



REGIONAL DISTRICT OF CENTRAL KOOTENAY

DEVELOPMENT PERMIT

DP2110E (Downey)

Date: July 13, 2021

Issued pursuant to Sections 490 and 491 of the Local Government Act

1. This Development Permit is issued to Cynthia Lynn Downey and Arthur William Downey of Nelson, BC as the registered owners (hereinafter called the "Permittees") and shall only apply to those lands within the Regional District of Central Kootenay, in the Province of British Columbia legally described as PARCEL 1 (SKETCH PLAN 21362A) BLOCK E DISTRICT LOT 4161 KOOTENAY DISTRICT PLAN 761A (PID: 015-873-641) as shown on the attached Schedules 1 and 2, forming part of this Permit, referred to hereafter as the "said lands".
2. This Development Permit is issued subject to compliance with all of the bylaws of the Regional District of Central Kootenay applicable thereto, except as specifically varied or supplemented by this Permit.
3. This Development Permit shall not have the effect of varying the use or density of land as specified in the applicable Zoning Bylaw of the Regional District of Central Kootenay, nor a Floodplain Specification under Section 524 of the Local Government Act.
4. The said lands have been designated Country Residential (RC) and are located within a 'Watercourse Development Permit Area' pursuant to the *Electoral Area 'E' Rural Official Community Plan Bylaw No. 2260, 2013*.
5. The Permittees have applied to the Ministry of Transportation and Infrastructure for a two lot subdivision proposal to separate the existing house from the main lot (Lot A – 0.3 hectares,) and create a new building lot (Lot 2 – 2.58 hectares) on the said lands, related proposed development also includes: re-graveling of a 3 metre wide driveway along the west side of proposed Lot A, and connecting a waterline from the reservoir building to a future dwelling for proposed Lot B. Pursuant to this Development Permit and subject to the terms and conditions herein contained, as well as all other applicable Regional District Bylaws, the Regional District of Central Kootenay hereby authorizes the use of the said lands for this purpose.
6. The Permittees are required to obtain approval in writing from the Regional District of Central Kootenay prior to any further disturbance, construction any new buildings, external additions to existing buildings or for any deviation from the development authorized under Schedules 2 and 3 of this Development Permit. Furthermore, the Permittees are hereby advised of the following requirements:
 - 6.1 The Regional District of Central Kootenay Building Department requires that the Permittees obtain a demolition permit and/or building permit prior to the removal of any existing buildings and structures, the renovation, expansion or alteration of any existing building and the construction of any new building.
 - 6.2 Development is authorized in accordance with the terms described in the report titled "5775 Longbeach Road, BC - Riparian Assessment" prepared by Masse Environmental Consultants Ltd., dated May 10, 2021, and attached to this permit as Schedule 3. Conditions of the report can be categorized as follows:
 - 6.2.1 Measures to protect the integrity of the Streamside Protection and Enhancement Area (SPEA) include the protection of trees and other vegetation within the SPEA, sediment and

erosion control, storm water management, protection of fish habitat, scheduling of environmentally sensitive activities, construction waste management, management of equipment and fuel/lubricant materials and management of invasive plants. All work shall be done in accordance with Section 5 of the attached report (Schedule 3). Notably, the following conditions shall be adhered to:

- 6.2.1.1 Staging and access should only occur in previously disturbed areas of the site;
 - 6.2.1.2 The SPEA should be clearly marked prior to construction of the new dwelling on Lot B to protect vegetation and root systems within the SPEA. Snow fencing shall be installed along the 10 metre setback from Craigend Creek or top of embankment and shall remain in place through the duration of construction.
 - 6.2.1.3 No pollutants should be allowed to contaminate the soil within the development area next to the SPEA.
 - 6.2.1.4 To reduce the risk of sediment input into Craigend Creek the amount of soil disturbance should be kept to a minimum. Any surface runoff should be controlled and directed away from exposed soils. In the event of heavy rainfall, additional mitigation measures such as ditching or covering soils may be required to ensure turbid wastewater does not leave the construction site and enter the creek. Soil should be safely stockpiled in a manner that eliminates the possibility of erosion and sediment transport. Disturbed soils should be revegetated as soon as possible after construction.
 - 6.2.1.5 The following mitigation measures will help decrease stormwater impacts: rainwater collected on roofs should not be allowed to form surface runoff. Downspouts should direct rainwater into suitable landscape features which can absorb and utilize runoff rather than discharging it directly; and stormwater discharges must adhere to the Water Sustainability Act or any other applicable legislation.
 - 6.2.1.6 Works should be scheduled to avoid impacts to nesting birds. The best timing for vegetation clearing is within the least risk window for nesting birds (August 15-April 15). Any clearing outside of these windows shall require a nesting survey.
 - 6.2.1.7 Development of the property should protect fish habitat by adhering to sediment, stormwater, and waste management best practices outlined in the Riparian Assessment to ensure that there is no release of deleterious materials into Craigend Creek.
 - 6.2.1.8 To minimize the likelihood and impact of a spill of fuel/lubricant materials within the riparian area, ensure that: each piece of heavy equipment will have its own spill response kit; all staff will be familiar with the use of spill kits and their contents; and equipment shall be stored in a designated area as far from Craigend Creek as possible and secondary containment will be utilized to capture any potential spills or leaks.
 - 6.2.1.9 To reduce the establishment and proliferation of invasive plant species on site: all equipment should be thoroughly washed and inspected before entering the project site to prevent the import of new invasive plant seeds and root fragments; amount of vegetation clearing, and soil disturbance should be minimized; all exposed soils should be re-vegetated immediately following construction.
- 6.3 The proposed development shown in Schedule 2 does not encroach within the SPEA and the same "not net loss" principle as outlined in the Shoreline Management Guidelines for

Kootenay Lake have been followed for this subdivision proposal. The proponent has demonstrated the principle of “avoidance” by locating the proposed new home outside of the 10 metre SPEA of Craigend Creek. To help restore these areas invasive scotch broom shall be removed within the SPEA, and the following revegetation plan will include: planting native trees at a minimum 3 metre spacing and shrubs at a minimum 1 metre spacing. Refer to Table 3 for the recommended plant species list. Plant composition and plant locations within the revegetation area are at the discretion of the owner. Planting should not occur during period of hot dry weather unless they are irrigated daily. Preferred planting periods are in the spring or fall. Additional soil amendments, including top soil, mycorrhizae, and shrub and tree transplant fertilizer are recommended during planting. Bark mulch placement around each of the planted stock will help the soil retain moisture and reduce weeds and watering requirements. Ensure the objective of the restoration is to naturalize the riparian area and not create a landscaped garden. Plant species shall be in accordance with Table 3.

- 6.4 A building permit shall be required prior to any construction involving land in this location at which time the Permittees shall be required to address sewage disposal issues to the satisfaction of the Interior Health Authority and Regional District of Central Kootenay Senior Building Official.
7. As a condition of the issuance of this Permit, the Regional District shall hold an irrevocable Letter of Credit submitted by the Permittees in the amount of \$750 to ensure the landscaping requirements as set forth in Section 7 are completed and in accordance with the following provisions:
 - 7.1 A condition of the posting of the Letter of Credit is that should the Permittees fail to carry out the works and services as herein above stated, according to terms and conditions of this permit within the time provided, the Regional District may use the Letter of Credit to complete these works or services by servants, agents or contractors, and any surplus shall be paid over to the Permittees. If the amount of funds is insufficient to cover the actual cost of completing the works, then the Permittees shall pay such deficiency to the Regional District immediately upon receipt of the Regional District’s bill for same.
 - 7.2 The Permittees shall complete the landscaping works required by this Permit prior to July 16, 2023. Within this time period the required landscaping must be inspected and approved by the Regional District.
 - 7.3 If the landscaping is not approved within this time period, the Regional District has the option of continuing to renew the Letter of Credit until the required landscaping is completed or has the option of drawing from the Letter of Credit to complete the required landscaping. In this event, the Regional District or its agents have the irrevocable right to enter into the property to undertake the required landscaping for which the Letter of Credit was submitted.
 - 7.4 If the landscaping is approved within this time period without the Regional District having to draw the on the Letter of Credit, 90% of the original amount of the Letter of Credit shall be returned to the Permittees.
 - 7.5 A hold back of 10% of the original amount of the Letter of Credit shall be retained until a final inspection is undertaken within 12 months of the date of the original inspection and approval was given to the landscaping. If the landscaping receives approval at final inspection, the 10% hold back will be returned to the Permittees. If after the final inspection, approval of the landscaping is not given, the Regional District has the option of continuing to renew the Letter of Credit until the required landscaping is approved or has the option of drawing on the Letter of Credit the funds to complete the required landscaping. In this event, the Regional District or its agents have the irrevocable right to enter onto the property to undertake the required landscaping for which the Letter of Credit was submitted.
8. The said lands shall be developed strictly in accordance with the terms and conditions of this Development Permit and the requirements of all applicable Regional District Bylaws as well as any plans and specifications which may, from time to time, be attached to this Permit shall form a part

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thereof.

9. In accordance with the Local Government Act, if the development authorized by this Development Permit is not commenced within two years of the date of this Permit, this Permit shall lapse.
10. In accordance with the Local Government Act, 'Notice' shall be filed in the Land Title Office that the said lands are subject to this Development Permit.
11. The terms of this Development Permit including subsequent amendments, are binding on all persons who acquire an interest in the said lands associated with this Permit.
12. It is understood and agreed that the Regional District has made no representations, covenants, warranties, guarantees, promises, or agreement (verbal or otherwise) with the Permittees other than those in this Development Permit. It is solely the responsibility of the Permittees to ensure that the requirements of all other applicable government agencies are satisfied.
13. This Development Permit does not constitute a building permit.
14. This Development Permit shall come into force and effect 14 days after the date of issuance unless a Waiver of Appeal is received from the Permittees at which time the Development Permit shall be deemed to be issued upon receipt of the Waiver of Appeal. OR If a Notice of Appeal is received the Development Permit shall be suspended until such time as the Board of the Regional District of Central Kootenay has decided the Appeal.

