



**DEVELOPMENT PERMIT NO. DP001056**

**MARK BASHER AND SANDRA BASHER  
MARK GODFREY AND ANDREA GODFREY**  
Name of Owner(s) of Land (Permittee)

**3500 / 3520 CHINOOK ROAD**  
Civic Address

1. This development permit is issued subject to compliance with all of the bylaws of the municipality applicable thereto, except as specifically varied or supplemented by this permit.
2. This development permit applies to and only to those lands within the municipality described below, and any and all building structures and other developments thereon:

Legal Description:

**LOT 1, DISTRICT LOT 39, WELLINGTON DISTRICT, PLAN 28349**

**PID 000-602-311**

**LOT A, DISTRICT LOT 39, WELLINGTON DISTRICT, PLAN 41471**

**PID 000-659-134**

3. The land described herein shall be developed strictly in accordance with the following terms and conditions and provisions of this permit and any plans and specifications hereto which shall form a part thereof.

**Schedule A Location Plan**  
**Schedule B Letter of Rationale**  
**Schedule C Environmental Report**

- a) If the applicant does not substantially commence the development permitted by this permit within two years of the date of this permit, the permit shall lapse.
4. This permit is not a building permit nor does it constitute approval of any signage. Separate applications must be made for a building permit and sign permit.

### PERMIT CONDITIONS

1. The proposed revetments shall be installed generally in accordance with the Site Plans in Figure 2 of the Environmental Report prepared by Aquaparian Environmental Consulting Ltd., dated 2017-MAY-30, as shown on Schedule C..
2. The subject properties shall be developed in accordance with the Planting Plan in Figure 3 of the Environmental Report prepared by Aquaparian Environmental Consulting Ltd., dated 2017-MAY-30.
3. A landscape bond is required for 100% of the landscape estimate prepared by Aquaparian Environmental Consulting Ltd., and contained in the Environmental Report dated 2017-MAY-30.
4. A five-year maintenance period is required as per the Environmental Report prepared by Aquaparian Environmental Consulting Ltd., dated 2017-MAY-30. A certified letter of completion is required from the Qualified Environmental Professional at the end of the five-year maintenance period.
5. Construction shall occur at low tide during the dry season.

REVIEWED AND APPROVED ON

*2012-Nov-02.*

Date

*[Signature]* **ACTING DIRECTOR**

*for* D. Lindsay  
Director

**Community Development**

Pursuant to Section 154 (1)(b) of the Community Charter

GN/in

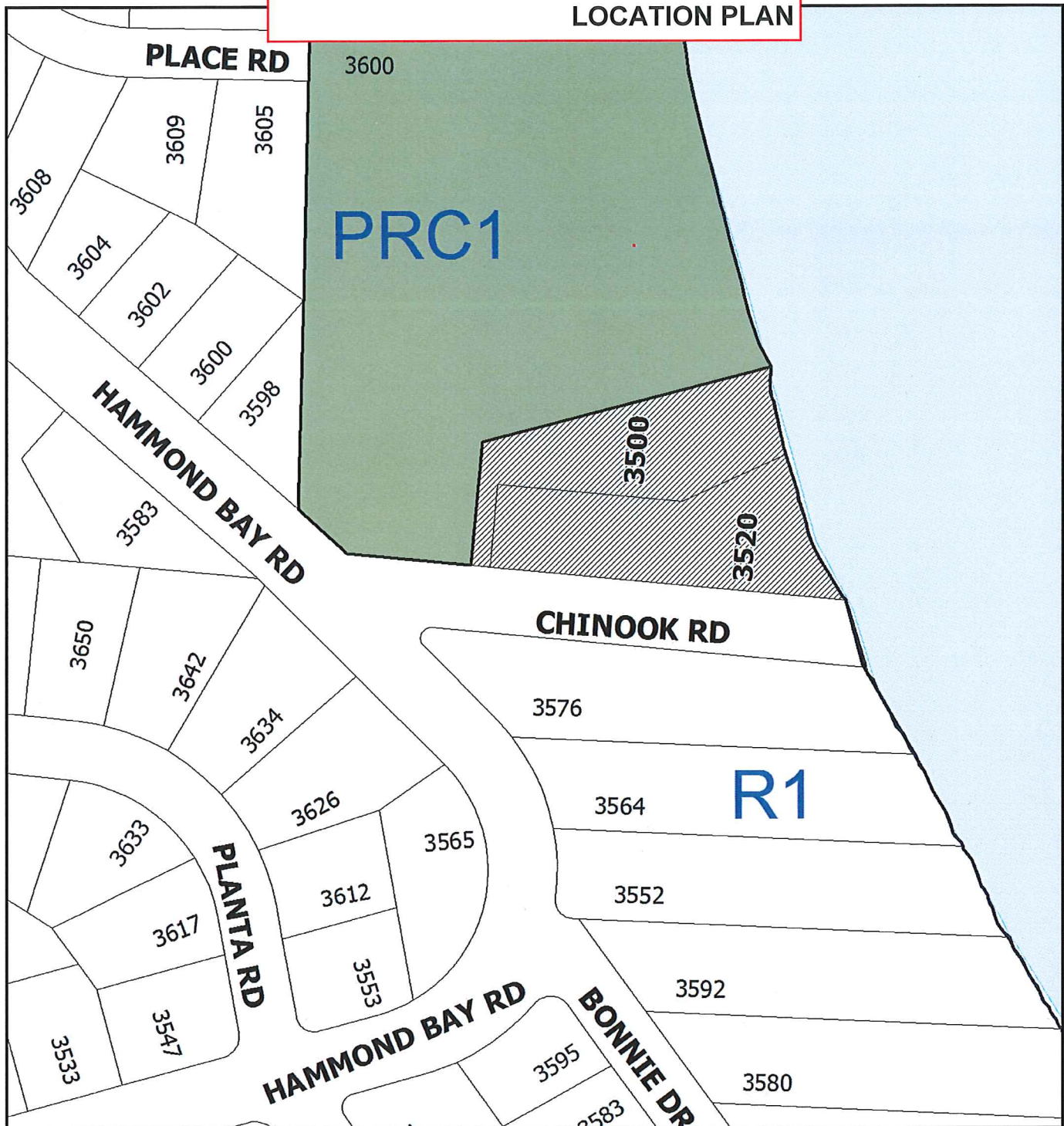
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Development Permit DP001056

Schedule A

3500 / 3520 Chinook Road

**LOCATION PLAN**



DEVELOPMENT PERMIT NO. DP001056



**LOCATION PLAN**

 **Subject Properties**

Civic: 3500 and 3520 Chinook Road  
Lot A, District Lot 39, Wellington District, Plan 41471  
and Lot 1, District Lot 39, Wellington District, Plan 28349



**LETTER OF RATIONALE**

3500 Chinook Road, Nanaimo

3520 Chinook Road, Nanaimo

**Development Permit Application – Executive Summary**

This Development Permit Application has been made jointly by the adjacent property owners of 3500 Chinook Road and 3520 Chinook Road, Nanaimo. Both properties have incurred loss of land due to sea erosion along the low bank shoreline. The owners desire to mitigate the detrimental effect that wave action during high seas, primarily during winter storm events, has on the two properties with the installation of a relatively low rock revetment wall in combination with enhanced natural vegetation planting to improve bank stabilization and resistance to erosion.

It has been observed that wave action during high seas erodes the lower portion of the bank at the gravel beach interface causing undermining and eventual collapse of the vegetated bank above. Both properties have septic tanks to the seaward side of the houses and these tanks could be under threat at some time in the future if the erosion is not halted. Please note that neither property has a septic field as the tanks have been converted to pump chambers and both properties pump their wastewater up to the City sanitary line at Hammond Bay Road. There are also several large mature trees close to the edge of the bank whose health and stability would be threatened if any further erosion occurred near the trees and their roots became exposed.

A rock revetment wall has been chosen to break the direct scouring effect of wave action on the lower portion of the bank. Large imported rock will be embedded into the existing beach to enhance stability of the wall and built up to approximately the top of the existing bank. The rock wall will have an approximate front slope of 1.5H:1.0V. A layer of non-woven geotextile will be installed at the bank /rock wall interface to ensure that no fines are washed away from the bank onto the beach. All new construction will occur above the normal high tide line. The owners fully appreciate that there is no guarantee of total success in containing the potentially destructive nature of the sea and expect that following extreme storm events there may be need for follow-up maintenance on the wall. A rock revetment wall has been chosen as the structure most likely to succeed in achieving the desired goal of resisting the ongoing erosion and it is a solution that can be readily maintained with relative low effort or disturbance to the environment should maintenance be required.

