified in the accompanying report. GreatPacific Consulting Ltd. assumes no liability to any other party for any representations contained in this Figure."

Photo 15:

Description: Vegetative debris in the area of Section 4 ditch .

Photo 16:

Description: View of Section 4 ditching.

GREATPACIFIC ENGINEERING & ENVIRONMENT	CLIENT: CRD
PROJECT NAME: IVBRP DRAINAGE ASSESSMENT	**ISLAND VIEW BEACH REGIONAL PARK**
PROJECT No. 1039-004 / PREPARED BY: BP	**DRAINAGE ASSESSMENT**
DATE: 2022-05-13 / REVIEWED BY: JC	**PHOTOS: 2022.04.14/18/22/28/30, 2022.05.03**
Photo 15 and 16	"This Figure is prepared solely for the use of our customer as specified in the accompanying report. GreatPacific Consulting Ltd. assumes no liability to any other party for any representations contained in this Figure."

Photo 17:

Description: Debris within eastern reach of Ditch Section 3.

Photo 18:

Description: Shallow ditching with long grass growth within the further east reaches of Ditch Section 3.

Ditch appears to be intended to drain a low lying area but does not appear to effectively do so.

GREATPACIFIC ENGINEERING & ENVIRONMENT	CLIENT: CRD
PROJECT NAME: IVBRP DRAINAGE ASSESSMENT	**ISLAND VIEW BEACH REGIONAL PARK**
PROJECT No. 1039-004 / PREPARED BY: BP	**DRAINAGE ASSESSMENT**
DATE: 2022-05-13 / REVIEWED BY: JC	**PHOTOS: 2022.04.14/18/22/28/30, 2022.05.03**
Photo 17 and 18	"This Figure is prepared solely for the use of our customer as specified in the accompanying report. GreatPacific Consulting Ltd. assumes no liability to any other party for any representations contained in this Figure."

Photo 19:

Description: Ditching along Ditch Section 2. Sidecasted materials shown along the ditch.

Photo 20:

Description: Looking east towards Ditch 10 extension near the intersection with Ditch 2. Overgrowth precluded inspection.

GREATPACIFIC ENGINEERING & ENVIRONMENT	CLIENT: CRD
PROJECT NAME: IVBRP DRAINAGE ASSESSMENT	**ISLAND VIEW BEACH REGIONAL PARK**
PROJECT No. 1039-004 / PREPARED BY: BP	**DRAINAGE ASSESSMENT**
DATE: 2022-05-13 / REVIEWED BY: JC	**PHOTOS: 2022.04.14/18/22/28/30, 2022.05.03**
Photo 19 and 20	"This Figure is prepared solely for the use of our customer as specified in the accompanying report. GreatPacific Consulting Ltd. assumes no liability to any other party for any representations contained in this Figure."

Photo 21:

Description: Inundated Tsawout lands (at left) in relation to Ditch 1 (at right)

Direct drainage connectivity was observed between the inundated area and Ditch 1, although the extent/contributary area draining to the ditch was not ascertained.

Photo 22:

Description: Looking northwest towards Tsawout lands from Ditch 1. Significant extend of inundation is observable.

GREATPACIFIC ENGINEERING & ENVIRONMENT	CLIENT: CRD
PROJECT NAME: IVBRP DRAINAGE ASSESSMENT	ISLAND VIEW BEACH REGIONAL PARK
PROJECT No. 1039-004 / PREPARED BY: BP	DRAINAGE ASSESSMENT
DATE: 2022-05-13 / REVIEWED BY: JC	PHOTOS: 2022.04.14/18/22/28/30, 2022.05.03
Photo 21 and 22	"This Figure is prepared solely for the use of our customer as specified in the accompanying report. GreatPacific Consulting Ltd. assumes no liability to any other party for any representations contained in this Figure."

Photo 23:

Description: Observed overland flow from the inundated Tsawout lands (left) to Ditch 1.