S Sudan

Sangita Sudan, General Manager of Development Services

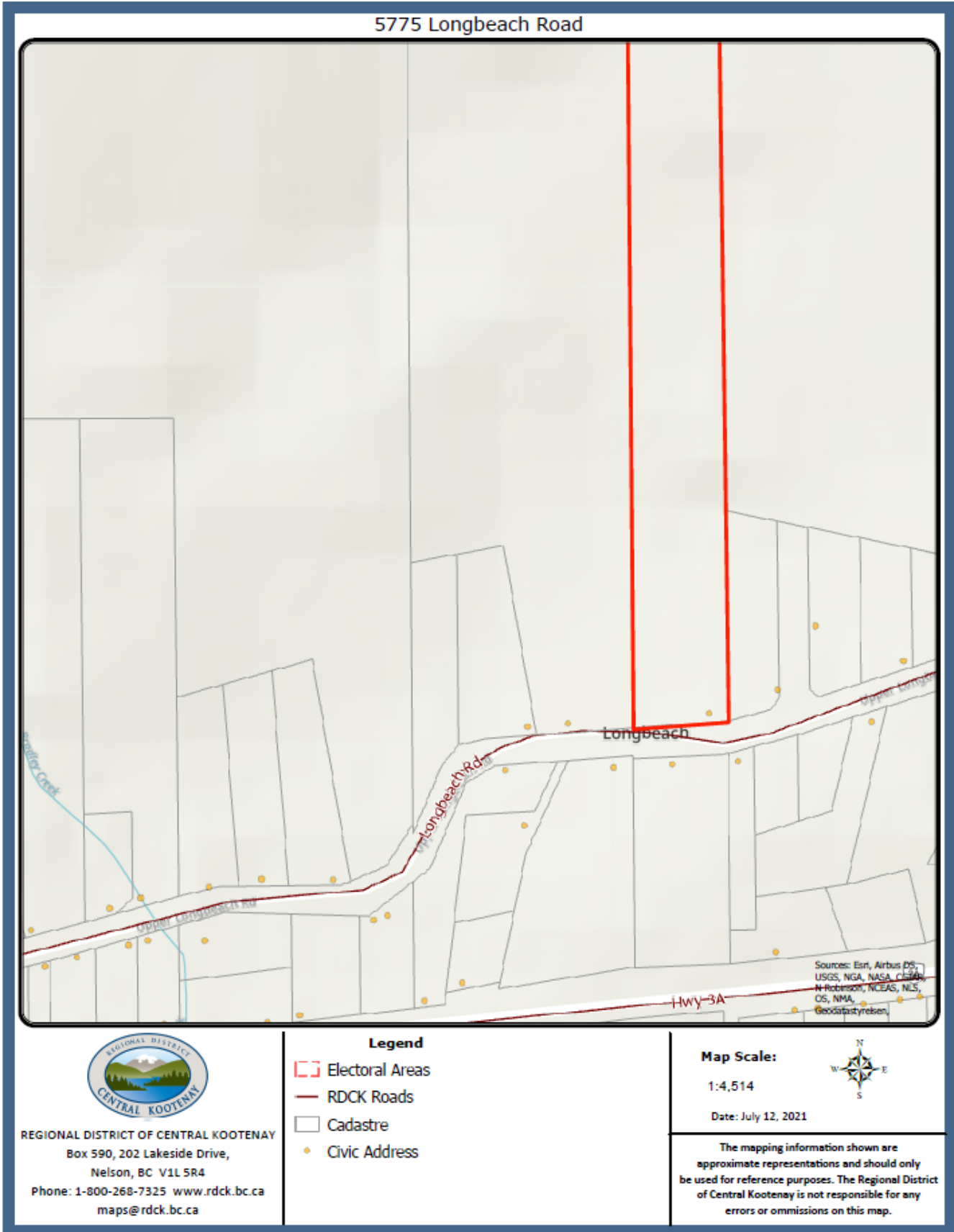
July 15, 2021

Date of Approval

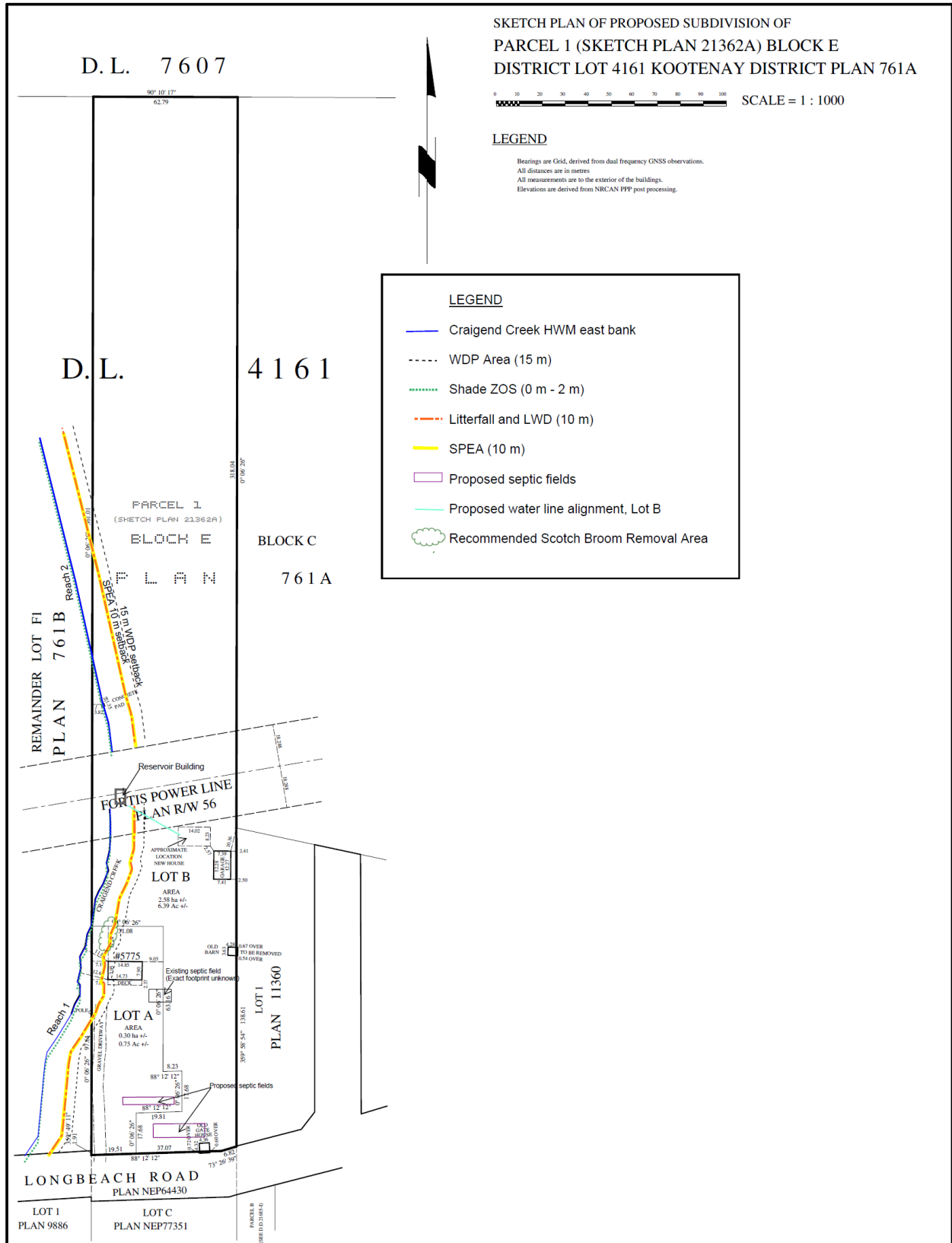
July 23, 2021

Date of Issuance

Schedule 1: Location Map



Schedule 2: Site Plan



Development Permit File DP2110E-06654.000-DOWNEY-DP000115

Schedule 3: Riparian Assessment, dated May 10, 2021 by Masse Environmental Consultants Ltd. for 5775 Longbeach Road



**5775 LONGBEACH RD
LONG BEACH, BC**

Riparian Assessment



Prepared for:
Regional District of Central Kootenay
202 Lakeside Drive,
Nelson BC, V1L 5R4

Prepared by:
Masse Environmental Consultants Ltd.
812 Vernon St.
Nelson, BC, V1L 4G4

May 10, 2021

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ABBREVIATIONS

- AHI: Aquatic Habitat Index
- DBH: Diameter at Breast-Height
- FIM: Foreshore Inventory Mapping
- GSC: Geodetic Survey of Canada
- HWM: High Water Mark
- LWD: Large Woody Debris
- FLNRORD: Forests, Lands and Natural Resource Operations and Rural Development
- QEP: Qualified Environmental Professional
- RAR: Riparian Area Regulation
- RDCK: Regional District of Central Kootenay
- ROW: Right of Way
- SPEA: Streamside Protection and Enhancement Area
- WDP: Watercourse Development Permit
- ZOS: Zones of Sensitivity

1 INTRODUCTION

Masse Environmental Consultants Ltd. was retained by Cindy Downer (Owner), to provide environmental consulting services for a watercourse development permit application for the proposed subdivision and development at 5775 Longbeach Rd (PID 015-873-641). The area proposed for subdivision and development is a ~2.88 ha property which the proponent proposes to subdivide into two lots, Lot A (0.3 ha) and Lot B (2.58 ha). Craigend Creek flows through the subject property which triggers the requirement for a watercourse development permit area (WDP) application. A site survey was conducted on April 6, 2021 by Fiona Lau B.Tech., A.Sc.T.

This riparian assessment evaluates the existing conditions of the property and riparian areas, identifies habitat values, assesses potential environmental impacts, and recommends mitigation measures to protect and compensate for the alterations within the riparian area. It is based on the following regulatory framework and best management practices documents:

- Electoral Area 'E' Rural Official Community Plan Bylaw No. 2260, 2013.
- British Columbia *Riparian Areas Regulation*
- Kootenay Lake Shoreline Management Guidelines
- British Columbia *Water Sustainability Act*
- General BMPs and Standard Project Considerations (Ministry of Environment)
- On the Living Edge: Your Handbook for Waterfront Living
- Develop with Care. Environmental Guidelines for Urban and Rural Land Development in British Columbia
- British Columbia Firesmart Homeowners Manual
- Riparian Factsheet No. 6 – Riparian Plant Acquisition and Planting
- BC Tree Replacement Criteria
- A Homeowner's Guide to Stormwater Management.

