Keystone Environmental
Knowledge-Driven Results

March 31, 2018

Mr. Grant Miller
Director of Planning Development Services
University of British Columbia
2210 West Mall University of British Columbia
Vancouver, BC V6T 1Z3

Dear Mr. Miller:

Re: Terrestrial and Wildlife Environmental Report at Site B in the Wesbrook Place Greenway, University of British Columbia, Vancouver, BC
Project No. 13965

Keystone Environmental Ltd. (Keystone Environmental) is pleased to present this terrestrial and wildlife environmental report for the proposed South Campus Greenway extension project at the University of British Columbia (UBC) Point Grey Campus (the Site; Figure 1). This report is intended to summarize the results of a vegetation health and habitat assessment for the South Campus Greenway extension between a residential development and UBC Farm. The findings include existing conditions within the Site, potential for sensitive or rare species and ecosystems, and known or potential use of the area by wildlife.

1. BACKGROUND

The proposed project will include construction of within approximately 470 m x 40 m of greenway between the Wesbrook Place residential development and UBC Farm along the west side of Ross Drive. This will require vegetation clearing within a second growth mixed wood forest. This report is intended to assess potential effects to terrestrial habitat as a result of vegetation clearing. Results of the terrestrial and wildlife environmental assessment are provided in the following sections. Tree health and retention potential was assessed by a certified arborist and the assessment results are provided in Appendix A.

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2. REGULATORY FRAMEWORK

The Site falls within the boundaries of the *Land Use Plan for The University of British Columbia Point Grey Campus* (2015), which identifies the Site as a Greenway under Schedule B. Development within this area must also conform to the guidelines in the *University of British Columbia Development Handbook* (2009).

Based on Keystone Environmental's understanding of the project scope and Site conditions the federal *Species at Risk Act* (SARA) and *Migratory Birds Convention Act* (MBCA) and the provincial *Wildlife Act* were also considered during the assessment. The SARA protects the defined critical habitat and individuals of species listed as threatened, endangered, or extirpated under Schedule 1 of the Act where they occur on federal land. The MBCA prohibits harm to bird species listed as migratory under the act, including destruction or disturbance of their nests, eggs, and young. The provincial *Wildlife Act* provides protection to the majority of native vertebrate species from harm or harassment unless otherwise indicated under the *Designation and Exemption Regulation* or authorized under a permit. Section 34 provides additional protection to bird species not listed under the MBCA, including their eggs or nests when occupied. The nests of eagle, peregrine falcon, gyrfalcon, osprey, heron, and burrowing owl are protected year-round.

3. METHODS

The terrestrial and wildlife assessment consisted of a desktop review of existing information and online databases, followed by a Site visit. The Site visit was conducted to ground-truth results of the desktop review and identifies additional Site sensitivities with potential to be affected by the proposed project.

Environmental values on-Site were assessed under: Vegetation Resources and Wildlife Resources. Assessment methods are summarized in the following sections.

3.1 Desktop Review

A search of historic assessments at the Site, publicly available environmental reports, online databases, reference manuals, and mapping applications was completed to document the terrestrial habitat values and their ecological sensitivities within the Site and surrounding area. The following sources of information were consulted:

- BC Biogeoclimatic Ecosystem Classification Program BECweb
- BC Conservation Data Centre (CDC) Species and Ecosystem Explorer
- BC Frogwatch Atlas
- eBird
- iMapBC 2.0
- Community Mapping Network:
  - Great Blue Heron Atlas
  - Wildlife Tree Stewardship Atlas

- UBC Environmental Assessments and Studies:
  - UBC Social Ecological Economic Development Studies (SEEDS) Student Report (Dyck 2016)
  - Biophysical Assessment South Campus University of British Columbia (Dunster 1999)
  - Campus lidar data (UBC 2015)
  - GIS Database Layer of Vegetation on UBC Vancouver Campus (PGL 2009)
  - Environmental Assessment – UBC South Campus Neighbourhood (PGL 2004)
  - UBC campus tree inventory GIS data (species, caliper dbh, general health, height, etc.)
  - UBC Vancouver Campus Tree Inventory Handbook (Bellis, et.al. 2017)

3.2 Vegetation Resources

3.2.1 Terrestrial Ecosystem Mapping

Terrestrial ecosystems within the Site were mapped using modified provincial Terrestrial Ecosystem Mapping (TEM) methods (RISC 1998). Ecosystems were classified according to *A Field Guide for Site Identification and Interpretation for the Vancouver Forest Region* (Green and Klinka 1994). Visual site inspections were completed using a ground inspection form (GIF) with each plot with the location recorded using a GPS (± 4m). Other information documented included landscape characteristics such as aspect, slope, slope position, drainage, approximate soil moisture, and nutrient regimes, forest structural stage and estimated vegetation cover. TEM site series was determined post-survey upon reviewing site information.