Photo was taken on the afternoon of April 22, during low tide conditions approximately 14.5 hours after a tidal high of 3.16 m Chart Datum (Sidney Predictions).

A subsequent visit did not observe a similar magnitude of surface drainage to the Park ditches, and it is believed that at the 3.16 m high tide, the Tsawout ditch overtopped its banks, resulting in inundation and flow to the Parks ditches.

Photo 24:

Description: Upstream reaches of Ditch 1, showing generally poor conveyance to downstream.

GREATPACIFIC ENGINEERING & ENVIRONMENT	CLIENT: CRD
PROJECT NAME: IVBRP DRAINAGE ASSESSMENT	**ISLAND VIEW BEACH REGIONAL PARK**
PROJECT No. 1039-004 / PREPARED BY: BP	**DRAINAGE ASSESSMENT**
DATE: 2022-05-13 / REVIEWED BY: JC	**PHOTOS: 2022.04.14/18/22/28/30, 2022.05.03**
Photo 23 and 24	

Photo 25:

Description: Ditching system of Ditch Section 1.

GREATPACIFIC ENGINEERING & ENVIRONMENT	CLIENT: CRD
PROJECT NAME: IVBRP DRAINAGE ASSESSMENT	**ISLAND VIEW BEACH REGIONAL PARK**
PROJECT No. 1039-004 / PREPARED BY: BP	**DRAINAGE ASSESSMENT**
DATE: 2022-05-13 / REVIEWED BY: JC	**PHOTOS: 2022.04.14/18/22/28/30, 2022.05.03**
Photo 25	"This Figure is prepared solely for the use of our customer as specified in the accompanying report. GreatPacific Consulting Ltd. assumes no liability to any other party for any representations contained in this Figure."

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Appendix 3 Aerial Photo (circa 1920's)

1926

CRD Regional Parks

2022 Island View Beach Regional Park Drainage Ditch Maintenance

Status as of July 13, 2022

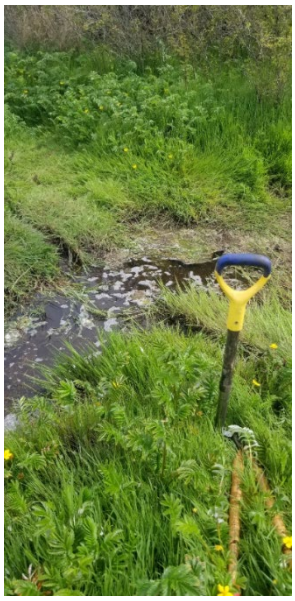
Activities:

- Ditch maintenance activities at Island View Beach Regional Park (IVBRP) began on June 7, 2022.
- As of July 13, 2022, 168 hours has been spent hand clearing ditches in sections not accessible by heavy equipment due to soft soils (see photos next page). The work being completed includes:
    - the removal of logs placed by park users to cross the ditches
    - the removal of clumps of grass and horsetail that are slowing the movement of the water through the ditches
    - cutting back branches that are overhanging the ditches
    - clearing a one-metre-wide section of vegetation adjacent to the ditches to provide full access to mosquito contractor staff; this vegetation is being piled by staff elsewhere on site
    - all work is being completed by hand using pole saws, loppers, shovels, rakes and pitch forks
- Another 42 hours is needed to complete the ditching work in areas too wet for heavy equipment.
- Another pass will be required during the growing season in order to control vegetative regrowth. This will require another 100 hours of labour.
- 310 hours of labour will be required to complete the IVBRP project.
- Observations on the condition of the drainage ditch system include:
    - Water in the ditches moving in all sections prior to the drainage work
    - No significant increase in flow after debris was removed
    - No blockages in the ditches resulting in water backing up and/or overflowing
- Aqua-Tex Scientific Consulting Ltd.'s (Aqua-Tex) annual ditch survey is scheduled for July. This survey includes two days of field work, which is summarized into a report. The CRD will receive the report in August and will begin to implement the ditch maintenance recommendations identified in the report.
- If Aqua-Tex recommends using heavy equipment to clear the ditches, a contractor will be hired to conduct this work; depending on availability this could happen as early as August.