This report has been prepared by Fiona Lau B.Tech., A.Sc.T., and reviewed by Lisa Pavelich, BSc, PAg.

I, Fiona Lau, hereby certify that:

- a) I am a qualified environmental professional, as defined in the Riparian Areas Regulation made under the Fish Protection Act;
- b) I am qualified to carry out this part of the assessment of the development proposal made by the developer;
- c) I have carried out my assessment of the development proposal, and my assessment is set out in this Assessment Report; and
- d) In carrying out my assessment of the development proposal, I have followed the assessment methods set out in the Schedule to the Riparian Areas Regulation.

2 PROJECT OVERVIEW

2.1 Location

The subject property is located ~9 km west of the community of Balfour, BC (Appendix 1). The property is bordered by private properties to the west (5745 Longbeach Rd) and east (5781 Longbeach Rd), Ministry of Transportation (MoT) right of way to the south (Longbeach Rd) and Crownland to the north. Fortis Power has an easement which crosses through the mid portion of the property.

The project area is within the Interior Cedar Hemlock dry warm variant 1 (ICHdw1) biogeoclimatic subzone (MacKillop and Ehman 2016). This moist climatic region is characterized by very hot, moist summers; and very mild winters with light snowfall. Soils generally dry out in late summer for varying extents of time ranging from insignificant to extensive. Snowpacks are very shallow to shallow and of short duration and combined with the mild climate result in no significant soil freezing (MacKillop and Ehman 2016).

2.2 Existing Site Conditions

2.2.1 Watercourses

Craigend Creek flows in a north to south direction through Lot B for ~40 m, north of the Fortis Power easement (Photo 1), where it is culverted and daylighted south of the easement for ~50 m (Photo 2) before flowing into the neighbouring property (5745 Longbeach Rd) adjacent to Lot A (Photos 3 and 4). Craigend Creek then crosses under Longbeach Rd and Hwy 3 and discharges into Kootenay Lake approximately ~300 m downstream of the property.



Photo 1. Upstream view of Craigend Creek north of Fortis Power easement, Lot B.



Photo 2. Upstream view of Craigend Creek below Fortis Power easement, Lot B.

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Photo 3. Upstream view of Craigend Creek next to house, proposed Lot A. Red line depicts approximate property line.



Photo 4. Downstream view of Craigend Creek within neighboring property (5745 Longbeach Rd) adjacent to proposed Lot A.

2.2.2 Existing Development

The property consists of both developed and undeveloped portions of land. In general, the lower portion of the property (proposed Lots A and B) below the Fortis Power easement have been historically cleared for farming and homestead purposes. Existing development within this portion of the property consists of a home, garage, old barn, reservoir building, gate house and driveways. The existing home and driveway along the west side of proposed Lot A is located partially within the 15 m WDP area of Craigend Creek (Photos 5 and 6). All other infrastructure is sited outside of the 15 meter WDP area within proposed Lot B. Temporary construction material storage areas were observed along the top of bank adjacent to the house within the riparian area (Photo 8).

The upper portion of the property (Lot B) is forested and undeveloped. This land was historically cleared; however, has been left to naturalize. The only infrastructure observed within this portion was the water box intake on Craigend Creek and a trail from the lower portion of the property to the water intake (Photo 9).

In March 2021, a severe wind storm occurred along the North Shore of Kootenay Lake taking down a few large conifer trees on and next to the subject property. A professional arborist was retained to assess the trees around the existing house and determined that seven trees were deemed a hazard. These trees have been taken down along the west side of the house within the subject property and on the neighboring property within the 15 m WDP area.

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Photo 5. View of existing home, proposed Lot A.



Photo 6. Existing driveway located along west side of proposed Lot A.



Photo 7. Recently cut hazard tree within subject property within the WDP area.



Photo 8. Recently cut hazard trees on 4745 house next to creek within the WDP area.



Photo 9. Water box on Craigend Creek, proposed Lot B.



Photo 10. Hazard tree removed next to proposed Lot A upstream of house within the WDP area.

2.3 Proposed Development

The proposed development within the 15 m WDP area consists of:

- Subdivision of single lot into two lots (Lot A and B).
- Re-graveling of 3 m wide driveway along west side of proposed Lot A.
- Connecting waterline from reservoir building to new house of proposed Lot B.

Refer to Site Plan for proposed development footprint and locations (Appendix 2).

2.4 Services

Sewage disposal for the existing residence on proposed Lot A is located south-east of the house, however the exact location and size could not be confirmed. The future reserve septic field for proposed Lot A will be located at the south end of the lot, >30 meters from Craigend Creek. The future septic field for proposed Lot B will be located at the south end of the lot, > 30 m from Craigend Creek. Septic field locations are shown on the Site Plan (Appendix 2).

The water source for the existing residence on proposed Lot A is a licensed system on Craigend Creek with a reservoir building located on proposed Lot B. The new residence proposed on Lot B will connect to the existing reservoir from Craigend Creek. Approximate waterline alignment is shown on the Site Plan (Appendix 2).

2.5 Streamside Protection and Enhancement Area

To determine whether the 15 m WDP setback from the HWM of Craigend Creek aligns with Riparian Area Protection Regulation (RAPR) criteria, a detailed assessment of the subject property was conducted to calculate the Streamside Protection and Enhancement Area (SPEA) setback. The stream was separated into two reaches (Reach 1- Lower portion and Reach 2- Upper portion), due to the change in gradient from 12% to 24%. Reach 1 had an average channel width of 0.6 m, while Reach 2 had an average channel width of 0.8 m. Results for the Zones of Sensitivity (ZOS) and SPEA are presented in Table 1, Figure 2 and Appendix 2.

As per the RAR, the Zone of Sensitivity (ZOS) setbacks were determined based on this stream width and channel type. The Large Woody Debris (LWD), and Litter ZOS were plotted at the minimum setback of 10 m from the HWM. The Shade ZOS was plotted 10 m due south of the high water mark (HWM) resulting in a shade ZOS of 0 - 2m. The SPEA was determined based on the ZOS with the greatest width. The SPEA throughout the site was determined to be 10 m from the stream boundary. Results for the ZOS and SPEA are presented in Table 1, and on the Site Plan (Appendix 2).

The BC Riparian Areas Regulation (BC 2015) defines "High Water Mark" and "Stream" as follows:

"High Water Mark" means the visible high water mark of a stream where the presence and action of the water are so common and usual, and so long continued in all ordinary years, as to mark on the soil of the

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bed of the stream a character distinct from that of its banks, in vegetation, as well as in the nature of the soil itself, and includes the active floodplain.”

"Stream" includes any of the following that provides fish habitat:

- (a) a watercourse, whether it usually contains water or not;
- (b) a pond, lake, river, creek or brook;
- (c) a ditch, spring or wetland that is connected by surface flow to something referred to in paragraph (a) or (b).

Table 1. Results of detailed RAPR assessment.

| Feature Type | SPVT ¹ | Zones of Sensitivity | | | SPEA |
|------------------------|-------------------|----------------------|-------------|--------|------|
| | | LWD | Litter fall | Shade | |
| Craigend Creek Reach 1 | TR | 10 m | 10 m | 0 -2 m | 10 m |
| Craigend Creek Reach 2 | TR | 10 m | 10 m | 0 m | 10 m |

¹SPVT: site potential vegetation type (TR-tree)

3 RESOURCES

3.1 Fish and Fish Habitat

Craigend Creek is a tributary to Kootenay Lake with no recorded fish presence and potential for fish occurrence is considered low due to lack of suitable fish habitat and connectivity. Dominant stream substrate consists of fines and gravel with more cobble in Reach 2 (Photos 11 and 12). Fish habitat is limited to overhanging vegetation providing litterfall and insect drop to the creek. The stream is culverted through a 500 mm diameter corrugated steel pipe (CSP) across the Fortis Power easement (Photo 13) and flows subsurface for ~6.5 m adjacent to the house (Photo 14).



Photo 11. View of typical stream substrate in section below Fortis Easement.



Photo 12. View of typical stream substrate upstream of Fortis easement.

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Photo 13. Perched culvert outlet downstream of Fortis easement proposed Lot B.



Photo 14. Area where creek flows subsurface next to existing house.

3.2 Riparian Vegetation

The riparian area along Reach 1 is relatively undeveloped with evidence of historical logging and forest maintenance practices including coarse woody debris and hazard tree removal (Photo 14). Bank slopes vary from 30-50% slope gradient, with banks becoming steeper upstream. The riparian area along Reach 1, downstream of the existing house consists of mature conifer trees with minimal understorey vegetation (Photo 15). Evidence of historical riparian vegetation removal and colonization of non-native species including periwinkle (*Vinca sp.*) and agronomic grasses was observed adjacent to the house (Photo 16). Upstream of the house, riparian vegetation composition consists of mixed conifer and deciduous trees with a variety of native shrub understory including skunk cabbage (*Symplocarpus foetidus*), alder sp. (*Alnus sp.*), willow (*Salix sp.*), elderberry (*Sambucus sp.*), thimbleberry (*Rubus parviflorus*), princes pine (*Chimaphila umbellata*) and falsebox (*Pachistima myrsinites*) (Photo 17).

The riparian area along Reach 2, above the Fortis Power easement is undeveloped and sited within a ravine (Photo 18). Bank slopes are 50- 70% gradient and evidence of historical logging is present. The riparian area is a mature conifer forest with understorey vegetation consisting mostly of young conifer tree saplings with abundant coarse woody debris and moss (Photo 19 and 20). An old stream bed or seepage draw was observed in the upper half of the property; however, it appears that the channel has been inactive for quite some time due to the lack of exposed soil, and presence of topsoil and young vegetation (Photo 21). Bank seepage was present on the ravine slope where the old channel would have flowed into Craigend Creek, indicating that there is subsurface flow present (Photo 22).

The dominant tree species within the riparian area of Craigend Creek consists of Interior Douglas Fir, Western red cedar (*Thuja plicata*), and Western hemlock (*Tsuga heterophylla*). Invasive Scotch broom (*Cytisus scoparius*) was observed in many areas of the subject property, with concentrated populations along the east side of the driveway, within the riparian area upstream of the house (Photo 23) and along the Fortis Power easement (Photo 24). Table 2 provides a list of plant species encountered within the riparian area of Craigend Creek.

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Photo 15. Downstream view, Reach 1.