3.2.2 Rare Plants and Ecosystems

Rare plants and ecosystems were assessed through a desktop review of previous environmental assessments and provincial data to identify species or communities known or with potential to occur within the Site. Results of the TEM were used to confirm classification and conservation status of on-Site terrestrial ecosystem units. A Site visit was also conducted on March 28, 2018 to confirm habitat suitability for rare plants; although the Site visit was conducted early in the growing season. The Site was walked in its entirety in a meandering fashion to record the potential for rare plants and species observed.

3.3 Wildlife Resources

3.3.1 Wildlife Habitat and Features

Wildlife and wildlife habitat were assessed qualitatively through characterization of habitat with potential to support wildlife known or with potential to occur on-Site. Data collection included documentation of wildlife habitat features, such as wildlife trees, wildlife trails, and coarse woody debris (CWD); assessment of bird nesting habitat, including a visual scan for protected nests (i.e., eagle, heron, osprey, or peregrine falcon); and documentation of incidental wildlife observations or sign, such as scat or tracks.

3.3.2 Species of Management Concern

For this assessment, wildlife species of management concern were defined as all federally threatened or endangered species listed under Schedule 1 of the SARA; and provincially red- and blue-listed wildlife. Species of management concern were described primarily through a qualitative assessment of their likelihood of occurrence within the Site. Likelihood of occurrence was determined based on the ability of the habitat to meet one or more life requisites for each species of management concern with potential to occur on-Site.

4. RESULTS

The following sections provide a summary of the results of the desktop review and Site visit for Vegetation Resources and Wildlife Resources. Selected Site photographs are provided in Appendix B.

4.1 Vegetation Resources

The Site is located within the Eastern Very Dry Maritime Coastal Western Hemlock Subzone (CWHxm1); however, this area is likely a transition area into the Moist Maritime Coastal Douglas-fir Subzone (CDFmm) due to its proximity to the ocean and northern CDFmm boundary. Both subzones were observed onsite (Figure 2), although the area is small and surrounded by disturbed habitats making the difficult to characterize.

A Site visit was conducted on March 28, 2018 by a Keystone Environmental vegetation biologist (R.P.Bio.) and an arborist to ground-truth the results of the desktop review, classify terrestrial ecosystems within the Site, and identify sensitive species or ecosystems with potential to be affected by the proposed greenway project.

The Site was generally characterized by a young (less 100 years old (PGL, 2004)), second growth coniferous or mixed wood forest (structural stage 5). Although the Site was a young forest, larger individual trees up to 250 years old were observed (Appendix A). In the northwest (Photograph 1), the tree layer was dominated by 25 to 40% western redcedar (*Thuja plicata*) and 10 to 35% Douglas-fir (*Pseudotsuga menziesii* var. *menziesii*), which transitioned to include a greater portion of red alder (*Alnus rubra*) and maple (*Acer macrophyllum*) in the southeast (Photograph 2). Trees showed signs of an historic burn, which occurred in 1919.

The small central forested area appeared as an anomaly with a single arbutus tree observed (*Arbutus menziesii*) and understory covered with oak leaves (Photograph 3); however, no oak trees were observed on that day (or by the arborist). The substrate exhibited a high amount of rounded cobble, which may indicate rapidly drained soils.

The understory vegetation was typical throughout the northwest area and consisted of 40% sword fern (*Polystichum munitum*), 10% salal (*Gaultheria shallon*), 3% Oregon grape (*Mahonia nervosa*), 2% salmonberry (*Rubus spectabilis*) and 1% red elderberry (*Vaccinium parvifolium*). These species were observed throughout the Site, although with lesser cover. The southeast had some areas where standing water was observed, potentially indicating a wetter microsite. The understory in the southeast also included a higher portion (10%) of Indian plum (*Oemleria*

cerasiformis). The Site is narrow and generally disturbed with debris, bare soil paths and various non-native such as: Himalayan blackberry (*Rubus armeniacus*), English holly (*Ilex aquifolium*), and laurel (*Prunus laurocerasus*). A full list of plant species observed is included in Appendix C.

4.1.1 Terrestrial Ecosystem Mapping

A total of four visual plots were surveyed within and adjacent to the Site, which identified two distinct vegetated ecosystem units: CWHxm1 04 Douglas-fir – Salal within the western portion of the Site (Photograph 1) and CDFmm 01 Douglas-fir – Sword Fern within the east (Photograph 2). The extent of the ecosystem units within the Site is provided in Figure 2. A complete list of plant species identified within each ecosystem unit is provided in Appendix C.