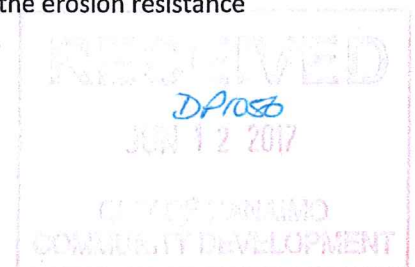
Graf Excavating Company has been contracted to complete the work. Graf Excavating has extensive experience in constructing rock revetment walls along the coast of Vancouver Island and is fully aware of all regulatory requirements around such a project in proximity to the ocean. The Owners will be engaging a qualified environmental monitor during progression of the works.

An Archeological Alteration Permit (#2017 -0129) has been obtained for the project. Ursus Heritage Consulting have been retained for archeological monitoring and reporting. One of the supporting criteria in the application for the Alteration Permit was the work was likely to enhance protection of archeological material within the bank that might otherwise be lost if the bank erosion continued.

Aquaparian Environmental Consulting has prepared an environmental assessment and planting plan. The restoration native plants species prescribed in the planting plan will enhance the erosion resistance of the bank and will improve the naturalization of the rock wall and embankment.

Attached, please find the following documents for reference:

Development Permit Application





Slope Planting Plan - Aquaparian Environmental Consulting Ltd  
Archeological Alteration Permit #2017-0129  
Drawings of proposed Rock Revetment Wall – 3500 Chinook Road  
Drawings of proposed Rock Revetment Wall – 3520 Chinook Road  
Development Permit Application Checklist

**ENVIRONMENTAL REPORT**

May 30, 2017

Mark & Sandra Basher  
3500 Chinook Road  
Nanaimo BC  
[msbasher@shaw.ca](mailto:msbasher@shaw.ca)

Mark Godfrey  
3520 Chinook Road  
Nanaimo BC  
[markB@graham.ca](mailto:markB@graham.ca)

**RE: 3500 & 3520 CHINOOK ROAD, NANAIMO BC  
SLOPE REPAIR PLANTING PLAN**

## 1.0 INTRODUCTION

Aquaparian Environmental Consulting Ltd. (Aquaparian) was retained by the property owners of 3500 Chinook Road and 3520 Chinook Road in Nanaimo BC to complete an environmental assessment and planting plan of a proposed foreshore slope rock revetment installation. The embankment along the shoreline of both properties has sustained ongoing erosion and slope failure due to wave action and storm events.

Aquaparian's scope of work was limited to providing the vegetation planting plan for the two properties. The erosion control drawings included in this report for the two parcels were provided to Aquaparian by the landowners of the two subject parcels to allow a planting plan to be produced for the site.

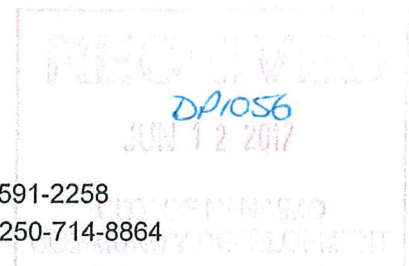
The subject neighbouring properties front onto the Strait of Georgia located south of Piper's Lagoon Park in the City of Nanaimo, BC. A site location map has been included as Figure 1. The legal descriptions of the properties are as follows:

**3500 Chinook Road:**

**Lot 1, District Lot 39, Wellington District, Plan 28349 except Plan 41471**

**3520 Chinook Road:**

**Lot A, District Lot 39, Wellington District, Plan 41471.**



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City of Nanaimo Bylaw 2008 No. 6500 identifies Environmentally Sensitive Areas (DPA 2) as the area between the water's edge and a perpendicular line inland 15m from the natural boundary of the sea. The properties also lie within Natural Hazard Lands (DPA 3) which are lands susceptible to flooding, erosion, land slip, avalanches or that pose a threat to surrounding lands should their natural condition be altered. Because the proposed shoreline revetment is located within these DPAs, a Development Permit will be required. Site plans prepared by the land owners for the proposed rock revetment have been included as Figure 2 and a Planting Plan has been included as Figure 3. Site photographs have been included as Appendix A.

In preparation of this report, Aquaparian reviewed the project drawings for both parcels and completed a site visit (May 4, 2017) with Kevin Brydges, Environmental Officer for the City of Nanaimo. In addition to the initial site environmental assessment, additional site visits may be performed by Aquaparian during proposed construction and/or after completion of construction (post-construction assessment) as required. This report has been prepared in support of the Development Permit Application for both properties.

## 2.0 SITE DESCRIPTION

The north parcel at 3500 Chinook Road is 0.62 acres in size and is a long and narrow panhandle lot with approximately 29m of waterfront. The south parcel at 3520 Chinook Road is 0.72 acres in size and is a long and narrow lot with approximately 50m of waterfront. The east boundary of both parcels front onto the shoreline where the proposed works are to occur and the rear west boundary is the driveway access to Chinook Road for both properties. The parcels are bounded by Chinook Road to the south and Piper's Lagoon Park to the north.

The parcels are moderately sloping towards the ocean with a steeper drop down towards the foreshore at the eastern extent. At 3500 Chinook Road an existing residence is located approximately 20m from the shoreline and a small shed is located near the northwest corner of the house. The rear backyard has a small lawn area with gardens with the remaining area treed. The front yard is lawn leading down a steep terraced slope with gardens and wooden retaining walls to a flat area of lawn with dune grasses at the top of the bank. A 1.2m high vertical slope leads down to a gravel/cobble beach.

At 3520 Chinook Road (downslope of 3500 Chinook) an existing residence is located approximately 10m from the shoreline and a small shed is located near the southeast corner of the lot approximately 5m from the shoreline. The house is surrounded by patios with terraced gardens in the backyard leading to the treed rear half of the property. The front yard is a narrow strip of lawn leading to a thickly vegetated top of bank with a 3.5m near vertical drop down to the beach.

The embankment slope along both properties show evidence of ongoing erosion due to heavy precipitation and severe storm events creating failure areas and undercutting along the length



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of the eastern property lines. Loose embankment materials are evident at the toe of the slope and previously installed landscape fabric has become exposed in areas. The shoreline of the area north of the subject parcels (Piper's Lagoon Park) is reinforced with a rock rip rap revetment. The top of the bank is vegetated with dune grass and dune grass has grown into the interstitial spaces of the rock revetment. Driftwood is piled at the toe of the slope. The southern residential property (3520 Chinook Road) has a higher foreshore embankment and vertical slope to the beach. The embankments are exposed to wave action with no protection of the shoreline. The property owners of 3500 Chinook Road & 3520 Chinook Road are applying for a Development Permit to reinforce the shoreline with a rock revetment to protect the property from further erosion.

### 3.0 PROJECT DESCRIPTION

#### 3500 Chinook Road:

The proposed project works for 3500 Chinook Road include minor excavation for placement of buried toe rock, placement of geotextile over the installation area, installation of large (0.5 - 1.0m diameter) partially buried toe rock above the high tide line along the existing toe of the slope, placement of rock infill over eroded embankment areas, creation of a walkway down to the beach near the south property boundary using armorflex blocks, revegetation of the newly constructed embankment with dune grass and installation of native shrubs along the top of bank.

The eroded areas along the embankment will require infilling to protect the slope from wave action. The rock infill is to be placed by an experienced excavator operator over the repair areas consisting of well-graded 300mm minus rock rubble creating a slope of 1 to 1.5 thus lessening the existing vertical grade. The infill will be placed in previously eroded sections along the 29m long embankment in 2m wide infill areas. Driftwood logs that are pushed up on the upper beach in the footprint of the rock revetment can be moved to the toe of the newly constructed rip rap slope. The walkway is to be installed using armorflex blocks overlying beach gravel infill in a 2.4m long by 3.1m wide section with topsoil, grass and turfmat overlying fill material at the top of the bank.