Photo 16. Upstream view, Reach 1.



Photo 17. Upstream view Reach 1, north of house.



Photo 18. Downstream view Reach 2, above Fortis easement.



Photo 19. View of mature conifer trees along ravine banks, Reach 2.



Photo 20. View of steep ravine slope and minimal understorey, Reach 2.

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Photo 21. Upstream view of old stream channel/seepage draw in upper half of property.



Photo 22. Bank seepage on ravine bank near mouth of old stream channel/seepage draw.



Photo 23. Scotch broom patches within the riparian area upstream of house.



Photo 24. Scotch broom patch within Fortis Power easement.

Table 2. Plant species encountered on the property.

| Species Name | Latin Name | Species Name | Latin Name |
|----------------------|------------------------------|----------------------|------------------------------|
| Trees | | Shrubs cont. | |
| Interior Douglas fir | <i>Pseudotsuga menziesii</i> | Thimbleberry | <i>Rubus parviflorus</i> |
| Western red cedar | <i>Thuja plicata</i> | Falsebox | <i>Pachistima myrsinites</i> |
| Western hemlock | <i>Tsuga heterophylla</i> | Scotch broom | <i>Cytisus scoparius</i> |
| Ponderosa pine | <i>Populus trichocarpa</i> | Elderberry | <i>Sambucus sp.</i> |
| White Pine | <i>Pinus monticola</i> | Beaked hazelnut | <i>Corylus cornuta</i> |
| Grand Fir | <i>Abies grandis</i> | Twinflower | <i>Linnaea borealis</i> |
| Western yew | <i>Taxus brevifolia</i> | Herbaceous | |
| Paper birch | <i>Betula papyrifera</i> | Rattlesnake plantain | <i>Goodyera oblongifolia</i> |
| Western larch | <i>Larix occidentalis</i> | Common horsetail | <i>Equisetum arvense</i> |
| Shrubs | | Pink wintergreen | <i>Pyrola asarifolia</i> |
| Willow sp. | <i>Salix sp.</i> | Skunk cabbage | <i>Symplocarpus foetidus</i> |

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| Species Name | Latin Name | Species Name | Latin Name |
|---------------|-----------------------------|----------------|------------------|
| Alder sp. | <i>Alnus sp.</i> | Periwinkle sp. | <i>Vinca sp.</i> |
| Oregon grape | <i>Mahonia aquifolium</i> | Grasses sp. | |
| Princes pine | <i>Chimaphila umbellata</i> | Lichen sp. | |
| Red raspberry | <i>Rubus idaeus</i> | Moss sp. | |

3.2.1 Reptiles and Amphibians

Portions of the riparian area within the subject property provide both cover and forage habitat for reptiles. There is also potential for amphibians such as frogs; however, the creek does not provide breeding habitat. Presence of these species on site was not confirmed during the site visit.

3.2.2 Birds

Both conifer and deciduous trees provide habitat for species such as cavity dwellers, songbirds and raptors. No nests were observed during the site survey. Multiple wildlife snags were identified in the undisturbed area of the property upstream of the Fortis Easement. Wildlife snags provide both feeding and nesting habitat for cavity dwellers.

3.2.3 Mammals

The undisturbed sections of the riparian area have suitable habitat for mammals with palatable vegetation including skunk cabbage, grasses and young saplings. Ungulates and bears most likely use the area to access the water and browse on vegetation. Deer droppings were observed within the property during the site visit. Encounters of cougar have been reported in the area and most likely migrate through the property (Pers. Comm, S. Stene).

3.3 Species at Risk

A 10 km buffer around the subject property was used to query BC Conservation Data Center records using the [CDC iMap](#) tool. Based on this query, three species at risk occurrences are known within the 10 km of the project area:

- 1) The Upper Kootenay River white sturgeon (*Acipenser transmontanus*) population- Red listed. . The subject property is not located on Kootenay Lake, therefore does not provide suitable sturgeon habitat.
- 2) Banded tigersmail (*Anguispira kochi*)- Blue listed. The nearest observation of banded tigersnail was in Kokanee Creek Park, approximately 3.5 km away and has potential to occur on the subject property.
- 3) Western bumblebee (*bumus occidentalis*) - Blue listed. The nearest observation of Western bumblebee was at Kokanee Creek Park, approximately 3.8 km away and has potential to occur on site.

- 4) Western Skink (*Plestiodon skiltonianus*) - Blue listed. The nearest observation of western skink was along Hwy 3a, approximately 1.2 km away. Habitat on the property is not ideal for this species however they have the potential to occur under cover objects on sunny parts of the property.

3.4 Archaeological Resources

Kootenay Lake and surrounding area is part of the traditional territory of the Sinixt, Okanagan and Ktunaxa First Nations and archaeological evidence is documented at multiple sites around Kootenay lake. A review of archaeological resources on this property is outside the scope of this report.

4 IMPACT ASSESSMENT

The proposed new home development is sited outside of the SPEA; therefore, direct impacts to the riparian area will be avoided. Indirect ecological impacts are expected to be minimal since the new home development is sited ~30 m away from Craigend Creek.

5 MEASURES TO PROTECT THE INTEGRITY OF SPEA

This section provides measures to protect the integrity of the SPEA as described in RAPR, as well as recommended best management practices.

5.1 Danger Trees

A hazard tree assessment was conducted previous to this report and hazard trees were removed within Lot A. A quick assessment for potential danger trees was conducted by the QEP within Lot B. Multiple snags were identified in the upper portion of the property above the Fortis Power easement; however, no development is proposed for this area and is therefore not deemed a hazard.

5.2 Windthrow

A Registered Professional Forester (RPF) was not retained to assess potential windthrow since no clearing is proposed within or adjacent to the SPEA. Further assessment of windthrow is beyond the scope of this report, and any such assessment should be led by a RPF, or Professional Arborist.

5.3 Slope Stability

The following hazard indicators on the steep ravine bank in proposed Lot B above the Fortis Power easement were observed: curved and sweeping trees and bank seepage. Further assessment of geotechnical hazard is beyond the scope of this report, and any such assessment should be led by a P.Ge, or P.Eng. It is recommended that a geotechnical assessment be conducted prior to any proposed development within or adjacent to the ravine in proposed Lot B.

5.4 Protection of Trees and Vegetation in the SPEA

Protection of trees and other vegetation in the SPEA can be achieved by implementing the following measures:

5775 Longbeach Rd – Riparian Assessment

- Staging and access should only occur in previously disturbed areas of the site.
- The SPEA should be clearly flagged prior to construction of the new home on Lot B to protect vegetation and root systems within the SPEA.
- No pollutants should be allowed to contaminate the soil within the development area next to the SPEA.

5.5 Encroachment

The proposed new home development on Lot B is sited outside of SPEA. Future encroachment within the SPEA of Craighend Creek is discouraged to preserve the function of the riparian vegetation and to help maintain bank stability. Any future development (ie. structures, landscaping, vegetation and tree removal) proposed within the SPEA would require a QEP review and a RDCK Watercourse Development Permit.

5.6 Sediment and Erosion Control

The following mitigation measures should be implemented to reduce the risk of sediment input into Craighend Creek:

- Amount of soil disturbance and vegetation removal should be kept to a minimum.
- Any surface runoff should be controlled and directed away from exposed soils.
- In the event of heavy rainfall, additional mitigation measures such as ditching or covering soils may be required to ensure turbid wastewater does not leave the construction site and enter the creek.
- Soil should be safely stockpiled in a manner that eliminates the possibility of erosion and sediment transport.
- Disturbed soils should be revegetated as soon as possible after construction.

5.7 Stormwater Management

The proposed development will result in a minimal increase of total impervious area of the property. The following mitigation measures will help decrease stormwater impacts for current and future development:

- Rainwater collected on roofs should not be allowed to form surface runoff. Downspouts should direct rainwater into suitable landscape features which can absorb and utilize runoff rather than discharging it directly.
- Stormwater discharges must adhere to the *Water Sustainability Act* or any other application legislation.

5.8 Floodplain Concerns

There were no floodplain concerns observed on the subject property.

5.9 Scheduling of Environmentally Sensitive Activities

Works should be scheduled to avoid impacts to nesting birds. The best timing for vegetation clearing is within the least risk window for nesting birds (August 15-April 15). Any clearing conducted outside of these windows shall require a nesting survey.

5.10 Protection of Fish Habitat

Development of the property should protect fish habitat by adhering to sediment, stormwater, and waste management best practices outlined in this report to ensure that there is no release of deleterious materials into Craigend Creek.

5.11 Management of Equipment and Fuel/Lubricant Materials

The most likely source of any contaminant is from equipment or vehicles used or stored on-site, either during fueling or from unanticipated leaks or the failure of a hydraulic hose. To minimize the likelihood and impact of a spill within the riparian area, ensure that:

- Each piece of heavy equipment will be equipped with its own spill response kit.
- All staff will be familiar with the use of spill kits and their contents. The contents of the kits will be replaced immediately after use.
- Equipment will be stored in a designated area as far from Craigend Creek as possible and secondary containment will be utilized to capture any potential spills or leaks.

5.12 Invasive Plant Management

Construction activities can potentially increase prevalence of invasive plant species which can out-compete native riparian vegetation, causing damage to habitat and ecosystem function. The following mitigation measures are recommended to reduce the establishment and proliferation of invasive plant species on site:

- All equipment should be thoroughly washed and inspected before entering the project site to prevent the import of new invasive plant seeds and root fragments.
- Amount of soil disturbance should be minimized.
- All exposed soils should be re-vegetated immediately following construction.

It is recommended that scotch broom located within the 10 m SPEA be treated and removed following the Best Management Practices for Scotch Broom (Appendix 3). The area should then be re-vegetated with native trees and shrubs. Refer to Section 6.1 for re-vegetation plan. These removal methods can also be employed throughout the property.

6 MITIGATION PLAN

The same “No Net Loss” principle as outlined in the Shoreline Management Guidelines for Kootenay Lake has been followed for subdivision and home development at 5775 Longbeach Rd. The principle is achieved by applying the following priority sequence of mitigation options: 1. *Avoidance* of environmental impacts; 2. *Minimization* of unavoidable impacts; 3. *On-site restoration*; and 4. *Offset* residual impacts that cannot be minimized through compensation (KLP 2018). The proponent has demonstrated the principle of “Avoidance” by locating the proposed new home outside of the 10 m SPEA of Craigend Creek.