4.1.2 Rare Plants and Ecosystems

There are no historical rare plant observations listed within the Project area (Appendix D) Historical observations from the area include: 1) Roell's brotherella (*Brotherella roellii*), red-listed, no SARA listing. 1969-04-20: Collected from base of *Alnus rubrus.* 1.4 km southeast of Site along Southwest Marine Drive. BC CDC 2018; and 2) big-leaf sedge (*Carex amplifolia*), observed south of the site near Pacific Spirit Regional Park. *Carex amplifolia* was listed as a rare plant in the 1999 assessment, but is no longer listed (originally blue-listed) Biophysical South Campus 1999.

4.2 Wildlife Resources

A Site visit was conducted on March 15, 2018 by a Keystone Environmental wildlife biologist (R.P.Bio.) to ground-truth the results of the desktop review and identify sensitive species or habitat features with potential to be affected by the proposed greenway project.

4.2.1 Wildlife Habitat and Sensitive Features

The assessment of wildlife habitat focused on the availability of suitable bird nesting habitat and wildlife habitat features, such as CWD or wildlife trees, that are important to a variety of bird, small mammal, and invertebrate species with potential to occur on-Site. Habitat within the Site was comprised primarily of young, coniferous-dominated forest (structural stage 5) with sparse understory vegetation. The Site was considered disturbed and is bordered by Ross Drive and two construction areas to the northeast and UBC Farm to the southwest. A complete description of the ecosystems classified on-Site is provided in Section 4.1.

A review of the Community Mapping Network's Wildlife Tree Stewardship Atlas identified a bald eagle nest directly adjacent to the Site (Nest ID BAEA-208-034; CMN 2011). The nest was recorded in 2011, but bald eagle activity was not observed. The Site visit confirmed the nest was present, located approximately 20 m north of the Site boundary near the eastern entrance to UBC Farm (Figure 2). The nest was located in a large coast Douglas-fir with a diameter at breast height of 1,300 mm and approximate height of 55 m (Photograph 4). Activity was not recorded within the nest; however, two bald eagles were observed overflying the area throughout the Site visit.

The Site visit also identified multiple wildlife trees with evidence of cavity nesting and foraging use. These trees were also considered to provide potential bat roosting habitat, although no bats were observed.

4.2.2 Species of Management Concern

Based on the results of the desktop review and Site visit, a total of seven wildlife species of management concern were known or had the potential to occur within the Site for all or a portion of their life requisites. Of these species, three are protected under Schedule 1 of the SARA (Appendix E). Recovery strategies and online mapping were reviewed for each threatened or endangered species and critical habitat was not identified within the Site.

A complete list of species of management concern with potential to occur on-Site, including their likelihood of occurrence and on-Site habitat associations is included in Appendix E.

5. DISCUSSION AND RECOMMENDATIONS

Based on the results of the terrestrial and wildlife assessment, key concerns identified within the Site were:

- Old growth or rare trees that include a Douglas fir estimated at 250 years old and a lone arbutus in the central green way.
- A mature Douglas fir with an Eagles nest; and
- The potential to disturb nesting birds during the clearing and grubbing phase of the Project.

In addition to terrestrial and wildlife values, the UBC farm and an Agro-forestry interpretive trail exist to the southwest of the Site. Potential effects to these neighbouring areas were not assessed in this report, but should be considered when reviewing all ecological and social impacts of the Project.

Overall, the Site was considered to be disturbed, forested edge habitat. Potential effects to vegetation or wildlife resources is anticipated to occur primarily through vegetation clearing during Site preparation, which may result in a small loss of forested habitat, temporary sensory disturbance, or injury or mortality of wildlife. Based on the small size of the project footprint and the disturbed nature of the on-Site habitat, potential effects to vegetation and wildlife resources is anticipated to be low. Mitigation measures provided in this section were designed to further avoid or reduce potential effects to terrestrial ecosystems.

The following measures are recommended to avoid or reduce effects to vegetation resources:

- Attempts should be made to maintain the arbutus tree and Douglas fir greater than 200 years old;
- Design of the greenway should incorporate existing access roads and disturbance areas to the extent feasible to limit requirements for vegetation clearing;

- Trees located adjacent to project activities should be protected through the installation of snow fencing extended to the drip line;
- Machinery and equipment must be clean and free of soils and plant materials prior mobilization and demobilization to and from the Site to reduce the potential for the spread or introduction of invasive plant species;
- Noxious weeds were not identified during the terrestrial and wildlife assessment, however, if identified during Site preparation, an invasive plant management plan may be recommended in consultation with a Qualified Environmental Professional (QEP); and
- Additional recommendations related to tree health and retention potential is provided in Appendix A.