- Duka Environmental Services Ltd. (Duka), the contractor for the annual mosquito control program, started its work at Island View Beach in late January 2022 and will continue into late October. Duka provides a monthly summary of the control program to the CRD

Before and After Photos of Ditch Clearing


Example 1

Example 2


Example 3

Example 4

Typical view of unimpeded IVBRP drainage ditch

Challenges:

- The ditch system starts on CRD land but one section of the ditch extends under a fence to private land. The photo to the right shows debris in the ditch on the private property (see also map on next page – black line indicates the location of this private property).
- Staff have observed what are believed to be stickleback fry in the ditches. This hinders further work being done in the ditches until a Section 11 permit from the Ministry of Environment and a permit from the Department of Fisheries and Oceans is obtained.

Status of IVBRP Drainage Ditch Maintenance Activities as of July 13, 2022

Ditch Colour

- Blue – completed
- Black – located on private property
- Red – not completed

Duka Environmental Services Ltd.

Central Saanich, Capital Regional District and Tsawout First Nation
Mosquito Surveillance and Control Program

Island View Beach Regional Park Summary 2022

The annual Nuisance Mosquito Surveillance and Control Program is provided for the benefit of all District of Central Saanich residents, businesses and visitors. It is a partnership between the three agencies above. The CRD control program boundaries are confined to the Island View Beach Regional Park.

The annual control program begins each January and extends through to late August and early September depending on conditions. The extent of development habitats, the magnitude of populations and the diversity of species is greatest between February and April, when water accumulations are also typically at their greatest. Larval mosquitos require non-flowing, standing waters for development. Mosquitos are able to development in salt water and freshwater habitats, and in waters with any range of salinity between these.

Mosquito development at Island View Beach (IVB) old field habitats and the adjacent Municipal Park and Tsawout First Nations salt marsh is initiated by snowmelt, precipitation and fluctuating tidal heights. The predominant habitat at the CRD IVB is temporary, variable and fluctuating water bodies created by surface water accumulations in depressions and low-lying areas located throughout the old, no longer active, farm fields. Their depths, size and persistence are affected by tidal heights, precipitation, seepage, surface water runoff and weather, including day time temperatures, humidity and winds etc. Seepage from the adjacent, western "bluff" maintains several permanent ponds and marshes along the base of this ridge. These fluctuate in response to the impacts of weather (precipitation, temperatures) on runoff and seepage.

In a typical season, these old field temporary sites have evaporated/drained by late May and early June. The more permanent ponds at the base of the bluffs tend to become reduced in size as the season progresses, but they continue to produce recurrent larval mosquito development. Extreme, or several days of precipitation can cause both temporary and permanent habitats to temporarily increase in size with a concomitant surge in larval development.

Field staff visit the Regional and Municipal parks at IVB, and the adjacent Tsawout First Nations salt marsh weekly, beginning in late January. Larval populations are monitored, samples collected for taxonomic identification and treatment/control of larvae is completed using a bio rational, bacterial larvicide (VectoBac 200G) containing *Bacillus thuringiensis* var. *israelensis*, *Serotype H-14, Strain AM 65-52*.

20619-91A Ave, Langley, B.C. Canada V1M 2X2 Tel: 1 604 881 4565 Fax: 1 866 759 5902
Email: duka@telus.net Website: www.duka.consulting

Since we cannot definitively determine the exact source of a mobile, active insect pest such as mosquitos, the magnitude, or contribution to the adult mosquito populations and localized nuisance would likely be a reflection of the predominant habitat type and its area.