5775 Longbeach Rd – Riparian Assessment

6.1 Revegetation

To help restore the areas where invasive scotch broom shall be removed within the SPEA the following revegetation plan is proposed.

Revegetation will include:

- Planting native trees at minimum 3 m spacing and shrubs at minimum 1 m spacing. Refer to Table 3 for recommended plant species list.
- Plant composition and plant locations within the revegetation area are at the discretion of the owner.
- Planting should not occur during periods of hot dry weather unless they are irrigated daily. Preferred planting periods are in the spring or fall.
- Additional soil amendments, including top soil, mycorrhizae, and shrub and tree transplant fertilizer are recommended during planting.
- Bark mulch placement around each of the planted stock will help the soil retain moisture and reduce weeds and watering requirements.
- Ensure the objective of the restoration is to naturalize the riparian area and not create a landscaped garden.
- Regularly irrigate new plantings during the plant establishment period for a minimum of 3 years.

Table 3. Recommended plant species.

| Species | Scientific Name | Species | Scientific Name |
|----------------------|------------------------------|---------------------|--------------------------------|
| Trees | | Shrubs cont. | |
| Interior Douglas fir | <i>Pseudotsuga menziesii</i> | Blue elderberry | <i>Sambucus caerulea</i> |
| Western hemlock | <i>Tsuga heterophylla</i> | Douglas maple | <i>Acer glabrum</i> |
| Ponderosa pine | <i>Pinus ponderosa</i> | Beaked hazelnut | <i>Arctostaphylos uva-ursi</i> |
| Western larch | <i>Larix occidentalis</i> | Mountain ash | <i>Sorbus</i> |
| Western red cedar | <i>Thuja plicata</i> | Nootka rose | <i>Rosa nutkana.</i> |
| Western white pine | <i>Pinus monticola</i> | Black hawthorn | <i>Crataegus douglasii</i> |
| Shrubs | | Oregon grape | <i>Mahonia nervosa</i> |
| Mountain alder | <i>Alnus incana</i> | Red osier dogwood | <i>Cornus stolonifera</i> |
| Scoulers willow | <i>Salix scouleriana</i> | Saskatoon berry | <i>Amelanchier alnifolia</i> |

7 ENVIRONMENTAL MONITORING

The anticipated effort for environmental monitoring and professional guidance on this project includes the following:

- QEP may be required by the RDCK to conduct a post construction site visit once development has been completed on Lot B.
- QEP may be required by the RDCK to prepare an environmental summary report.

5775 Longbeach Rd – Riparian Assessment

8 CONCLUSION

Overall, the proposed subdivision and construction of a new home on Lot B will pose minimal ecological risk to Craigend Creek, as long as the recommendations outlined in this report are implemented. It is recommended that the 10 meter SPEA setback be maintained as a no-construction zone. If future development activities (ie. structures, landscaping, vegetation removal) are proposed within the SPEA it will require a QEP review and an application for a Watercourse Development Permit. If you have any comments or questions, please do not hesitate to contact the undersigned.

9 CLOSURE

This report has been prepared by a Qualified Environmental Professional (QEP) who has not acted for, or as an agent(s) of the RDCK and was at the expense of the property owner.

I, Fiona Lau, certify that I am qualified to carry out this assessment; and that the assessment methods under the Regulation have been followed; and that, in my professional opinion:

- (i) if the development is implemented as proposed, or
- (ii) if the streamside protection and enhancement areas identified in the report are protected from the development, and
- (iii) if the developer implements the measures identified in the report to protect the integrity of those areas from the effects of the development,


then there will be no harmful alteration, disruption or destruction of natural features, functions and conditions that support fish life processes in the riparian assessment area.

Sincerely,



Fiona Lau, ASCT, BTech.
fiona@masseenvironmental.com

Reviewed by:



Lisa Pavelich, P.Ag, BSc.
Masse Environmental Consultants

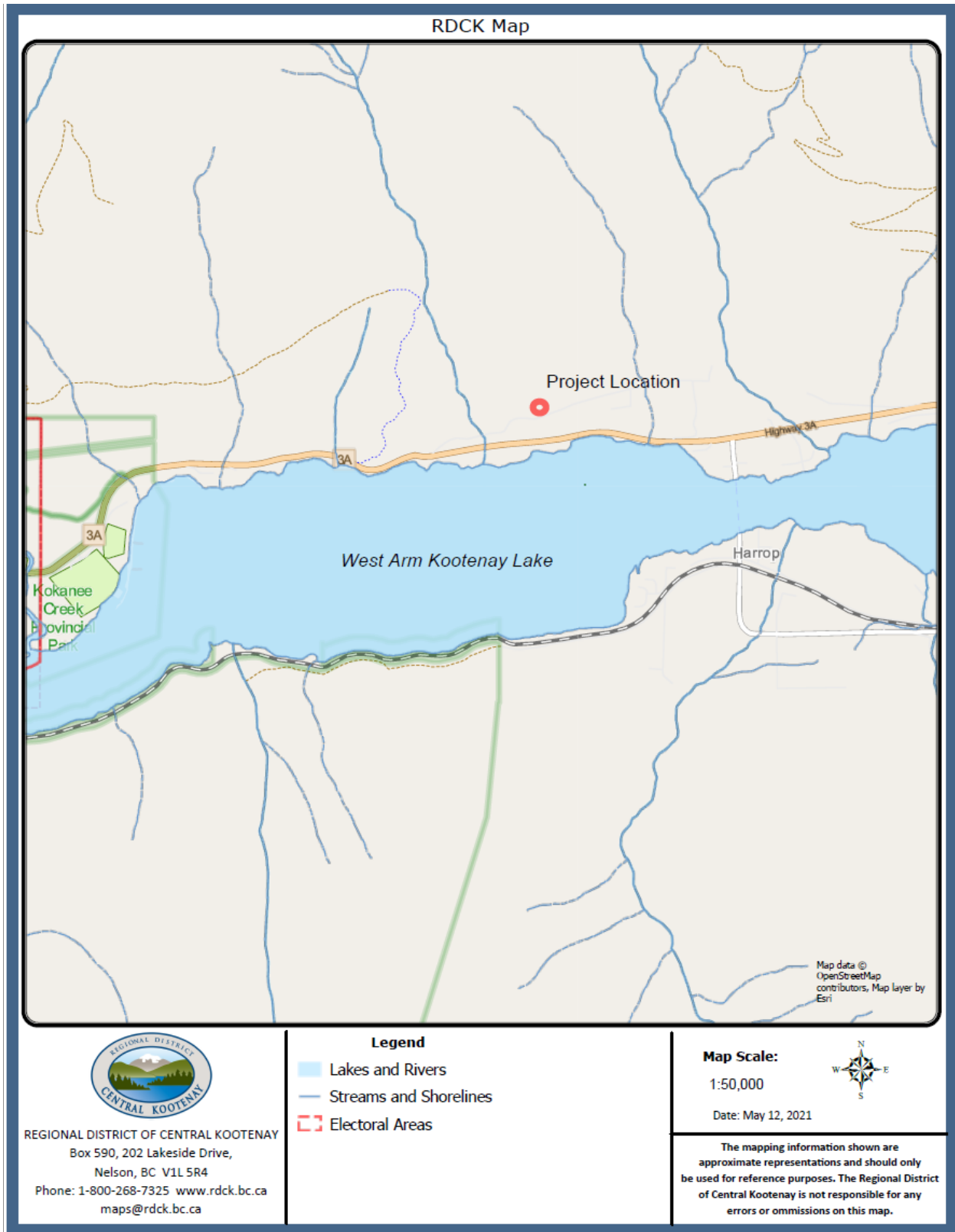
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[RDCK] Regional District of Central Kootenays. 2013. Electoral Area 'E' Rural Official Community Plan Bylaw No. 2260, 2013.

APPENDIX 1
LOCATION MAP



APPENDIX 2
SITE PLAN

APPENDIX 3
BEST MANAGEMENT PRACTICES FOR SCOTCH BROOM



BEST MANAGEMENT PRACTICES FOR
Scotch Broom
in the Metro Vancouver Region

Disclaimer

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Diamond Head Consulting



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Introduction

The impacts of invasive species on ecological, human, and economic health are of concern in the Metro Vancouver region. Successful control of invasive species requires concerted and targeted efforts by many players. This document - "**Best Management Practices for Scotch Broom in the Metro Vancouver Region**" - is one of a series of species-specific guides developed for use by practitioners (e.g., local government staff, crews, project managers, contractors, consultants, developers, stewardship groups, and others who have a role in invasive species management) in the region. Together, these best practices provide a compendium of guidance that has been tested locally by many researchers and operational experts.

Scotch broom is native to Mediterranean Europe and was introduced on Vancouver Island as an ornamental plant in the 1850s (Graham n.d.). It was subsequently intentionally planted along highways to stabilize the soil with its deep roots (King County 2008). In recent years it has been recognized as an invasive species locally. Academic institutions, government, and non-government organizations continue to study this species in British Columbia. As researchers and practitioners learn more about the biology and control of Scotch broom, it is anticipated that the recommended best management practices will change over time and this document will be updated. Please check metrovancover.org regularly to obtain the most recent version of these best management practices.

REGULATORY STATUS

Section 2 (1) (b) (iii) of the [Community Charter, Spheres of Concurrent Jurisdiction – Environment and Wildlife Regulation](#), states that "municipalities may regulate, prohibit and impose requirements in relation to control and eradication of alien invasive species", which includes Scotch broom.

Under the [Forest and Range Practices Act, Invasive Plants Regulation](#), a “person carrying out a forest practice or a range practice must carry out measures that are: (a) specified in the applicable operational plan, or (b) authorized by the minister, to prevent the introduction or spread of prescribed species of invasive plants.” Scotch broom is included in the list of invasive plants in the Regulation.