The following measures are recommended to avoid or reduce effects to wildlife resources:

- A bald eagle nest was identified adjacent to the Site (Figure 2) during the wildlife assessment. Disturbance or removal of the nest would need to be conducted under the terms and conditions of a provincial General Wildlife Permit. The following timing windows and measures must be considered during clearing or construction activities within 200 m of the nest (BC MOE 2014a,b):
  - A year-round setback of 100 m is recommended for raptor nests. Design of the greenway should incorporate existing gravel roads and disturbance areas to limit requirements for tree clearing within 100 m of the nest.
  - When active, an additional 100 m (a total of 200 m) no-disturbance setback is recommended to reduce the potential for nest abandonment during the breeding season (January to September) or until a QEP has determined the nest to be inactive.
- A pre-clearing bird nest survey conducted by a QEP is recommended prior to any vegetation clearing activities. If additional nests are detected, a species-specific setback would be implemented until the QEP can confirm the nest is inactive;
- Vegetation clearing should be avoided during the general nesting period for migratory birds (March 10 to August 20; ECCC 2017). It is recommended that clearing take place within 48 hours of the survey. If clearing activities are not complete within five days of the survey, additional nest surveys may be recommended by the QEP; and
- Several wildlife trees were identified within the Site during the assessment. Where feasible, these should be retained to avoid the loss of bird nesting and bat roosting habitat.

6. CLOSURE

Based on the results of the terrestrial and wildlife environmental assessment and with implementation of the recommended mitigation measures provided in Section 5, potential effects to the vegetation and wildlife resources discussed in this report are anticipated to be avoided or reduced.

7. STATEMENT OF LIMITATIONS

Findings presented in this report are based upon (i) reviews of available documentation, (ii) observations of the project area and surrounding lands. The conclusions and recommendations documented in this report have been prepared in a manner consistent with that level of care and skill normally exercised by other members of the environmental science profession, practicing under similar circumstances in the area at the time of the performance of the work.

This report has been prepared solely for the internal use of University of British Columbia Campus and Community Planning, pursuant to the agreement between Keystone Environmental Ltd. and University of British Columbia Campus and Community Planning. By using this letter report, University of British Columbia Campus and Community Planning agrees that they will review and use the letter report in its entirety. Any use which other parties make of this letter report, or any reliance on or decisions made based on it, are the responsibility of such parties. Keystone Environmental Ltd. accepts no responsibility for damages, if any, suffered by other parties as a result of decisions made or actions based on this letter report.

We trust the results of the terrestrial and wildlife environmental assessment and recommendations provided herein are sufficient to assist in the preliminary planning stages for Site development. If you have any questions or require additional information, please do not hesitate to contact the undersigned.

Yours truly,

Keystone Environmental Ltd.

Prepared by:

Jayme Brooks, B.Sc., R.P.Bio.
Intermediate Biologist

Reviewed by:

Jamie Slogan, Ph.D., R.P.Bio.
Department Head, Biological Services

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ATTACHMENTS:

- Figures
- Appendix A: Tree Health and Retention Potential
- Appendix B: Selected Site Photographs
- Appendix C: Vegetation Inventory
- Appendix D: Wildlife Species of Management Concern