The landscape plan will include installing sand into the areas between the rock rubble infill as a planting medium for dune grass and the installation of topsoil and planting of native shrubs in a 1m wide strip along the top of the rip rap slope to initiate the re-establishment of appropriate native shrubs that match the surrounding area. Seashore lupin can be planted amongst the dune grass along the top of the slope planting area in an 8m strip from the northern property boundary where the dune grass is thickest. Nootka rose and oceanspray can be planted for the rest of the length of the top of revetment. Dune grass can be planted immediately adjacent to the proposed walkway and the top of the walkway can be left clear of plantings to ensure access. A few trees are located at the top of bank which are to remain. No clearing of vegetation is planned for this slope stabilization project. Some areas of dune grass and other ground cover vegetation will be covered with the planned rock revetment. Dune grass

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plantings within the rock wall and the re-establishment of natural shrub vegetation at the top of bank will help to stabilize the slope and improve natural habitat along the embankment. The total restoration area is approximately 29m<sup>2</sup> along the top of the rock wall with approximately 8m<sup>2</sup> additional plantings in the spaces between rocks within the rock wall.

#### **3520 Chinook Road:**

The proposed project works for 3520 Chinook Road include minor excavation for placement of buried toe rock, placement of geotextile over the installation area, installation of large (0.5 - 1.0m diameter) partially buried toe rock above the high tide line approximately 2.25m out from the existing toe of the embankment and placement of rock infill at the toe of the embankment to create a rip rap bench of 1.5m high and 2.25m wide with a 1V:0.5H grade facing the ocean. The toe of the newly constructed rip rap revetment can be planted with dune grass and the 1m wide top of the bench can be vegetated with native shrubs.

The rock infill is to be placed by an experienced excavator operator along the 50m long embankment between the toe rock and the existing slope consisting of well-graded 300mm minus rock rubble creating a slope of 1 to 0.5 thus lessening the existing vertical grade and with the intention of protecting the erosion areas at the toe of the existing embankment. The brush that is currently piled on the beach from pruning of vegetation at the top of bank can be removed and any driftwood logs in the footprint of the rock infill can be moved down the beach to be placed at the toe of the revetment.

The landscape plan will include the installation of dune grass at the toe of the newly constructed rock revetment and the infilling of topsoil at the top of the bench with installation of native shrubs in a 1m wide strip along the top of the rip rap slope. No clearing of vegetation is planned for this slope stabilization project. The thickly vegetated ground cover of the top of the existing embankment will remain as stabilization for the slope. Dune grass plantings at the toe of the rock wall and the establishment of natural shrub vegetation at the top of bank will help to stabilize the slope and improve natural habitat along the embankment with infilling of dune grass expected. The total restoration area is approximately 50m<sup>2</sup> along the top of the rock wall with approximately 12m<sup>2</sup> additional plantings of dune grass at the toe of the rock wall. The project is expected to commence upon approval of permits and within low tide and dry weather windows.

#### **4.0 BIOPHYSICAL ASSESSMENT**

Aquaparian completed a thorough review of the site in preparation of this report. The construction area is located within 15m of the marine environment which is an environmentally sensitive area supporting fish, marine mammals, marine birds, invertebrates and various algae species. The area also contains steep slopes along the foreshore which are prone to erosion and are considered Natural Hazard Lands.

The coastline extending north and south of the parcels is a tidal beach with a mixed gravel and



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cobble intertidal zone and large amounts of beach driftwood located on the upper beach. The toe of the embankment leading down to the beach is located above or near the high tide line and forms the eastern boundary of the property.

The upslope western portions of both properties fronting Chinook Road are forested with a canopy cover dominated by Douglas fir. The embankment leading towards the beach is predominantly vegetated with dune grass at the 3500 Chinook Road property and with introduced species groundcover at the 3520 Chinook Road property. The septic systems are located within lawn areas between the houses and the top of bank.

The footprint of the project starts near the high water line and extends for approximately 3m wide along the length of the embankment (approximately 2m wide rock wall and 1m wide top of bank planting strip). The covering of groundcover species (sparse dune grass) with rock infill will result in a temporary disturbance. The area is to be replanted as soon as possible following repair works. Protection of the marine environment during construction will be required with a primary focus on protection of water quality during activities with a risk of runoff from the work area to the foreshore.

The risk of potential negative impacts to the marine environment during construction may include the following:

- Negative impacts to fish and fish habitat from suspension of sediments during removal of soil and exposure and excavation of subsurface materials, stockpiling of excavated soils, infilling with rock material and capping with topsoil; and,
- The potential for accidents and malfunctions during construction works including equipment failure resulting in spills of deleterious substances.

Construction is anticipated to follow standard methods including the use of heavy equipment such as excavators, dump trucks, etc. All waste materials are to be removed from the site and should be recycled where appropriate and/or feasible to an appropriate facility based on the materials removed.

## 5.0 REGULATIONS

Works near the marine environment are to be conducted in compliance with the following environmental acts, regulations and guidelines:

- DFO Projects Near Water and Measures to Avoid Harm: <http://www.dfo-mpo.gc.ca/pnw-ppe/measures-measures/index-eng.html> April 2014.
- Department of Fisheries and Oceans "Working Near Water in BC & Yukon" B.C.
- Develop with Care 2012, Environmental Guidelines for Urban and Rural Land Development in British Columbia.



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- Ministry of Water Land and Air Protection, February 2002. A Field Guide to Fuel Handling, Transportation and Storage.
- Spill Reporting Regulation.
- BC Guidelines for Industry Emergency Response Plans.
- CSA Z731-03-CAN/CSA Emergency Preparedness and Response standards.
- *Fisheries Act*.
- *Transportation of Dangerous Goods Act*.
- *Environmental Management Act*.

## 6.0 PLANTING PLAN

### 3500 Chinook Road:

The following species have been selected for the restoration area at 3500 Chinook Road with species selection based on existing native shrubs adjacent to the restoration area (see Table 1). Approximately 25% of the rip rap surface area in the voids between will be planted. Overall planting density to be achieved is a minimum of four plants per m<sup>2</sup> for the dune grass within the rip rap and one plant per m<sup>2</sup> for the 1m wide strip of native shrubs at the top of the revetment with the goal of 100% cover within 2-3 years. If there are revisions to the shoreline grading or rock placement plan, the planting plan is to be adjusted accordingly to achieve the desired density. Refer to Figure 3 for an illustrative planting plan.

**Table 1. Planting Plan – 3500 Chinook Road**

Total Environmentally Sensitive Areas DPA Area calculation within the parcel: ~435m <sup>2</sup>				
Proposed Restoration Area within the DPA (Total Estimated Planting Area): ~37m <sup>2</sup>				
Common Name	Species	Spacing	Size	Quantity
Dune grass	<i>Elymus mollis</i>	0.25 m <sup>2</sup>	1 Gal	45
Seashore lupin	<i>Lupinus littoralis</i>	1 m <sup>2</sup>	1 Gal	8
Nootka rose	<i>Rosa nutkana</i>	1 m <sup>2</sup>	1 Gal	16
Oceanspray	<i>Holodiscus discolor</i>	1 m <sup>2</sup>	1 Gal	5
<b>Total Plants:</b>				<b>74</b>

**BOND: Estimated cost:** (Plants 74x\$5.00=\$370) + (Labour 2 X \$370=\$740) = **Total: \$1110**

### 3520 Chinook Road:

The following species have been selected for 3520 Chinook Road (see Table 2). Overall planting density to be achieved is a minimum of four plants per m<sup>2</sup> for the dune grass and one plant per m<sup>2</sup> for the 1m wide strip of native shrubs at the top of the revetment with the goal of 100% cover within 2-3 years. If there are revisions to the shoreline grading or rock placement plan, the planting plan is to be adjusted accordingly to achieve the desired density. Refer to Figure 3 for an illustrative planting plan.