IMPACTS

Scotch broom is a fast growing shrub that forms dense monocultures (Prasad 2003). It grows in variable ecological niches and spreads rapidly due to its ability to produce large quantities of long-lived seeds, tolerate drought and cold, and its lack of predators. It alters the soil chemistry by releasing chemicals into the soil that adversely impact soil mycorrhizae and the growth of native plants (Grove, Haubensak and Parker 2012). In addition to its leaves, the stems of Scotch broom are photosynthetic, allowing the plant to grow year-round. All of these traits provide competitive advantages over native species that are easily displaced (Evergreen 2015), especially at nutrient poor sites. The impact of Scotch broom is particularly problematic in sensitive and endangered ecosystems such as the Garry Oak grasslands (Prasad 2003), dry moss/lichen plant communities and sandy shoreline ecosystems on the South Coast of British Columbia.

Large patches of Scotch broom provide minimal benefits to wildlife because they offer little cover and impede the movement of large animals (Evergreen 2015). Although Scotch broom is not readily grazed by animals, its seeds and other vegetative parts are toxic to ungulates and humans (King County 2008).

The high oil content of Scotch broom makes it highly flammable (BroomBusters n.d.); dense patches of the plant intensifies fire hazard by increasing fuel loads. Scotch broom obstructs sight lines along roads (Invasive Species Council of British Columbia 2014). Scotch broom can also limit the growth of coniferous seedlings on lands under restoration or reforestation (Prasad 2003).

All levels of government, non-profit organizations and private property owners spend significant resources managing Scotch broom in the Metro Vancouver region every year. In 2016, agencies represented on Metro Vancouver’s Regional Planning Advisory Committee - Invasive Species Subcommittee spent nearly \$44,000 on Scotch broom control efforts. This figure does not include control costs for private landowners across the region, volunteer ‘weed pull’ hours, or costs associated with education and awareness activities.

REPRODUCTION AND SPREAD

Scotch broom lives 10 to 15 years on average, and up to 20 years (Evergreen 2015), produces deep roots and can resprout from its stump after cutting.

The peak flowering period for Scotch broom is from March to June (E-Flora 2017). Each plant can produce up to 10,000 seeds per growing season that can survive in the ground for 30 to 40 years (Prasad 2003) and possibly up to 80 years, creating long-lasting seed banks in infested areas (Evergreen 2015). At maturity, the seedpods split and can eject seeds up to five metres away from the parent plant (Invasive Species Council of British Columbia 2014). Viable seeds are located in the top 6 cm of soil (Prasad 2003).

Seedlings can germinate in extremely high densities; up to 350 seedlings/m² (Parker 2017). Scotch broom rapidly colonizes disturbed areas and eventually forms a major component of the areas it occupies (Prasad 2003).

HABITAT AND DISTRIBUTION

Scotch broom prefers sandy, well-drained soil and full sun exposure. However, it can also tolerate partial shade and moist conditions (Evergreen 2015), as well as low-nutrient soils (King County 2008). In drought conditions or under stress, the plant may drop most of its leaves (King County 2008)

Disturbed soils create ideal conditions for germination (King County 2008). It is commonly found on transportation corridors, utility rights-of-way, gravel pits, degraded pastures, and anywhere with disturbed, bare soil. Scotch broom can be found in most coastal sand ecosystems in the Georgia Basin (Page 2011).

Scotch broom is common throughout the Metro Vancouver region, Sunshine Coast and Vancouver Island. It has also been found at Bella Bella, on Haida Gwaii, the Fraser Valley, North Okanagan, and Central Kootenay regions.



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Identification

The following identification information is a compilation of information from King County (2008) and [E-Flora](#) (2017).

Lifecycle: Perennial.

Stem: Up to 3 m tall, erect, branched, twigs green and strongly 5-angled, becomes woody and yellow-brown when mature.

Leaves: 5 to 20 mm long, oval, alternate, lower/older leaves compound with 3 leaflets, upper/newer leaves simple and unstalked, pointed at the tip.

Flowers: Inflorescence of solitary or sometimes 2 or 3 pea-like flowers borne in a leaf axil, 2 cm long; yellow petals, sometimes tinged with red, orange, white or purple.

Fruits: Pods, black, flattened, 2.5 to 4 cm long, glabrous except along the long-hairy margins; mature pods split open and spiral as they dry, ejecting 5 to 12 seeds per pod.

The following photos show Scotch broom plant parts.



Leaves
CREDIT: ISCMV



Flowers
CREDIT: ISCMV



Dried seed
pods
CREDIT: L. BATES-
FRYMEL

SIMILAR SPECIES

Scotch broom resembles other broom species, all of which are non-native, invasive species:

- Spanish broom (*Spartium junceum*) can be differentiated from Scotch broom by its flowers, which grow in loose clusters at the tips of the stems (as opposed to solitary along the entire branch) and stems which are leafless or few-leaved (Swearingen 2016).
- French broom (*Genista monspessulana*) flowers grow in clusters of four to ten (as opposed to solitary) and has round stems covered in silvery, silky hair (California Invasive Plant Council n.d.).
- Portuguese broom (*Cytisus striatus*) is very similar in appearance to Scotch broom except the pods are densely hairy making them appear whitish-grey like pussy willow buds. The stems are more silvery and the flowers paler yellow than Scotch broom (Oregon Department of Agriculture n.d.).
- Gorse (*Ulex europaeus*) can be differentiated by the spines on its stems (Washington State Noxious Weed Control Board n.d.).



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Tracking

The provincial government maintains the [Invasive Alien Plan Program \(IAPP\) application](#) (BC Ministry of Forests, Lands and Natural Resource Operations and Rural Development 2017), which houses information pertaining to invasive plant surveys, treatments, and monitoring. Many agencies, including local governments, have their own internal invasive species inventory and mapping protocols that are used by staff, contractors and, in some cases, the public. For example, the City of North Vancouver has its own system called AlienMap. Agencies in British Columbia that do not enter data into IAPP are encouraged to check it regularly because it contains public reports and data from other agencies and it is important to consider as much data as possible when making management decisions. The Map Display module of IAPP is publicly accessible.

When carrying out a Scotch broom inventory it is useful to record the following information as it will later inform treatment plans:

- Size and density of infestation;
- Location in relation to the high water mark of water courses; and
- Location in relation to other water sources, such as wells.

Reporting

Since Scotch broom is widespread throughout the Metro Vancouver region and does not pose an imminent health or safety risk, there is generally little value in reporting individual occurrences.

Prevention and Control Strategies

Effective invasive plant management techniques may include a variety of control techniques ranging from prevention, chemical, manual, mechanical, biological and/or cultural methods. Each method is described below in order of effectiveness.

Scotch broom can be effectively controlled through manual/mechanical and chemical treatment techniques. The technique used is dependent on the age and size of the infestation, and site characteristics. Chemical treatment is most effective and efficient; however, it is not necessarily suited to all sites. Manual/mechanical treatment can also be effective but will generally be more time consuming and may promote seedling germination through soil disturbance. It should be noted that promoting seedling germination can be a positive long term management approach as it may help deplete the seed bank. Follow-up monitoring and treatment will be required for several years regardless of the treatment technique.

STRATEGY COLOUR LEGEND

GREEN: RECOMMENDED

ORANGE: CAUTION

RED: NOT RECOMMENDED OR NOT AVAILABLE

PREVENTION: IMPERATIVE

Prevention is the most economical and effective way to reduce the spread of Scotch broom over the long term. Spread of Scotch broom infestations can be minimized by avoiding soil disturbance (Evergreen 2015) as this will promote seed germination. When soil disturbance does occur, monitor the area for germination of Scotch broom and other invasive plants. Remove any germinating Scotch broom and quickly revegetate disturbed sites with fast-growing, competitive native plants (A. Hulting 2008).

Inspect and remove plants, plant parts, and seeds from personal gear, clothing, pets, vehicles, and equipment and ensure soil, gravel, and other fill materials are not contaminated with Scotch broom before leaving an infested area. Bag or tarp plants, plant parts, and seeds before transport to a designated disposal site (see Disposal section).

Do not purchase, trade or grow Scotch broom. Instead, grow regional native plants that are naturally adapted to the local environment and non-invasive. Consult the Invasive Species Council of BC's '[Grow Me Instead](#)' Program or [Metro Vancouver's Grow Green website](#) for non-invasive, drought-tolerant plants, and garden design ideas. Ensure all materials (e.g., topsoil, gravel, mulch, compost) are weed-free. Healthy green spaces are more resistant to invasion by invasive plants, so it is also important to maintain or establish healthy plant communities.

MANUAL/MECHANICAL: RECOMMENDED

It is important to minimize soil disturbance during all manual or mechanical treatments, since disturbance facilitates germination of the seed bank (Evergreen 2015), unless promoting germination to deplete the seed bank is part of the long term management plan. The Invasive Species Council of BC (2014) suggests that manual treatment will provide an effective control when the entire plant is removed, no seeds are dropped onto the surrounding soil and soil disturbance is minimized. When it is not feasible to remove the entire plant, it is recommended to cut the flower heads off the plant in June or July, before the seeds mature (Evergreen 2015).

The following manual/mechanical methods can be used to control Scotch broom:

- **Pulling**

Pulling is most appropriate to target **young Scotch broom plants**. They can be easily pulled by hand from the soil when the stem is approximately 1.5 cm in diameter or less, or roughly the size of a pencil (Garry Oak Ecosystem Recovery Team 2002). However, they become much more difficult to pull as the plant grows and ages.

Pulling should take place during the wet months of the year and the plant should come out without removing soil. This can be done manually or with a very small weed wrench to avoid disturbing the soil because soil disturbance can facilitate re-establishment (Page 2011). Any soil divots created by pulling should be replaced to diminish soil disturbance (King County 2008).

- **Cutting**

Approximately 50% of smaller (younger) Scotch broom plants have a greater tendency to re-sprout when cut; therefore, cutting should be avoided (Prasad 2003). Cutting should target **larger plants** with stem diameters of at least 5 cm, and no longer green at the bases (King County 2008). On coastal sites, Evergreen (2015) reports that older broom plants have been found to re-sprout less than 5% of the time after cutting. King County (2008) observed a re-sprout rate of 20% over five years following the cutting. Plants should be cut at or slightly below ground level with loppers or a saw to reduce the likelihood of re-sprouting. Making a flat cut (at 90 degrees from the trunk) versus an angled cut eliminates a hazard for people, dogs and other animals. Plants cut high are more likely to re-sprout (Lucero 2017).