The attached graph presents the total volumes of VectoBac 200G applied annually for each of the partners at island View Beach. A review of the past four seasons, 2019-2021 confirms that the total volume of treatment required at CRD IVB has ranged from 10-25% of the total treatments required for all three (partners) areas.

The great majority of adult mosquitos collected from within the boundaries of the IVB, at the Tsawout salt marsh and at adjacent properties over the past several years have been *Aedes dorsalis*. These mosquitos develop in salt water habitats, the predominant habitat of the Tsawout salt marsh. The predominant species of *Aedes* larvae collected at CRD IVB sites is *Aedes sticticus*.

I trust this provides you with the summary information you require.

Yours truly,

Curtis Fediuk BSc., RPBio.,
President

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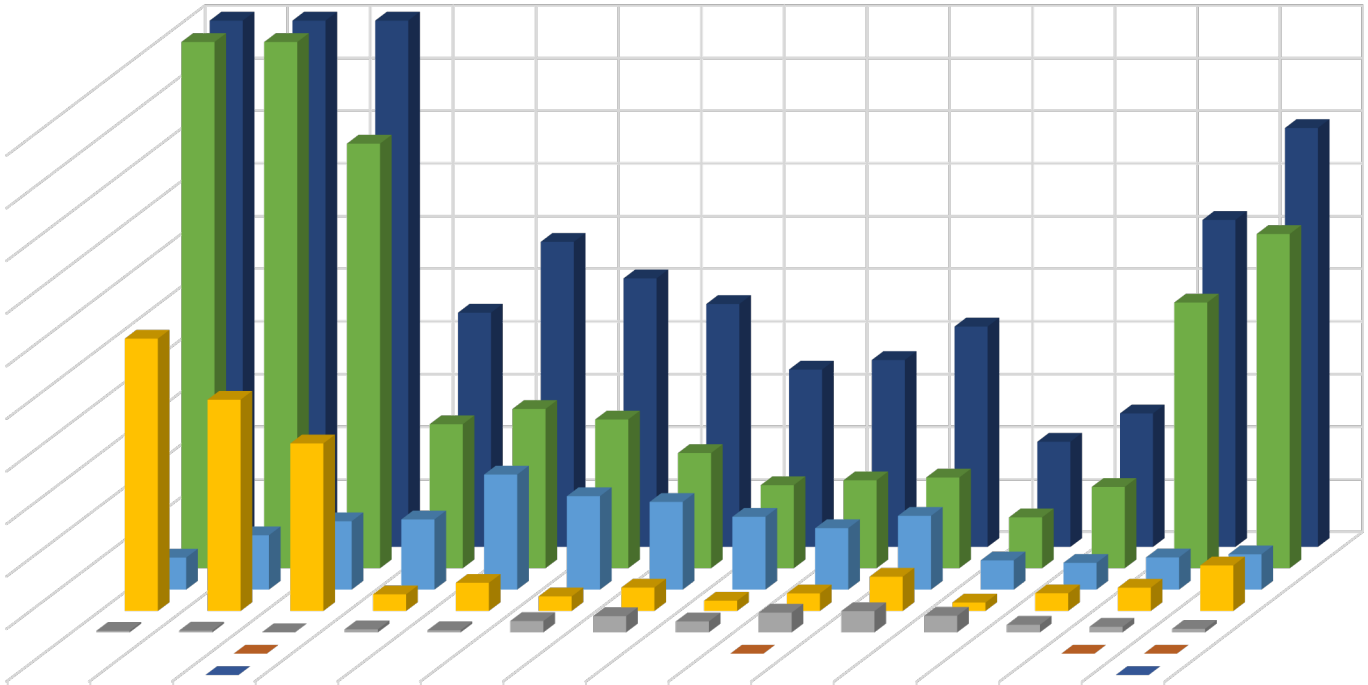
Providing communities with safe, effective and sustainable mosquito and biting fly control services for over 35 years.