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**Table 2. Planting Plan – 3520 Chinook Road**

Total Environmentally Sensitive Areas DPA Area calculation within the parcel: ~750m <sup>2</sup>				
Proposed Restoration Area within the DPA (Total Estimated Planting Area): ~62m <sup>2</sup>				
Common Name	Species	Spacing	Size	Quantity
Dune grass	<i>Elymus mollis</i>	0.25 m <sup>2</sup>	1 Gal	50
Snowberry	<i>Symphoricarpos albus</i>	1 m <sup>2</sup>	1 Gal	20
Nootka rose	<i>Rosa nutkana</i>	1 m <sup>2</sup>	1 Gal	20
Oceanspray	<i>Holodiscus discolor</i>	1 m <sup>2</sup>	1 Gal	10
<b>Total Plants:</b>				<b>100</b>

**BOND: Estimated cost:** (Plants 100x\$5.00=\$500) + (Labour 2 X \$500=\$1000) = **Total: \$1500**

## 6.1 PLANT SOURCES

### Green Thumb Nurseries

6261 Hammond Bay Road  
Nanaimo BC V9T 5M4  
250-758-0808

E-mail: [grnthumb@shaw.ca](mailto:grnthumb@shaw.ca)

### Streamside Native Plants

7455 Island Highway West, Bowser, British Columbia V0R 1G0  
Phone/Fax: 250-757-9999 / Toll Free: 877-570-3138

[http://members.shaw.ca/nativeplants/streamside\\_home.html](http://members.shaw.ca/nativeplants/streamside_home.html)

E-mail: [Richard@streamsidenativeplants.com](mailto:Richard@streamsidenativeplants.com)

The nursery is located at 7455 Island Highway West (Highway 19A) Bowser B.C.

## 6.2 INSTALLATION AND MAINTENANCE RECOMMENDATIONS

- Installation of vegetation will be completed following the slope repair and must be maintained and irrigated as necessary through at least two summer seasons to optimize survival. Native flowering shoreline plant species can be incorporated into the landscape plan in addition to the native shrubs identified to add visual appeal. Appropriate native shoreline plants include: silver burweed, entire-leaved gumweed, beach pea, seashore lupin, silverweed, camas and nodding onion.
- Topsoil is to be added to the constructed slope where native shrub species plantings are to occur; a layer of top soil (~1ft deep) will be required for the planting area with



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composted bark mulch or straw layer on top to prevent moisture loss and soil erosion.

- Overall shrub density should be a minimum of one plant per m<sup>2</sup> along the top of slope and four plants per m<sup>2</sup> for the dune grass. Plant placement should mimic a natural growth pattern i.e. clusters of same species.
- For top of slope plantings, dig a hole 1.5 times the size of the pot and prepare the planting hole with topsoil and a handful of bone meal (reduces transplant shock). Water plantings immediately and as necessary until established. Planting in cool wet weather will reduce transplant shock and allow the plants to establish root systems without drought stress. Every year the site will need to be inspected for invasive species growth and dead plants. Invasives are to be removed as often as necessary.
- Dead plants are to be replaced until 100% cover is achieved. Infill is expected to occur from the selected species.
- The City of Nanaimo is currently recommending a maintenance period of 5 years to ensure successful planting projects.

## 7.0 ENVIRONMENTAL PROTECTION MEASURES

Environmental protection measures are to be in place prior to excavation and construction activities. Site runoff management and spill prevention contained in this report should be reviewed with the construction crew prior to the start of the project. If additional environmental support is necessary due to an unforeseen event, Aquaparian will be available upon request. Aquaparian will be available to complete a site inspection during project construction and a post construction inspection with report if required by a change in scope, or an environmental incident such as a spill or sedimentation onto the foreshore.

Aquaparian recommends the following Environmental Protection Measures for this project based on the construction information provided:

- Environmental monitoring on a part-time basis is recommended for this project. Aquaparian will be available upon request.
- Complete excavation and construction activities during periods of low tide conditions and dry weather or minimal rain forecast if possible. Minimize tracking back and forth across the beach as much as feasible.
- Sediment control materials are to be brought to the site prior to starting excavations and may include poly sheeting, sand bags, silt fence etc.
- Do not stockpile waste materials on site – remove as soon as possible.



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- All heavy equipment should be clean and free of leaks and to have a fully stocked spill kit on board.
- Drift logs that need to be moved out of the work area are to be replaced following completion of the project and embedded in the beach material as best as possible.
- Control of site drainage and runoff may be necessary during or following excavation, construction, and landscaping activities to prevent migration of fines if a heavy rain event occurs. Measures may include: temporarily covering the exposed soils with sheets of poly and weighing it down to prevent it blowing off, containing or redirecting/diversion of runoff with sand bags (or similar), placement of additional silt curtains between work areas and the foreshore, or temporary work stoppages.
- During excavations, if soils are temporarily stockpiled on site they are to be stored above the top of bank on the grass areas and will require protection from stormwater exposure i.e. place soils on a sheet of poly and cover with a tarp or sheet of poly.
- The following water quality guidelines for turbidity apply to the Project where "background" is defined as the level at an appropriate adjacent reference site that is neither affected by works at the site, nor by sediment-laden, induced suspended sediments, or induced turbidity resulting from works or activities with the Project of work site:
  - Change from background of 8NTU at any one time for a duration of 24hr during clear waters;
  - Change from background of 2NTU at any one time for a duration of 30 days during clear waters;
  - Change from background of 5NTU at any time when background is 8-50NTU during turbid water;
  - Change from background of 10% when background is >50NTU at any time during turbid water;

*(Table 1: Summary of water quality guidelines for turbidity, suspended and benthic sediments. For complete details (including definitions for background, clear flow, and turbid flow) see Caux et al. (1997) (<http://www.env.gov.bc.ca/wat/wq/BCguidelines/turbidity/turbiditytech.pdf>)*



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## 8.0 CONCLUSION

Shoreline erosion protection is required for the two subject parcels to prevent ongoing erosion and to protect the existing sanitary systems located between the top of bank and the houses.

The 3500 Chinook Road slope repair and landscape plan consists of installation of toe rock, infilling of the failure areas with rock material to create a 1 to 1.5 slope, installation of a walkway, addition of beach sand to the newly constructed rip rap slope and planting with dune grass, and vegetation of the top of the rock revetment with native shrubs for a total restoration area of 37m<sup>2</sup>.

The 3520 Chinook Road project works include installation of toe rock, infilling with rock material at the toe of the embankment with rock to create a bench with a 1 to 0.5 slope, planting with dune grass at the toe of the bench and vegetation of the top of the bench with native shrubs for a total restoration area of 62m<sup>2</sup>. The proposed work activities are within the 15m setback from the ocean defined in the City of Nanaimo Environmentally Sensitive Areas DPA and the Natural Hazard Lands DPA. As such, habitat compensation (i.e. native plant replacement) is required for this project to replace habitat value along the shoreline.

Anticipated risks to the environment during construction and landscaping are expected to be limited to potential runoff of deleterious substances resulting from equipment failure or very heavy rain events mobilizing fines outside the work area. If all mitigation measures are implemented as recommended in this report, no negative impact to the adjacent marine environment is expected to occur.



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## 9.0 CLOSURE

This report has been completed in accordance with generally accepted biological practices. No other warranty is made, either expressed or implied. Aquaparian does not take any responsibility for the suitability of the erosion control designs for this project.

Aquaparian trusts that the information provided in this report meets your requirements. Any questions regarding information provided in this document, please contact the undersigned at (250) 591-2258.

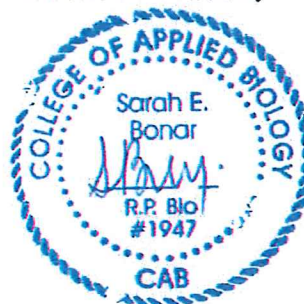
Sincerely,

**AQUAPARIAN ENVIRONMENTAL CONSULTING LTD**

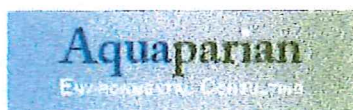
Prepared by:

Reviewed/Revised by:

  
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Environmental Technician



Sarah Bonar B.Sc., R.P.Bio  
Biologist/Principal



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**SARAH BONAR** 250-714-8446 **CHRIS ZAMORA** 250-714-8864