Ideally cutting should occur when broom is in bloom during the spring (BroomBusters n.d.), or after flowering (but before seed maturity) and at the start of the dry season, when its food reserves are at their lowest

(Prasad 2003). Cutting the plant in bloom or shortly after will minimize its ability to successfully re-sprout, as it will die in the summer's heat; this will therefore avoid the need to remove roots.

- **Mowing**

Mowing is not as effective as other control strategies and will either need to be repeated throughout the growing season or combined with other control methods (King County 2008). Parker et al. (2017) found that mechanical control in general promotes germination of the seedbank, particularly in the first few years after treatment.

On coastal sand ecosystems, a recommended removal method for large patches of Scotch broom is to mow the above-ground broom with a tractor-mounted mower or other mechanical means between September 30th and April 30th (to avoid impacts on nesting birds), and strip 5 cm of soil with a rubber-tired backhoe or bobcat (Page 2011). Soil should be disposed as per the recommendations in the section on disposal. This method ensures the removal of most seeds, therefore preventing re-establishment. The remaining seeds that germinate in the first five years following the stripping generally do not survive the dry summer conditions.

CHEMICAL: RECOMMENDED

When alternative methods to prevent or control invasive plants are unsuccessful, professionals often turn to herbicides. Chemical control may be required to control large Scotch broom infestations, such as transportation corridors or other non-pasture sites (King County 2008).

With the exception of substances listed on Schedule 2 of the [BC Integrated Pest Management Regulation](#), the use of herbicides is highly regulated in British Columbia. Site characteristics must be considered with herbicide prescribed, based on site goals and objectives and in accordance with legal requirements. [This summary of BC's](#)

[Integrated Pest Management Act](#) provides an overview of the provincial legislation.

PESTICIDE LICENCE AND CERTIFICATION

A valid pesticide licence is required to:

- offer a service to apply most pesticides;
- apply most pesticides on public land including local government lands¹; and
- apply pesticides to landscaped areas on private land, including outside office buildings and other facilities.

Pesticides (e.g., herbicides, insecticides, fungicides) are regulated by the federal and provincial government, and municipal governments often have pesticide bylaws.

- Health Canada evaluates and approves chemical pest control products as per the [Pest Control Products Act](#).
- The [BC Integrated Pest Management Act](#) sets out the requirements for the use and sale of pesticides in British Columbia. This Act is administered by the Ministry of Environment.
- Several municipalities have adopted bylaws which prohibit the use of certain pesticides.

Everyone who uses pesticides must be familiar with all relevant laws.

ONLY companies or practitioners with a valid Pesticide Licence and staff who are certified applicators (or working under a certified applicator) may apply herbicide on invasive plants located on public lands in British Columbia. Applicators must be either the land manager/owner or have permission from the land manager/owner prior to herbicide application.

On private property the owner may obtain a Residential Applicators Certificate (for Domestic class products only) or use a qualified company. Residents do not require a Residential Applicator Certificate for certain uses of domestic class glyphosate including treatment of plants that are poisonous for people to touch, invasive plants and noxious weeds listed in legislation, and weeds growing through cracks in hard surfaces such as asphalt or concrete. Refer to the 'Pesticides & Pest Management' and 'Home Pesticide Use' webpages listed in the Additional Resources Section for more information.

Questions? Contact the BC Integrated Pest Management Program: Telephone: (250) 387-9537

Email: bc.ipm@gov.bc.ca

Pesticide applicator certificates can be obtained under the category 'Industrial Vegetation Management' to manage weeds on industrial land, roads, power lines, railways, and pipeline rights-of-way for control of noxious weeds on private or public land. Assistant applicator training is also available and the [online course and exam](#) are free.

¹ on up to 50 ha/year by a single organization. Organizations looking to treat over 50 hectares of land per year are also required to submit a Pest Management Plan and obtain a Pesticide Use Notice confirmation.

Although an annual fee and annual reporting are required, it is best practice for personnel supervising or monitoring pesticide contracts to also maintain a pesticide applicator licence so they are familiar with certification requirements.

For more information on how to obtain a licence and the requirements when working under the provincial [Integrated Pest Management Act and Regulation](#), please review the Noxious Weed & Vegetation Management section on this webpage: gov.bc.ca/PestManagement.

HERBICIDE LABELS

Individual herbicide labels must always be reviewed thoroughly prior to use to ensure precautions, application rates, and all use directions, specific site and application directions are strictly followed. Under the federal *Pest Control Products Act* and the BC Integrated Pest Management Regulation, **persons are legally required to use pesticides (including herbicides) only for the use described on the label and in accordance with the instructions on that label.** Failure to follow label directions could cause damage to the environment, poor control results, or danger to health. Contravention of laws and regulations may lead to cancellation or suspension of a licence or certification, requirement to obtain a qualified monitor to assess work, additional reporting requirements, a stop work order, or prohibition from acquiring authorization in the future. A conviction of an offence under legislation may also carry a fine or imprisonment.

Herbicide labels include information on both the front and back. The front typically includes trade or product name, formulation, class, purpose, registration number, and precautionary symbols. Instructions on how to use the pesticide and what to do in order to protect the health and safety of both the applicator and public are provided on the back (BC Ministry of Environment 2011).

Labels are also available from the Pest Management Regulatory Agency's [online pesticide label search](#) or [mobile application](#) as a separate document. These label documents may include booklets or material safety data sheets (MSDS) that provide additional information about a pesticide product. Restrictions on site conditions, soil types, and proximity to water may be listed. If the herbicide label is more restrictive than provincial legislation, the label must be followed.

HERBICIDE OPTIONS

The following herbicides can be used on Scotch broom; although not specifically listed on these herbicide labels Scotch broom may be treated under the general application provision for broadleaved plants.

| ACTIVE INGREDIENT (EXAMPLE BRAND NAMES)+ | APPLICATION | PERSISTENCE | GROWTH STAGE++ | TYPE+++ |
|--|---|--------------|--------------------------------------|--------------------------------------|
| Glyphosate (many products) * | foliar application | non-residual | actively growing (preferable spring) | non-selective |
| Imazapyr (example: Arsenal™) | foliar spray | residual | actively growing | non-selective |
| Triclopyr (example: Garlon™) | foliar spray, cut-stump, stem application | residual | actively growing | selective, no effect on grasses |
| 2,4-D; alone or mixed with triclopyr or imazapyr | foliar spray | residual | actively growing | selective, no effect on most grasses |
| Picloram** | foliar spray | residual | actively growing | selective, no effect on grasses |

* Glyphosate should be used with care as it will kill grass and other surrounding vegetation, which may facilitate Scotch broom seedlings germination (Whatcom County n.d.)

** Hard on trees: not good in forested areas (Miller 2017)

+ The mention of a specific product or brand name of pesticide in this document is not, and should not be construed as, an endorsement or recommendation for the use of that product.

++ For Scotch broom actively growing is defined as spring to late summer (A. Hulting 2008)

+++ Herbicides that control all vegetation are non-selective, while those that control certain types of vegetation (for example, only grasses or only broadleaf plants) are termed selective.

APPLYING PESTICIDE IN RIPARIAN AREAS

Provincial legislation prohibits the use of herbicides within 10 metres of natural water courses and 30 metres of domestic or agricultural water sources on public lands. On private lands herbicide labels must be followed (which means for glyphosate products treatment can happen up to the water's edge), and additional restrictions may apply for some private lands (e.g., industrial sites, forestry sites, golf courses, etc.). On public lands, glyphosate is the only active ingredient that can be applied within the 10 metre Pesticide-Free Zone (PFZ)² in British Columbia in accordance with the *BC Integrated Pest Management Act* and Regulation and all public land Pesticide Management Plans (PMPs). A plant must be either a listed Noxious Weed (under the *BC Weed Control Act*) or appear in the *Forest and Range Practices Act Invasive Plants Regulation* to be treated within the 10 metre PFZ. Scotch broom is listed in the latter and therefore glyphosate can be applied on Scotch broom up to 1 metre away from the high water mark (HWM)³. The 30 metre no-treatment zone around a water supply intake or well used for domestic or agricultural purposes may be reduced if the licensee or PMP holder is "reasonably satisfied" that a smaller no-treatment zone is sufficient to ensure that pesticide from the use will not enter the intake or well

2 The Pesticide-Free Zone (PFZ) is an area of land that must not be treated with pesticide and must be protected from pesticide moving into it, under the *Integrated Pest Management Act* and Regulation.

3 The High Water Mark (HWM) is defined as the visible high water mark of any lake, stream, wetland or other body of water where the presence and action of the water are so common and usual and so long continued in all ordinary years as to mark upon the soil of the bed of the lake, river stream, or other body of water a character distinct from that of the banks, both in vegetation and in the nature of the soil itself. Typical features may include, a natural line or "mark" impressed on the bank or shore, indicated by erosion, shelving, changes in soil characteristics, destruction of terrestrial vegetation, or other distinctive physical characteristics. The area below the high water mark includes the active floodplain (BC Ministry of Environment and Climate Change Strategy 2018).

When managing Scotch broom with herbicide in riparian areas:

- Observe and mark all PFZs while on site.
- The HWM should be determined by careful evaluation by the applicator.
- Distances in PFZs should be measured as horizontal distance.
- Herbicides restricted in a PFZ must not enter these zones by leaching (lateral mobility) through soil or by drift of spray mist or droplets.
- Treatments should be conducted when water levels are low (e.g. summer months) to reduce risk.
- Note that efficacy may be dependent on site conditions, including moisture in the soil.

APPLICATION METHODS

The preferred application methods to minimize non-target damage are foliar application, cut surface application, and basal stem application (Invasive Species Council of British Columbia 2014).

- **Foliar application** requires a thorough wetting of the actively growing plant parts with an appropriate herbicide. Herbicides should not be applied when plant is in bloom as blooms will prevent full coverage of spray on the remainder of the plant (A. Hulting 2008).
- **Cut surface application** is labour intensive but is more target specific than foliar spray and reduces the risk of damaging non-target vegetation. The plant should be cut at the base and the stump immediately (within 1 minute) painted with an appropriate herbicide (Huckins and Soll 2004).

- **Basal stem application** involves using a backpack sprayer with a flat fan, solid cone nozzle, or wick attachment, to apply sufficient spray to stems less than 8 cm in basal diameter to form a band 5 cm in width.