Central Saanich - Island View Beach Area - VectoBac 200G Applications
Summary 2009 - 2022 (12 July*)



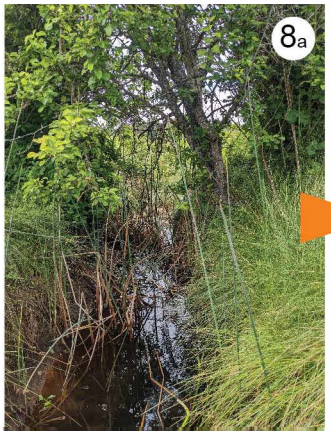
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Tsawout Flapper gate repair			XX											XX
Ditch cleaning /Maintenance			X						X				X	X
Central Saanich, sites #69 A,B	3.00	3.30	0.00	5.70	3.90	21.50	30.80	20.70	37.50	40.30	31.57	14.40	10.55	6.55
Central Saanich, sites #123	518.00	402.00	319.05	31.80	53.60	27.77	44.55	19.60	33.40	65.30	16.10	33.65	44.40	86.8
CRD, sites #66, #68	61.00	103.50	130.20	133.70	219.20	178.01	167.01	138.70	117.01	140.52	55.61	50.95	61.31	67.23
Tsawout, site #34	1063.00	1017.80	807.00	274.10	303.10	283.12	219.39	158.21	167.56	172.91	96.92	154.90	505.20	635.45
Totals	1645.00	1526.60	1256.25	445.30	579.80	510.40	461.75	337.21	355.47	419.03	200.20	253.90	621.46	796.03