**FIGURE 1. SITE LOCATION MAP**  
**3500 & 3520 CHINOOK ROAD**

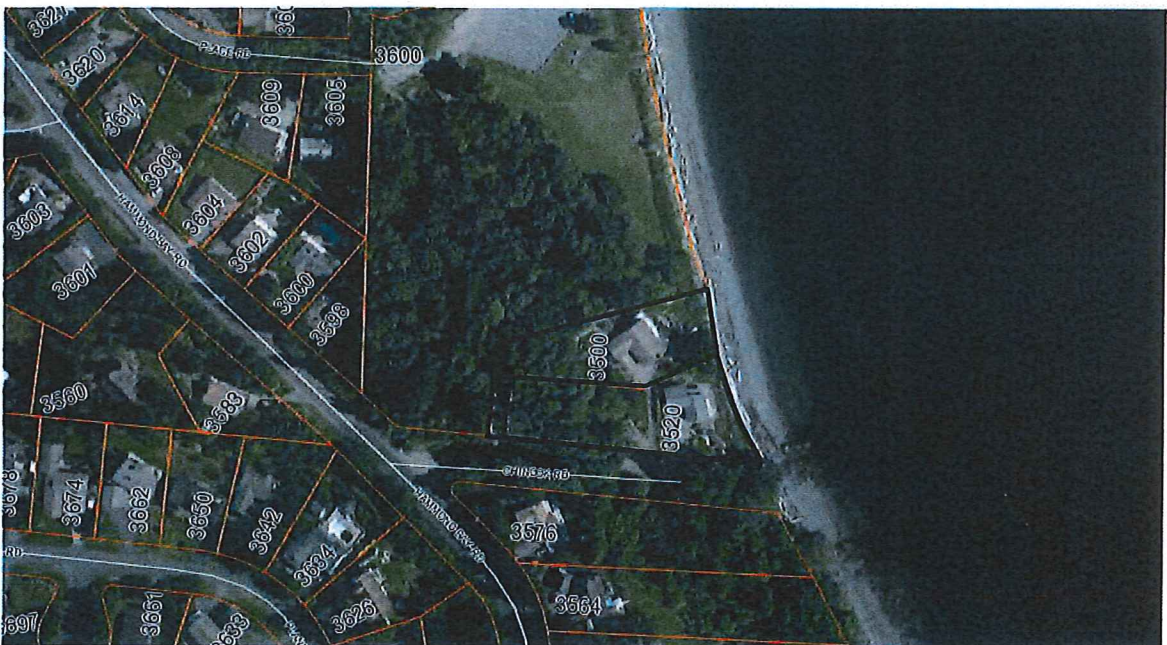
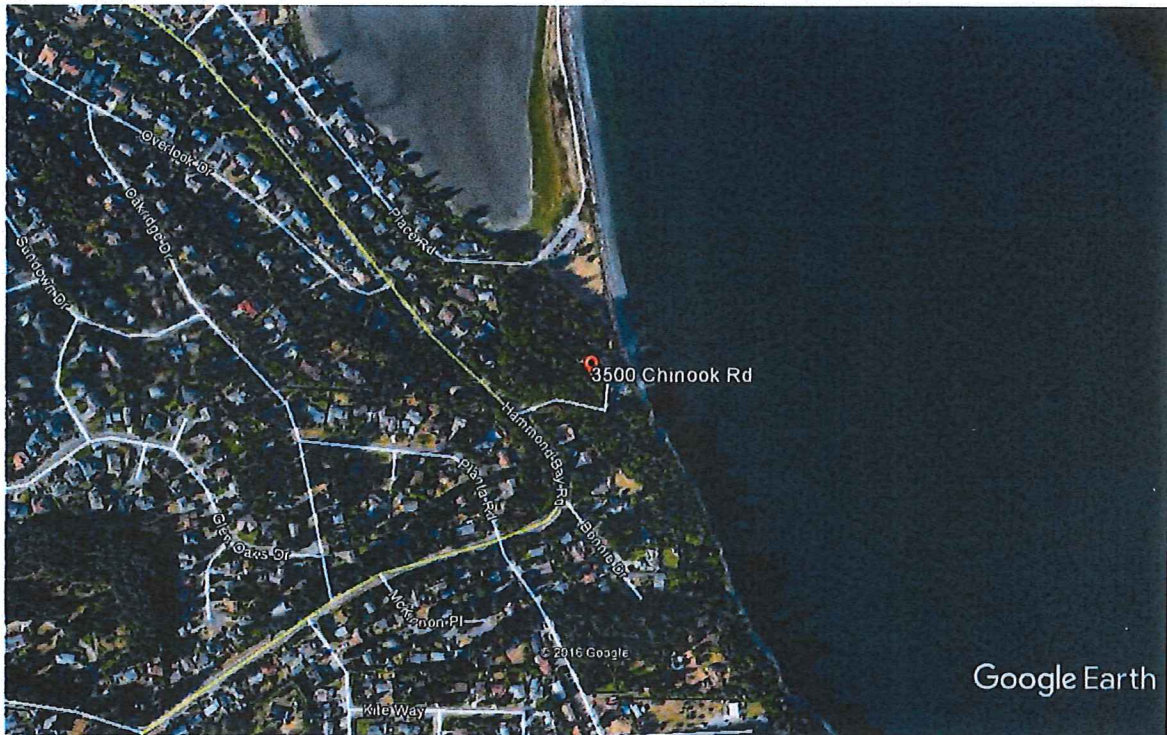