CULTURAL: PARTIALLY RECOMMENDED

Scotch broom can be culturally controlled by growing a closed tree canopy with deep shade to suppress the plant. The utility of this method is restricted to sites where a tree canopy is desired and/or appropriate. It may be challenging to develop tree cover in an existing infestation because the changes to soil chemistry caused by Scotch broom will suppress and stunt tree growth (Grove, Parker and Haubensak 2017), therefore early intervention is recommended.

The Invasive Species Council of BC (2014) reports that Scotch broom seed consumption by chicken and goat grazing has reduced infestations. Angora and Spanish goats eat the tops of young plants, which deplete their root reserves; they are most effective for one- to four-year-old plants and re-growth (King County 2008). Within Metro Vancouver, grazing to control Scotch broom is likely only feasible in agricultural or field habitats. Opportunity for grazing in urban areas is limited due to municipal bylaws regulating livestock, the high probability of interface with the public, and the damage animals would cause to riparian areas and other sensitive sites with multiple land uses and is therefore not recommended. Due to these constraints, cultural control is not recommended as a practical management option in the Metro Vancouver region.

BIOLOGICAL: NOT AVAILABLE

There are currently no approved biocontrol agents for Scotch broom in BC (Invasive Species Council of British Columbia 2014). At least two biocontrol agents have been tested in the Pacific Northwest including the Scotch broom seed beetle (*Bruchidius villosus*) and Scotch broom seed weevil (*Exapion fuscirostre*). Both species attack the developing seeds within the seedpods, ultimately reducing

the number of seeds that germinate (Andreas 2016). The adults feed on flowers, foliage and stems. In large populations individual plants can die starting at the tips (BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development n.d.). *Aceria genistae* (Scotch broom gall mite) attack newly forming flowers and foliage creating a small gall and reducing the number of seed pods a plant can produce (Landcare Research 2014).

These three Scotch broom biocontrol agents were released in Washington State from the 1990s onwards and have

moved north adventitiously (BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development n.d.). Populations of all three biocontrol agents are present in the Metro Vancouver region with larger numbers found at Iona Beach Regional Park and smaller populations seen in Pacific Spirit Regional Park (Cousins 2018).

All current adventive Scotch broom biocontrol species are slow to establish (Lucero 2017), and therefore can only be used as a component of a long-term Scotch broom management plan and to minimize the seed bank.

SUMMARY

The following table provides a summary and comparison of control methods for Scotch broom*.

| CONTROL STRATEGY | TECHNIQUES | APPLICABLE SITE TYPE | PROS | CONS |
|------------------|---|--|---|---|
| Manual | Cut, pull, dig | Low or medium density sites, small infestations, sensitive sites** | Selective, volunteer friendly, non-chemical | Creates disturbance, may stimulate germination, labour intensive |
| Mechanical | Excavate, mow | High density sites, large, non-sensitive sites | Less labour intensive, non-chemical | Non-selective, creates disturbance, stimulates germination |
| Chemical | Foliar, stem, cut and paint | High density sites, large or small sites with minimal integration of native trees and shrubs | Selective with appropriate herbicide and application, less labour intensive, can suppress seed bank | Unintended environmental/health impacts, high public concern, weather dependent, requires trained staff |
| Cultural | Suppress through tree canopy shade | Where forest canopy is acceptable | Natural competition, self-sustaining | Takes many years to effectively shade out broom |
| Biological | No bioagents are currently available for distribution in British Columbia | | | |

* Adapted from Lucerno (2017) and Garry Oak Ecosystem Recovery Team (2002)

** Sensitive sites may include riparian areas or sites with red or blue listed plants or plant communities

Disposal

The method of disposal depends on the presence or absence of seeds on the dead plants. Ideally, control activities should be done before plants go to seed (King County 2008).

If seeds are not present:

- For small volumes of Scotch broom, leave on site, scattered or mulched, or deposit in densely shaded areas under conifers where there is no ground vegetation.
- For large volumes, the Pacific Forestry Centre (2003) recommends disposing of the plants by chipping. Perform chipping activities off site or chip into the existing Scotch broom impacted area to minimize spread of undetected seeds. Large unchipped volumes can be disposed at an appropriate disposal or industrial composting facility (see below).

If seeds are present:

- If removal and disposal is not practical, plants with seeds should be left on site, in place, to avoid spread (King County 2008).
- If removal is realistic, plants should be carried on tarps or in a way that prevents seeds from spreading and disposed of at an appropriate facility (see below).

Composting Scotch broom foliage and berries at home or at municipal works yards is **not recommended** as the temperature will not reach high enough to kill the seeds.

Scotch broom patches are a fire hazard. Leaving dead Scotch broom on site increases the risk of fire. Herbicide killed material may need to be cut and either chipped or removed off site due to either fire risk or aesthetic reasons. It is best to wait to cut herbicide-killed material until the high fire hazard season has passed to reduce the risk of equipment or vehicles starting an ignition.

OFF SITE DISPOSAL

When disposed off site, transport plant parts on tarps or in thick plastic bags to an appropriate disposal or industrial composting facility. In the Metro Vancouver region, several facilities accept Scotch broom plants and/or infested soil. [This list](#) provides addresses and website links for the disposal facilities. This list is updated periodically.

PLEASE CONTACT ALL FACILITIES BEFOREHAND TO CONFIRM THEY CAN PROPERLY HANDLE THE MATERIAL.

CLEANING AND DISINFECTION⁴

Before leaving a site, remove all visible plant parts and soil from vehicles, equipment, and gear, and if possible, rinse these items. When back at a works yard or wash station, vehicles should be cleaned and disinfected using the following steps:

- Wash with 180 °F water at 6 gpm, 2000 psi*, with a contact time of ≥ 10 seconds on all surfaces to remove dirt and organic matter such as vegetation parts or seeds. Pay special attention to undercarriages, chassis, wheel-wells, radiators, grills, tracks, buckets, chip-boxes, blades, and flail-mowing chains.
- Use compressed air to remove vegetation from grills and radiators.
- Sweep/vacuum interior of vehicles paying special attention to floor mats, pedals, and seats.
- Steam clean poor access areas (e.g., inside trailer tubes) – 200 psi @ 300 °F.
- Fully rinse detergent residue from equipment prior to leaving facility.

* Appropriate self-serve and mobile hot power-wash companies in the Metro Vancouver area include: Zolliker Fleet Cleaning, Omega Power Washing, Eco Klean Truck Wash, RG Truck Wash, Ravens Mobile Pressure Washing, Hydrotech Powerwashing, Platinum Pressure Washing Inc, and Alblaster Pressure Washing. Wash stations should be monitored regularly for Scotch broom growth.



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⁴ Adapted from Metro Vancouver 2018 Water Services Equipment Cleaning Procedures and Inspection Protocols.

Follow-up Monitoring

Whatever control method is used, follow-up monitoring and maintenance treatments are components of an integrated management plan or approach.

- For **manually** treated sites, follow-up monitoring should take place for many years following initial treatment, due to the long viability of the seedbank.
- **Chemical treatments** must be repeated over many years also due to the long viability of the seedbank (Invasive Species Council of British Columbia 2014). Seedlings should be treated before they reach 0.5 cm in height (Prasad 2003). The first follow-up treatment may need to take place within the first year after the treatment.

Keeping up-to-date maps of seed bank locations facilitates monitoring sites for regrowth (Pocock 2017).

Restoration

Restoration is recommended to create competition, control Scotch broom regrowth and replace lost habitat. However, planting should not take place until control of new seedlings has been carried out, so as not to impede treatment (Whatcom County n.d.).

Mulch can be used to avoid leaving bare soil and reduce colonization by other invasive plant species (King County 2008). The International Society of Arboriculture and relevant municipal Parks or arboriculture departments offer guidelines for mulch application. Specific mulch depths can be used to control invasive weeds and encourage plant growth (International Society of Arboriculture 2011).

Replacement species should be chosen based on the ecology of the site by a qualified environmental professional. Local biologists, environmental professionals, agronomists, agrologists, native and domestic forage specialists, seed companies and plant nurseries are all good sources for localized recommendations for regional native species and regionally adapted domestic species, based on site usage. There are several science-based resources available to guide restoration efforts, such as the South Coast Conservation Program's [Diversity by Design](#) restoration planning toolkit.

Examples of common competitive native species prescribed in Metro Vancouver sites are summarized in the table below based on site moisture. Note that Scotch broom is often found in coastal sands ecosystems; many of the plant species listed below would not be appropriate for that type of ecosystem.

| WET SITES | MOIST SITES | DRY SITES |
|-------------------|-------------------|-----------------------|
| SHRUBS | | |
| Salmonberry | Salmonberry | Thimbleberry |
| Hardhack | Willow | Nootka rose |
| Willow | Red osier dogwood | Red flowering currant |
| Red osier dogwood | Red elderberry | Snowberry |
| Pacific ninebark | Vine maple | Tall Oregon grape |
| | Indian plum | Oceanspray |
| TREES | | |
| Western red cedar | Western red cedar | Douglas-fir |
| Red alder | Red alder | Red alder |

Revegetation of the site to a domestic or cultured non-native plant species composition may be considered in some circumstances. Often domestic species are faster establishing and grow more prolifically which aids in resisting Scotch broom re-invasion.

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Additional Resources

For more information please refer to the following resources.

- BC Ministry of Forests, Lands, and Natural Resource Operations, Invasive Alien Plant Program (IAPP). www.for.gov.bc.ca/hra/Plants/application.htm
- E-Flora BC, an Electronic Atlas of the Plants of BC. www.eflora.bc.ca/
- Field Guide to Noxious and Other Selected Weeds of British Columbia. 2002. [https://www.agf.gov.bc.ca/cropprot/weedguid/ Scotchbroom.html](https://www.agf.gov.bc.ca/cropprot/weedguid/Scotchbroom.html)
- Pesticides and Pest Management. Province of British Columbia <https://www2.gov.bc.ca/gov/content/environment/pesticides-pest-management>
- Prasad, Raj. Scotch Broom, *Cytisus scoparius* L. in British Columbia. <http://cfs.nrcanz.gc.ca/pubwarehouse/pdfs/31653.pdf>
- Grow Me Instead. <http://bcinvasives.ca/resources/programs/plant-wise/>
- Invasive Species Council of British Columbia Scotch Broom Fact Sheet. https://bcinvasives.ca/documents/Scotch_Broom_TIPS_Final_08_06_2014.pdf

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