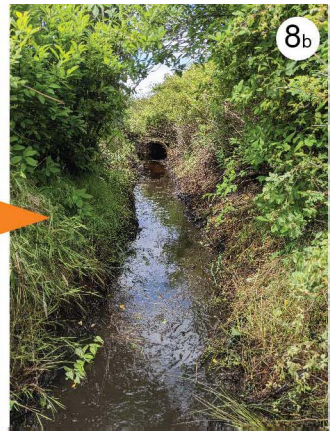
APPENDIX B

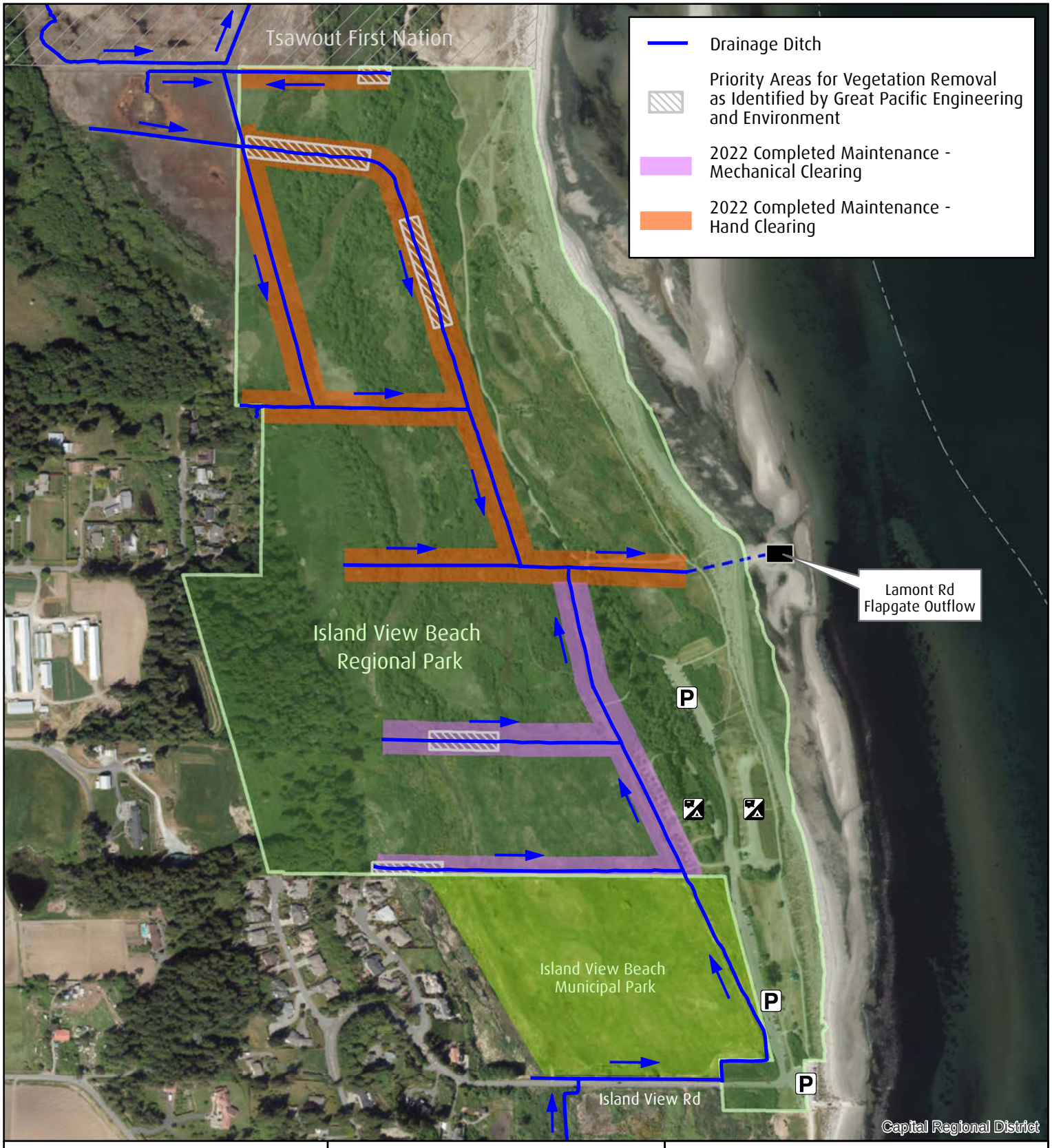
DITCH MAINTENANCE 2022
ISLAND VIEW BEACH REGIONAL PARK

Hand Clearing and Vegetation Removal (Images 1-4): Mechanical Clearing (Image 5):

Before and After Photos (Images 6-8):







0 150 300

Metres

N W E S

UTM Zone 10N NAD 1983

Important This map is for general information purposes only. The Capital Regional District (**CRD**) makes no representations or warranties regarding the accuracy or completeness of this map or the suitability of the map for any purpose. **This map is not for navigation.** The CRD **will not be liable** for any damage, loss or injury resulting from the use of the map or information on the map and the map may be changed by the CRD at any time.

2023-02-22-SR-RPC-IVB-Mosquitos-AppendixC.mxd I January 2023

- Island View Beach Regional Park
- Island View Beach Municipal Park
- Tsawout First Nation
- Parking Area
- Campground

Appendix B

2022 Annual Ditch Maintenance Activities
Island View Beach Regional Park

Regional Parks Committee
Staff Report
February 22, 2023

CRD
Making a difference...together

Aqua-Tex
Scientific Consulting Ltd. (1993)

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Victoria, B.C. V8R 4H2
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MEMO

To: Marc Solomon, CRD Regional Park Operations Supervisor – North District

From: Cori Barraclough, M.Sc., R.P. Bio., PMP, Freshwater Ecologist
Patrick Lucey, M.Sc., R.P. Bio, Sr. Aquatic Ecologist

Re: Island View Beach Ditch Maintenance 2022

Date: September 15, 2022

This memo outlines the findings of the most recent site visit to Island View Beach Regional Park on Monday July 16, 2022 (11:30 a.m. – 1:30 p.m.) by Aqua-Tex staff members Cori Barraclough (RP Bio, PAg) and Patrick Lucey (RP Bio). This memo is a supplement to an email summary and .kmz file provided to CRD on July 16 following the field assessment.