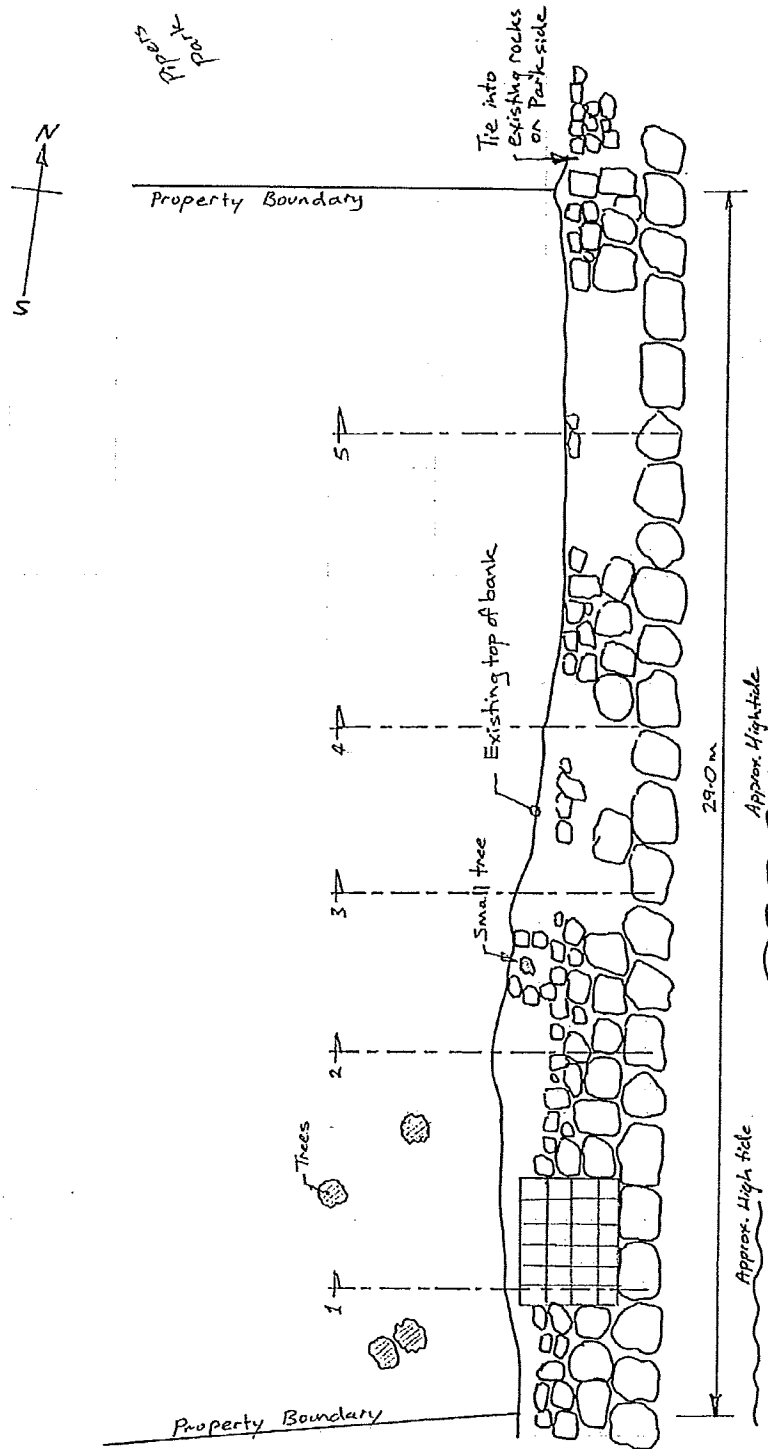
FIGURE 2. SITE PLAN

3500 Chinook Road  
Nanaimo  
Basher Property

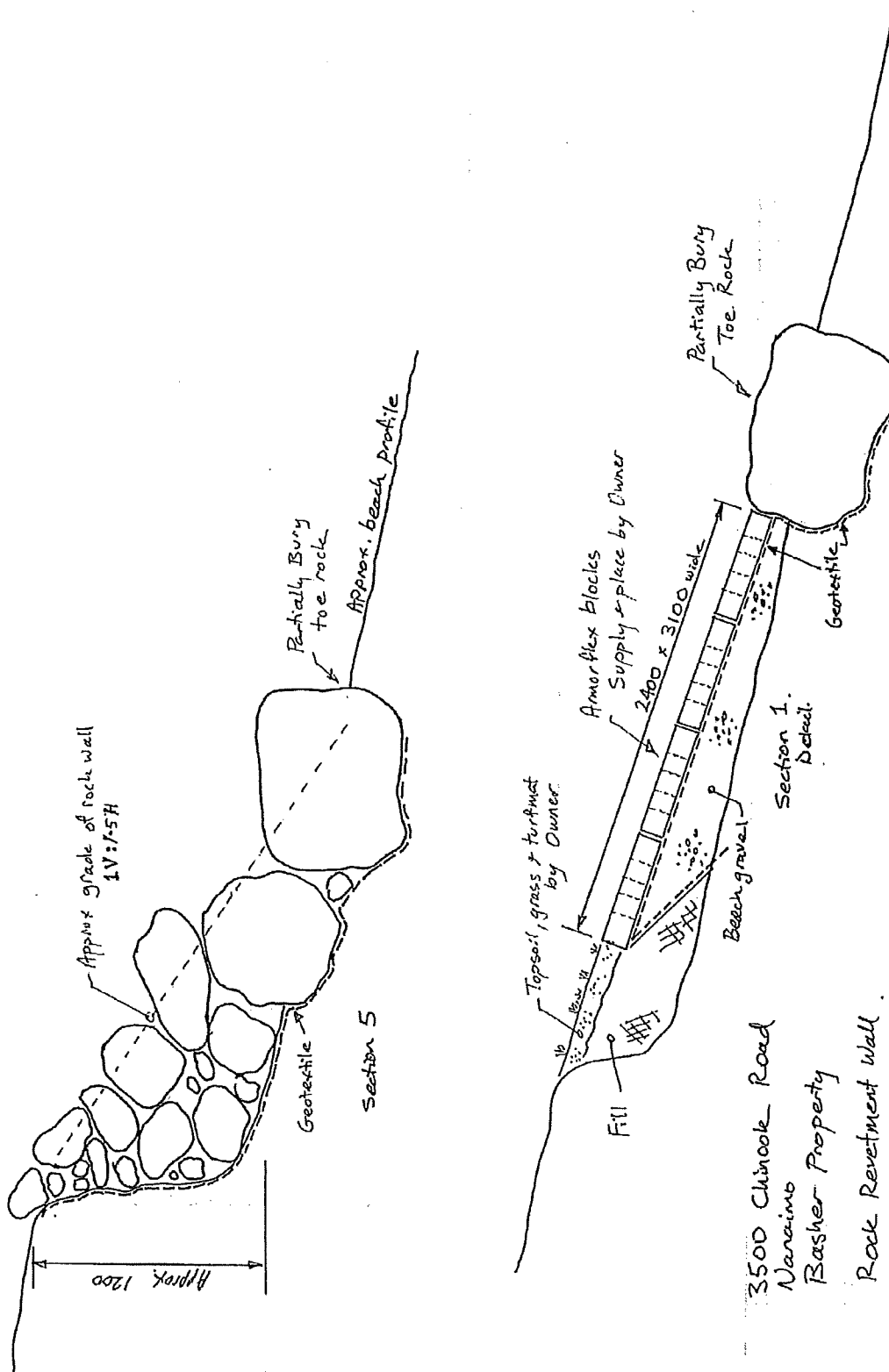
Rock Revetment Wall

Plan View

Scale 1:100

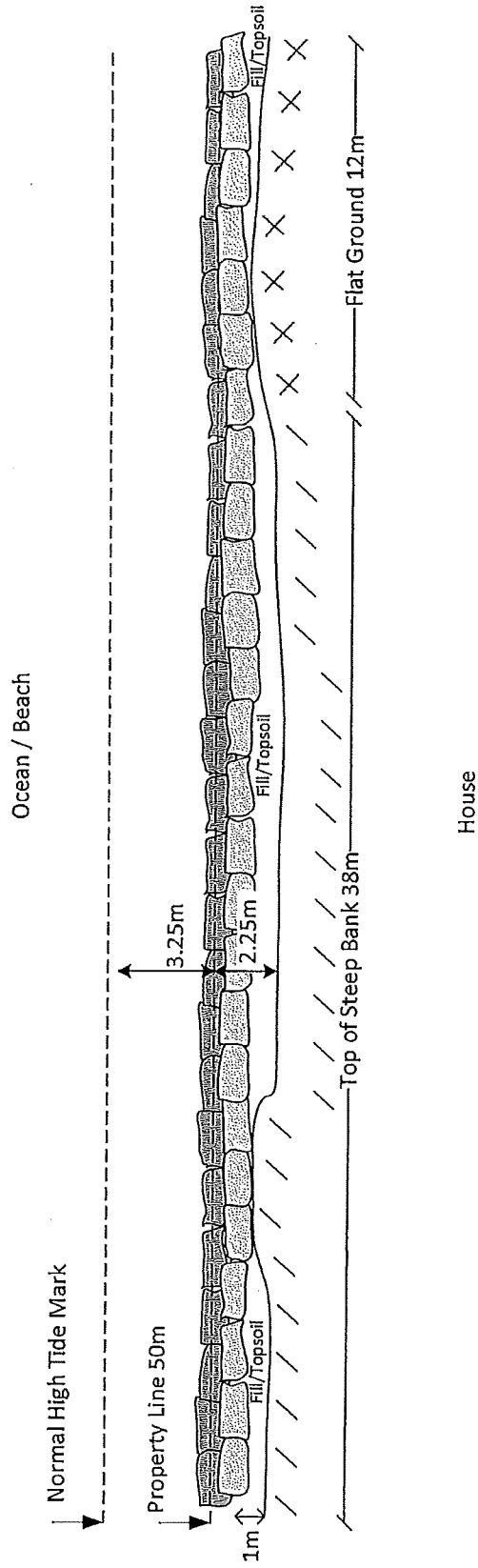