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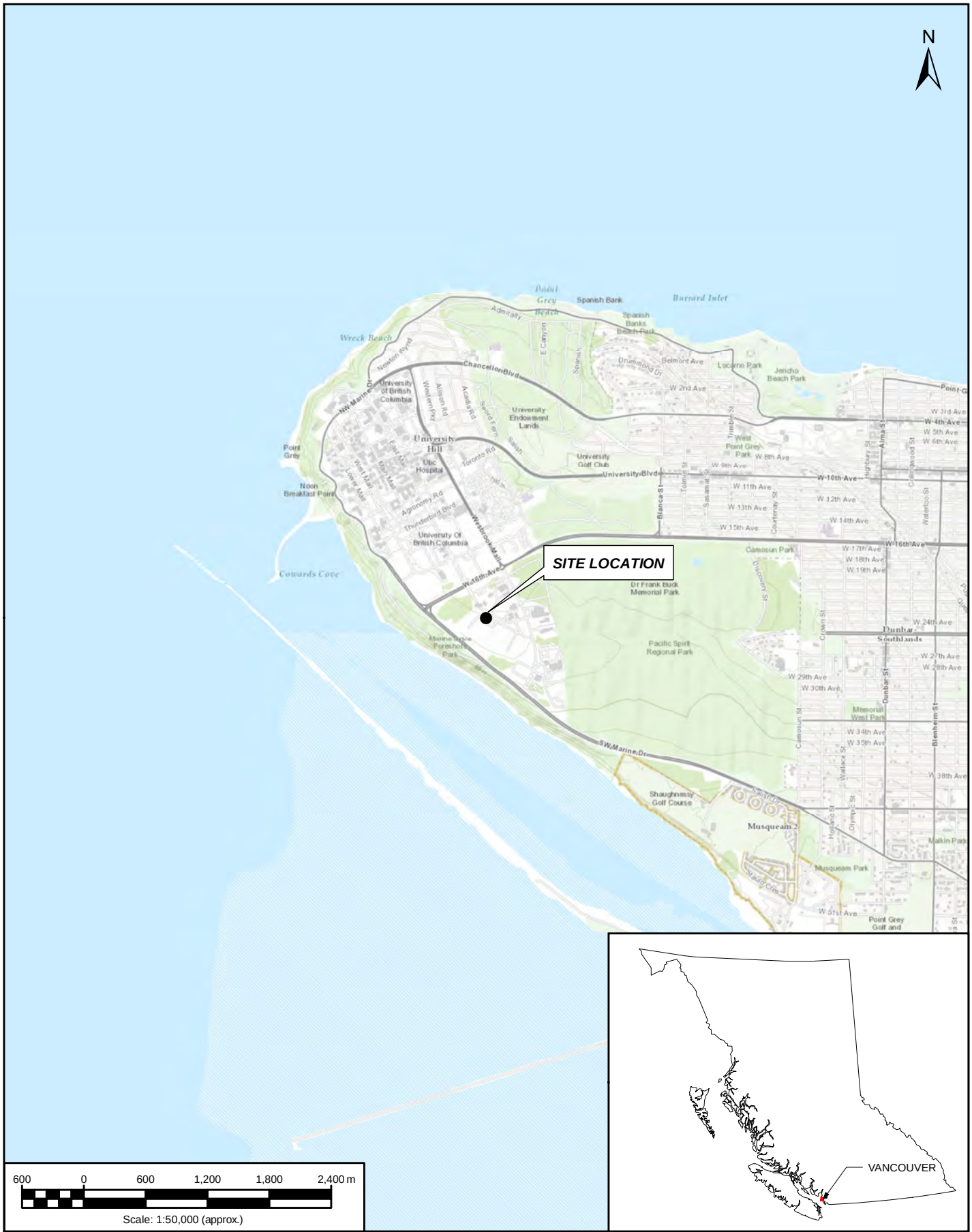
FIGURES



Keystone Environmental

Ross Drive
Vancouver, B C
University of British Columbia Campus and Community Planning

REVISION No.	DATE	PROJECT No.
00	Mar. 2018	13965-104

Figure 1
Location Plan

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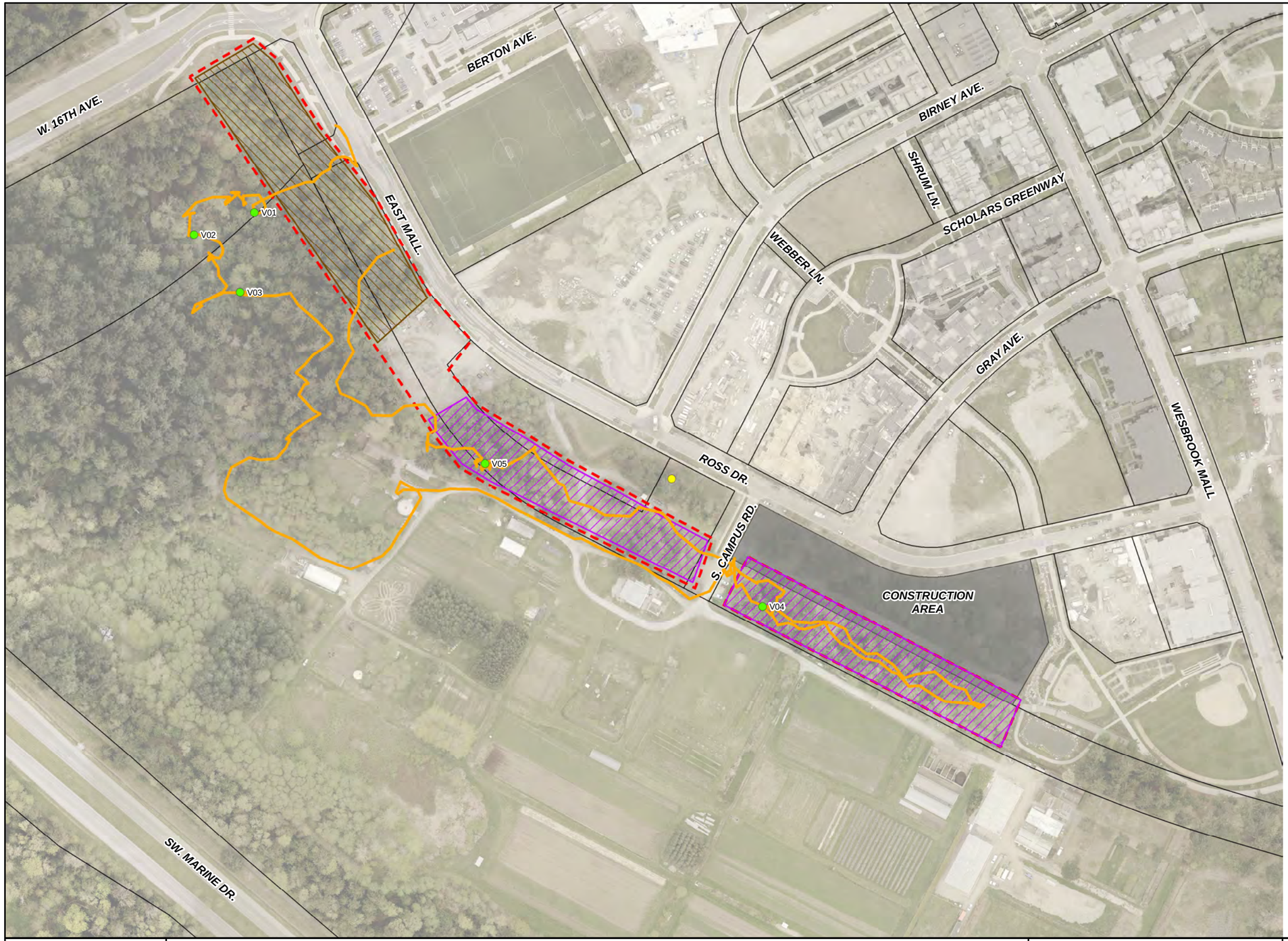