At the time of assessment, the tide was 0.58 m and falling, with low tide occurring at 1:06 p.m. and high tide occurring at 9:10 p.m. at Saanichton Bay (Figure 1). The tide was low enough to observe the tide gate and low water levels in the ditch network.

Figure 1. Tidal cycle for Saanichton Bay, July 16, 2022

The channel conditions were significantly improved over the 2021 assessment due to the extensive ditch maintenance work that was completed July 14-15, 2021. The remains of sidecast material from this work was evident, but was well spread out and did not appear to be impeding drainage from the fields into the ditches.

Vegetation growth in the channels was very minimal and positive drainage (flow) was evident in many places as the tide went out. There were no impediments to flow that were observed. Trails were generally very accessible.

There was no evidence of sediment building up in the channels and many ditches were dry. The tide was still falling upon our arrival so we expected water to be present.

The ditches did not appear to be over-excavated, which would lead to standing water, but grading these channels is very difficult because the land is so flat. Some observed isolated pockets of water, which were very few, may have been slightly lower than the rest of the channel. Surrounding soils in the fields were damp in the wettest areas, but the main part of the site, including the depression through the middle of the site, which is often wetted, was dry at the surface.

Very few mosquitos were observed. The majority were present along the fenced private property in the northwest part of the site. Numbers were low enough that they were not bothersome during the assessment. There was an iron-bacteria film on some sections of ditches, but its presence was markedly reduced over 2021. These bacteria are natural and harmless but often concern observers who think they are a sign of pollution.

The tide was low enough to observe the trash rack on the Lamont ROW and the tide gate very clearly. Both appeared in good condition though a small amount of debris was noted on the trash rack.

Invasive teasels (*Dipsacus fullonum)* were observed this year along Ditch 4. This is the first time we have noted this plant, but it is becoming common in much of the CRD. It produces thousands of seeds, so controlling this plant before it takes over a larger area is essential.

Selected photos, most with comparisons to last year, are provided in the following pages. As much as possible, photos remain in the same order as previous years which generally follows the path walked during the field assessment. Comments on channel conditions are described below the photos.

A .kmz file of the track that was walked, as well as associated GPS-referenced photos, was provided as a supplement to this report. The .kmz file includes many more photos than are included in this memo.

In summary, the ditches were clear of impeding vegetation and sediment and no maintenance was recommended this year, other than control of invasive plants, especially teasels.

After assessing these ditches every year for 12 years, it is evident that variations in the water levels in the ditches are closely tied to weather patterns. Wet, cold or late spring weather raises groundwater tables and delays the drying of soils. Hot, dry summers raise evaporation rates and reduce water levels. While maintenance of the channels to remove ingrowth of vegetation is important, the variation year-to-year appears driven by weather. Fluctuations in groundwater levels and the timing of the same could be tracked using self-contained in-ground water level dataloggers. Similarly, it may be possible to use datalogging conductivity/salinity sensors to track variations in salinity which may be influenced by the contributions of groundwater or rainfall. Camosun College students installed piezometers to assess groundwater levels for a brief time several years ago. The data from this program may be useful in determining if a data collection program is practical. If so, we recommend installing a small number of sensors at strategic locations to test the methods and refine a data collection program before expending significant funds. Localized meteorological data may also be helpful in interpreting the water level and salinity data.

Figure 2. Overview aerial photograph showing the location of the ditches at Island View Beach

Campground ditch looking south from the trail crossing July 16, 2022. Channel is clear with no impediments to flow.

Campground ditch July 5, 2021 prior to 2021 maintenance.

Campground ditch looking north from the trail crossing July 16, 2022. There is minor ingrowth of vegetation but still a clear open channel.