Proposed Soft Barrier — 3520 Chinook Rd.  
Overhead View

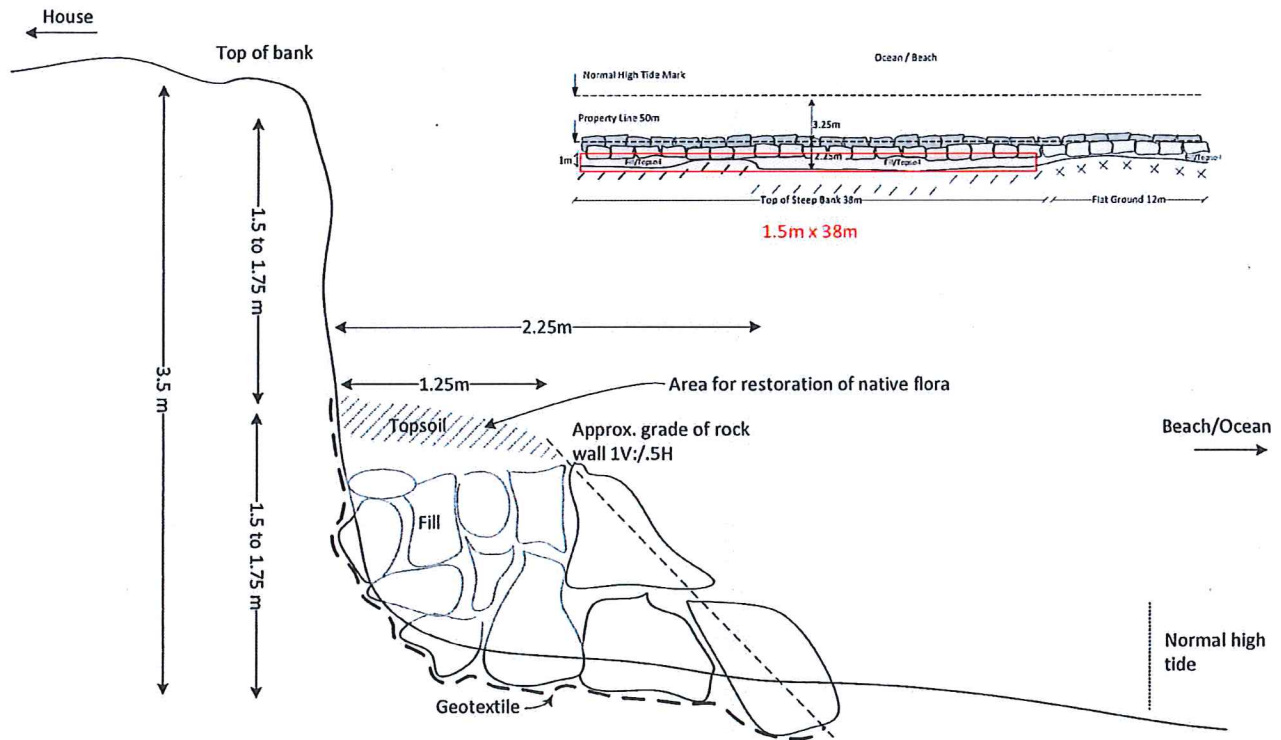
← Basher Property  
3500 Chinook Rd



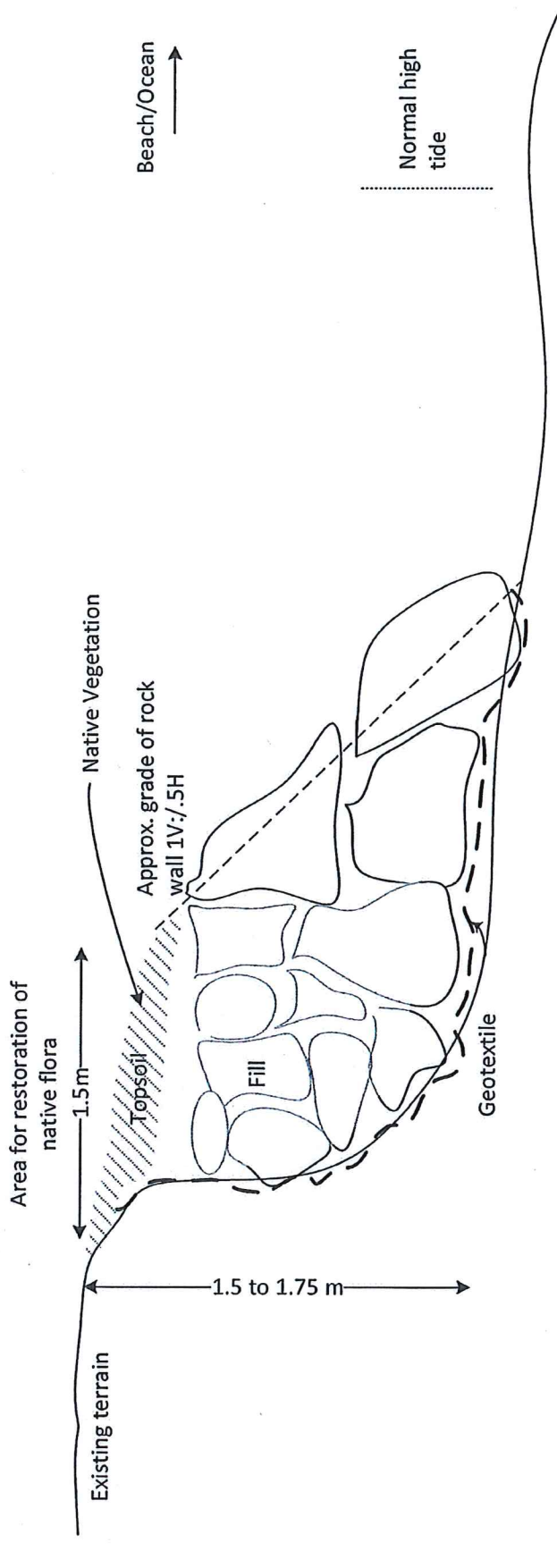
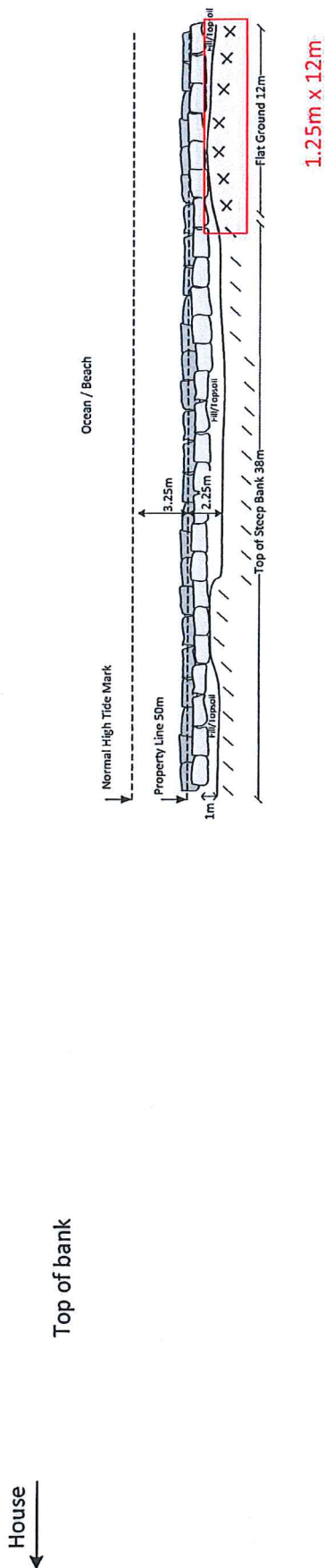
Scale  
85mm = 17m  
5 mm = 1m