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NOTES:
1. THIS DRAWING IS FOR GENERAL INFORMATION ONLY. LOT BOUNDARIES AND FEATURES ARE APPROXIMATE.
2. DATE OF ORTHO PHOTO IS 2015.

50 0 100 m

SCALE: 1:2,500 (approx.)

Ross Drive
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00	Mar. 2018	13965-104

Figure 2
Assessment Area and Site Sensitivities

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APPENDIX A

TREE HEALTH AND RETENTION POTENTIAL

ARBORIST REPORT

PROJECT:

WESBROOK PLACE GREENWAY SITE B

PROJECT LOCATION:

Section of South Campus Greenway along Ross Drive separating residential development sites in Wesbrook Place from UBC Farm

CLIENT:

KEYSTONE ENVIRONMENTAL

PREPARED BY:

Koome Urban Forestry

305 – 1163 The High Street
Coquitlam, BC V3B 7W2

PROJECT ARBORIST

Kelly J Koome, ISA Certifed Arborist PN-5962A

CONSULTING FORESTER

Robin Clark, RPF #2225

March 22, 2018

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APPENDICES

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Background

Kelly Koome (of Koome Urban Forestry) was contracted by Keystone Environmental to prepare a preliminary tree survey for the South Campus Greenway along Ross Drive separating residential development sites in Wesbrook Place from UBC Farm.

Assignment

Review the overall health of the forest and identify the suitability of groupings of trees for retention; describe the trees species, age and health.

Limits of the Assignment

Project Arborist, Kelly Koome's (ISA Certified Arborist PN-5962A) and Consulting Forester, Robin Clark's ground-based observations were limited to site visits on March 15 & 16, 2018.

No tissue or soil samples were sent to a lab for identification or analysis.

Testing and Analysis

Kelly Koome used visual tree assessment and mallet sounding to test the trees' health, condition and risk level.

Proposed Site Development

Multi-use Pathway.