Campground ditch looking north July 5, 2021 prior to 2021 maintenance.

Ditch behind the tenting area of the campground July 16, 2022.

Lamont ROW ditch looking west, downstream end July 16, 2022. There was a very small amount of water in the channel and positive drainage was observed.

Lamont ROW ditch looking west, downstream end July 5, 2021.

Confluence of Lamont Road ROW and Ditch 4 July 16, 2022. Note the clear open channel as a result of last year's maintenance.

Confluence of Lamont Road ROW and Ditch 4 July 5, 2021.

Ditch 4 at confluence with Lamont Rd ROW July 16, 2022.

Ditch 4 at confluence with Lamont Rd ROW July 5, 2021.

Downstream end of Ditch 1 July 16, 2022.

Downstream end of Ditch 1 July 5, 2021.

Above: Ditch 1 looking west from the mid-point of the ditch toward the confluence with Ditch 2 July 16, 2022. The channel was clear of vegetation.

Right: Ditch 1 at the midpoint of the ditch July 5, 2021. These bulrushes were removed during 2021 maintenance.

Confluence of Ditch 1 and Ditch 3 July 16, 2022.

Confluence of Ditch 1 and Ditch 3 July 5, 2021.

Looking east down Ditch 1 from the confluence of Ditch 1 and Ditch 2 July 16, 2022.

Downstream end of Ditch 2 looking northwest July 16, 2022. The channel is clear. The trail of bubbles were flowing south as expected. Iron bacteria were significantly reduced over last year.

Downstream end of Ditch 2 looking northwest July 5, 2021.

Ditch 2 from middle of the channel looking northwest July 16, 2022. The channel is more open and was draining well.

Ditch 2 from middle of the channel looking northwest July 5, 2021.

Above: Ditch 2 looking southwest July 16, 2022.

Right: Ditch 2 looking southwest July 5, 2021.

Confluence of Ditch 2 and Ditch 3 July 16, 2022.

Confluence of Ditch 2 and Ditch 3 July 5, 2021.

Ditch on Tsawout land running east-west along chainlink fence (looking west) July 16, 2022.

Ditch on Tsawout land running east-west along chainlink fence (looking west) July 5, 2021.

Above: Ditch running northeast on Tsawout land July 16, 2022.

Above: Ditch running northeast on Tsawout land July 5, 2021.

Ditch 5 July 16, 2022. Taken from mid-point of channel looking east.

Ditch 5 from the western end of the ditch looking east July 16, 2022.

Ditch 5 from the western end of the ditch looking east July 5, 2021.

Above: Ditch 3 near north end of the wet depression looking southeast July 16, 2022.

Right: Ditch 3 near north end of the wet depression looking southeast July 5, 2021.

Photo taken from Ditch 3 looking southwest across the wet depression. The dominant plant is silverweed (*Potentilla*). Soils were dry on the surface.

Looking north from trail crossing over intersection of Ditches 3 & 4 looking north up Ditch 3, July 16, 2022. The lack of vegetation along the channel may encourage new growth in the channel as light is no longer limited.

Looking south from trail crossing over intersection of Ditches 3 & 4 looking south down Ditch 4, July 16, 2022.

Ditch 4 near the midpoint. July 16, 2022. Note the extensive English ivy carpet (*Hedera helix*).

Ditch 4 about 6 m north of the Lamont ROW where old waterlines cross the creek July 16, 2022.

Invasive teasels (*Dipsacus fullonum*) along Ditch 4 about 60 m north of the Lamont ROW July 15, 2022.

Lamont ROW looking east toward the tide gate July 16, 2022. Water was actively flowing toward the trash rack (seaward).

Lamont ROW at the trash rack upstream of the tide gate July 16, 2022.

Trash rack upstream of the tide gate July 16, 2022.

Trash rack upstream of the tide gate July 5, 2021.

Tide gate at close to low tide 1:00 p.m. July 16, 2022.