## Proposed Soft Barrier – 3520 Chinook Rd.

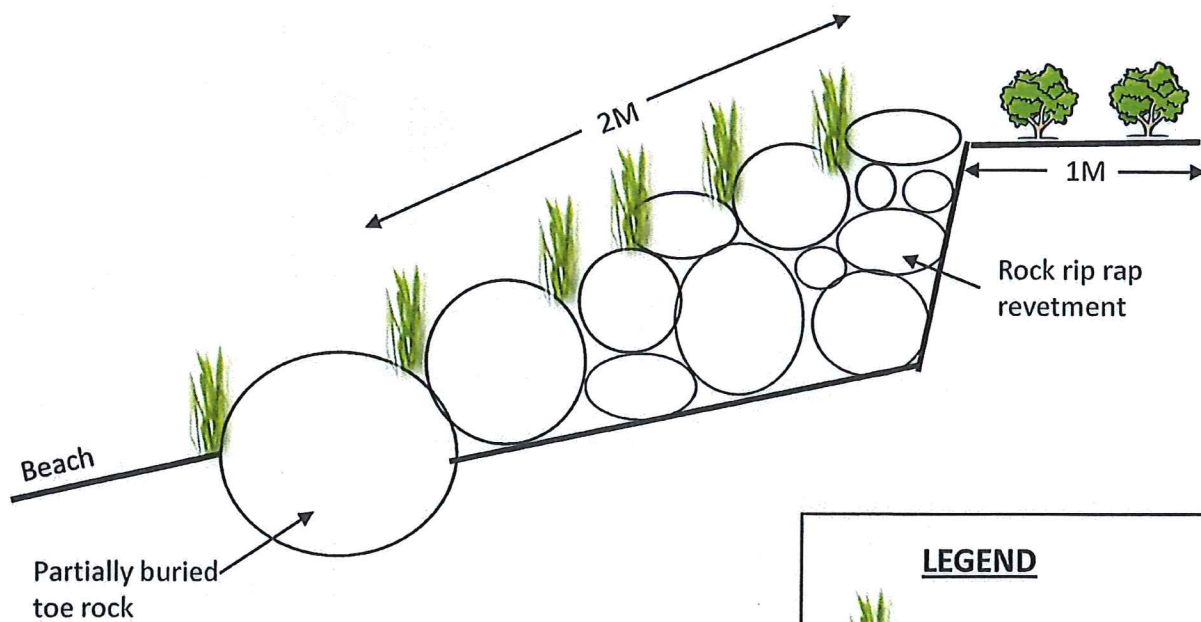


# Proposed Soft Barrier – 3520 Chinook Rd.





**FIGURE 3. PLANTING PLAN  
3500 CHINOOK ROAD**



**LEGEND**



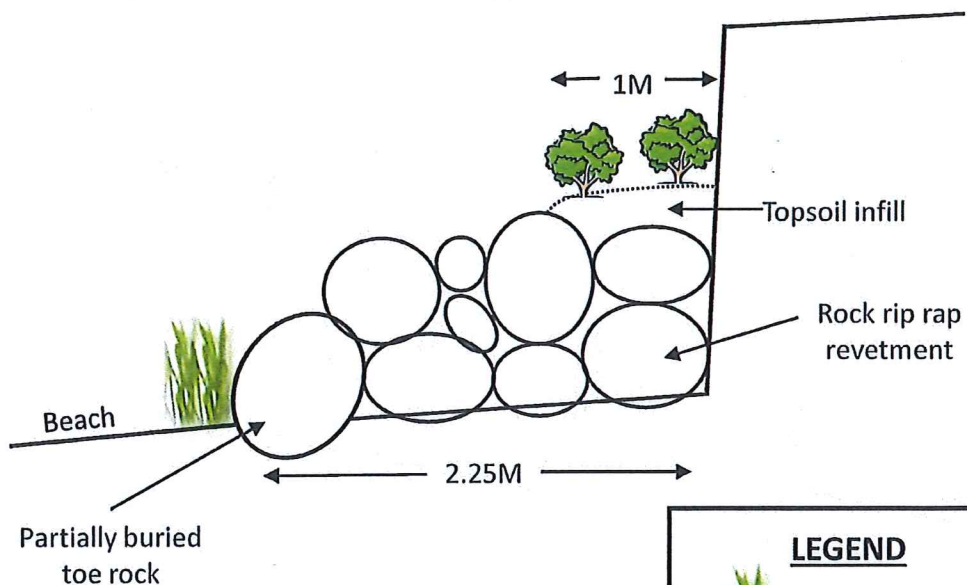
Dune grass





Native shrubs: nootka rose, snowberry, oceanspray



# PLANTING PLAN 3520 CHINOOK ROAD



LEGEND	
	Dune grass
	Native shrubs: snowberry, nootka rose, oceanspray



**Site Photographs – 3500 Chinook Road  
Photo Sheet 1**



Photo 1. View of the front lawn and waterfront area from the front of the house. Facing east.



Photo 2. Showing the trees at the top of the embankment which are to remain.



**Photo Sheet 2 – 3500 Chinook Road**



Photo 3. Showing the embankment slope down to the beach vegetated with dune grass. Slope erosion areas evident. The rock rip rap will cover the erosion areas.



Photo 4. Facing south down the shoreline towards the neighbouring property. Showing slope above the high tide line to be reinforced with rock revetment.



**Photo Sheet 3 – 3500 Chinook Road**

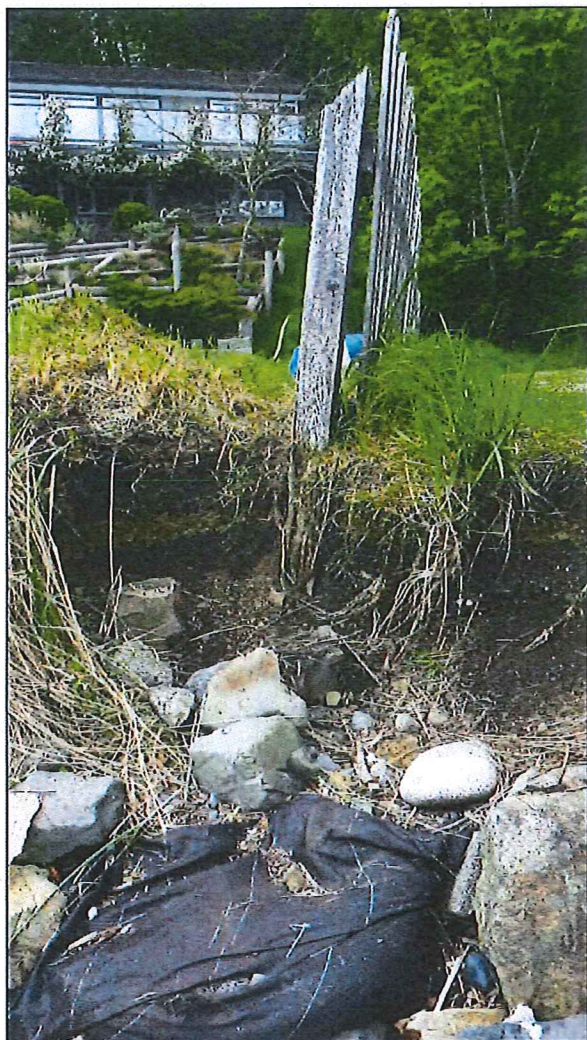


Photo 5. Showing the north property line fence and slope failure area.

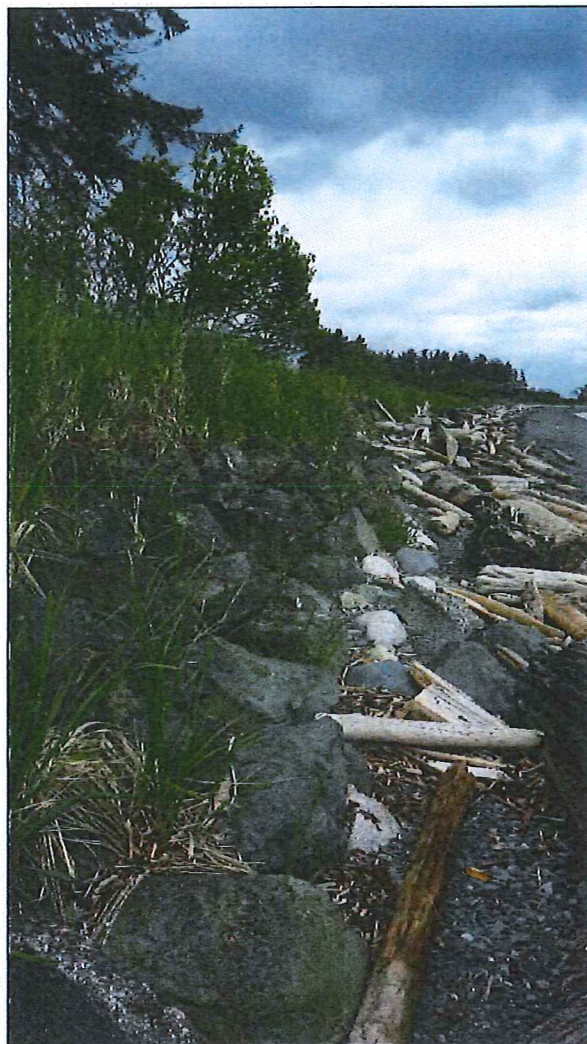


Photo 6. Showing the shoreline facing north towards Piper's Lagoon Park with rock rip rap shoreline protection.



**Photo Sheet 4 – 3520 Chinook Road**



Photo 1. Showing the top of the bank leading down to the beach. Facing south.



Photo 2. Showing thickly vegetated embankment with erosion along the toe of the slope.



**Photo Sheet 5 – 3520 Chinook Road**



Photo 3. Large driftwood logs at the base of the slope piled up from storm events. Logs can be moved to make room for rock rip rap and be placed near the toe of the revetment. Facing south.



Photo 4. Showing the southeast corner of the property where the small shed is located.



**Photo Sheet 6 – 3520 Chinook Road**



Photo 5. Showing the flat area near the south property boundary.



Photo 6. Showing the embankment slope facing north towards the neighbouring property (3500 Chinook Road). Erosion evident at the toe of the slope.