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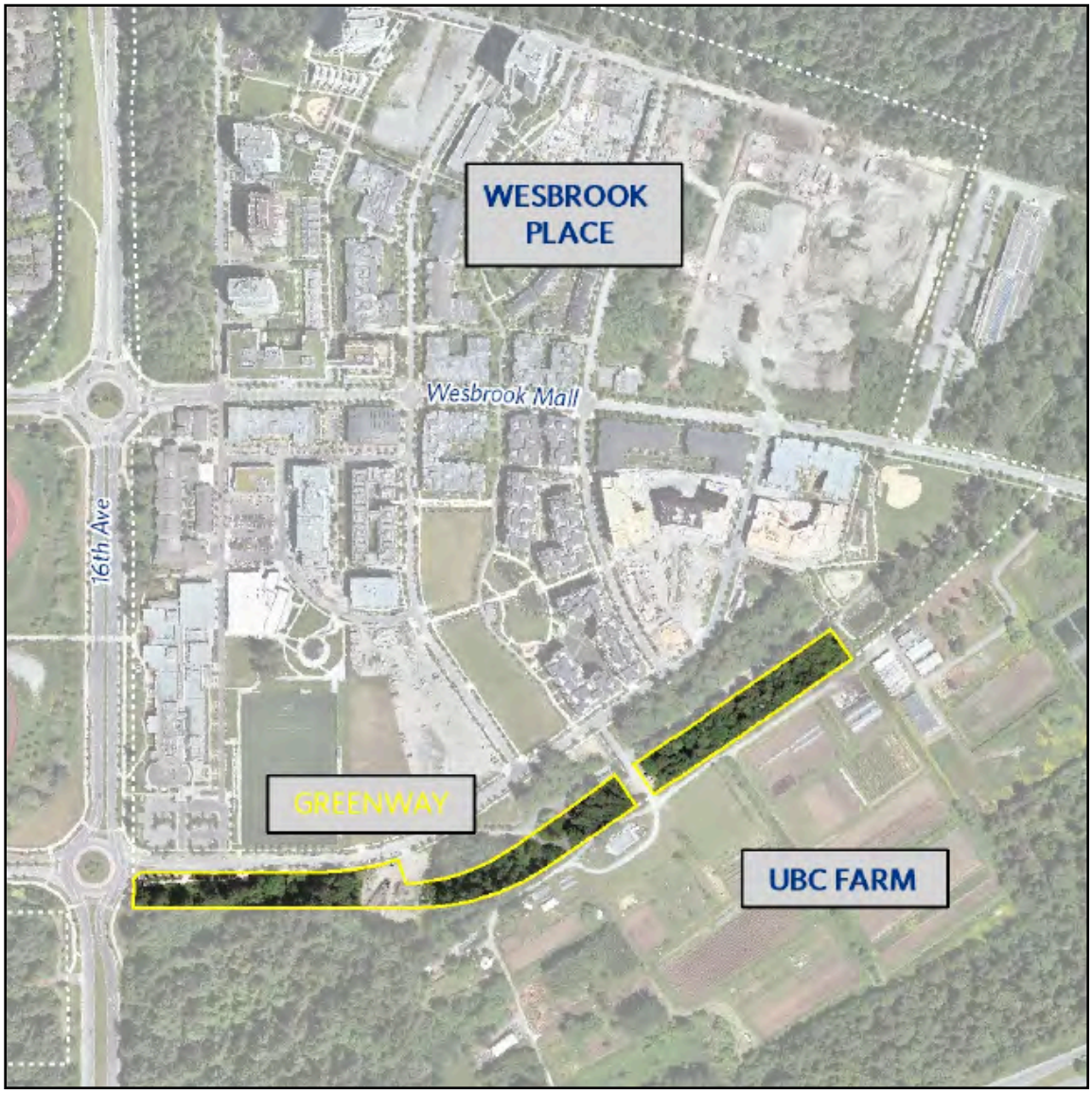
Site Review



Site B - Assessed area shown in yellow

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Environmental Description

The site is an established greenway that is bordered by UBC Farm to the West, Ross Drive to the East, 16th Avenue to the North and with a new residential development to the South.

Observations

Due to past logging activities and a fire in 1919 this forest is largely second growth. There are some exceptions but most of the trees are less than 100 years of age. Generally the forest is in good health and would be suitable for a multi-use pathway.

We observed some candidates that are especially well suited for preservation. There are some mature Douglas-fir estimated to be 250 to 300 years old that should be retained. There are also a few species (*arbutus menziesii* (FIGURE 4), *rhamnus purshiana* (FIGURE 3) not typically found around UBC that are also excellent candidates for retention. These trees could serve as points of interest for interpretive signage.

Routing the walking path near these mature &/or interesting trees can to help to reduce (wild trails) from being created and keep users on the path. There are many standing dead trees being used as wildlife habitat (FIGURE 8, 9). If the path is routed close to these trees the trees could be safely retained by reducing the height. Other features of the forest that could be of interest for interpretation include remnants of the fire (FIGURE 6), nurse stumps and logs (FIGURE 10) and some unusually large shrubs (FIGURE 2 and 5). There is a large Douglas-fir with an Eagle's nest along Ross drive that needs to be protected (FIGURE 5)

The survey uncovered a few areas of concern. The first of which being a likely persistent issue with root disease in the Douglas-firs. Robin Clark, RPF examined all the failed Douglas-firs on the site. At first, the cause of failure appeared to be windfall but a closer look showed evidence of root disease (FIGURE 14). Root disease was also identified on a felled snag.

Approximately 10% of the live Douglas-firs showed basal resinosus (FIGURE 13). According to Robin Clark, this particular pattern (extending higher up along the mail bole) of resinosus is not typical of root disease. Therefore, we recommend a more in-depth inspection of individual trees to determine the cause.

Some of the western red-cedars along Ross Drive are chlorotic (FIGURE 1). This is common across metro-Vancouver as the species is not tolerant to the increasingly hot and dry summers. Because the cedars are on the road they are more exposed to direct sunlight. The species also has a low tolerance to construction in general (grade changes / compaction). These already stressed trees are not suitable to act as edge trees along the path.

There are some trees with a significant lean (FIGURE 11, 12). These could be hazardous and should be removed if they will be located within falling distance of the multi-use pathway or interpretive zones.

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Table 1: Tree Inventory Summary

Common Name ***Botanical Name***	**Canopy cover** **%**	**Health**
Douglas-fir *Pseudotsuga menziesii*	75	- Some mature trees should be preserved if possible - Concerns of root disease should be confirmed with a more in-depth inspection of affected trees
Western red-cedar *Thuja plicata*	10	- Chlorotic condition noted along Ross Drive
Other[1]	15	- Some rarer species should be preserved if possible

1 - Other tree species in order of abundance are; *tsuga heterophylla, alnus rubra*, *acer macrophyllum*, *prunus spp., populus tremuloides, populus trichocarpa, llex aquafolium, acer platanoids, quercus* spp., (2) *arbutus menziesii* (1) *and rhamnus purshiana* (1).

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APPENDIX A - GLOSSARY OF TERMS

Abutment: A structure built to support the lateral pressure of an arch or span, e.g., at the ends of a bridge.
Age: The relative age (young, intermediate, mature) within the particular stand of trees or forest.
Algae: Is a simple, nonflowering plant (includes seaweeds and many single-celled forms). They do contain chlorophyll (but lack true stems, roots, and vascular tissue)
ALR: The Agricultural Land Reserve in which agriculture is recognized as the priority.
Bole: The stem or trunk of a tree.
C: Refers to trees on City property.
Chlorotic: Yellowing of plant tissues caused by nutrient deficiency &/or pathogen.
Co-dominant Leaders: Forked dominant stems nearly the same size in diameter, arising from a common junction.
Co-dominant Within Stand: Individual tree whose height is generally equal to trees (regardless of species) within the same stand.
Compaction: Compression of the soil that breaks down soil aggregates and reduces soil volume and total pore space, especially macropore space.
Conk: A fungal fruiting structure typically found on trunks and indicating internal decay.
Creek: A flow of water often being a tributary of a river.
Culvert: A tunnel that carries a stream under a road.
Dead Standing: A tree that has died but is still standing erect.
Decurrent Tree Form: Tree form which develops when the lateral branches grow as fast, or faster, than the terminal shot. This results in a tree with a broad, spreading from and multiple trunks.
DBH: The Diameter of the tree at 1.40 meters above the ground.
Ditch: A narrow, drainage channel used along roads and fields.
Dominant Within Stand: Individual tree whose height is significantly greater than adjacent trees (regardless of species) within the same stand.
Dwarf Mistletoe: A species of parasitic plants that infect numerous tree species in North America. Severe dwarf mistletoe infection can result in reduced growth, premature mortality.
Excurrent Tree Form: Tree form which develops when the leader outgrows the lateral branches. This results in a tree with a narrow, cone-shaped crown and clearly defined central trunk.
CRZ: Critical Root Zone - The area between the trunk and to the end of the Drip Line.
DRIP LINE: Means a circle drawn on the ground around a tree directly under the tips of the outermost branches of the canopy of the tree.
Fair: Healthy but has some defects such as co-dominant trunk, dead branches.
Feeder Roots: The smaller roots responsible for water and nutrient absorption and gas exchange. These roots can extend far beyond the Drip Line (or outer canopy) of the tree.
Fungus (singular) / Fungi (plural): Unicellular, multicellular or syncytial spore-producing organisms that feed on organic matter (including molds, yeast, mushrooms and toadstools).
Gale - A very strong wind.
Girdling Root: Root that encircles all or part of the trunk of a tree or other roots and constricts the vascular tissue and inhibits secondary growth and the movement of water.
Good: Good form and structure, healthy with no defects.
Hazardous: Significant hazard exists with a high risk of immediate failure; which could result in serious damage to property or person(s).
Height: Height of tree is approximate.
LCR: Live Crown Ratio – The ratio of crown length to total tree length.

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Level 1 Limited Visual Assessment: Limited visual assessment looking for obvious defects such as, but not limited to dead trees, large cavity openings, large dead or broken branches, fungal fruiting structures, large cracks, and severe leans.

Level 2 Basic Visual Assessment: Detailed visual inspection (aboveground roots, trunk, canopy) of tree(s) may include the use of simple tools to perform assessment (i.e. sounding mallet, trowel, measuring tape, binoculars). The assessment does not include advanced resistance drilling of trunk.

Level 3 Advanced Assessment: To provide detailed information about specific tree parts, defects, targets, or side conditions. May included arial inspection, resistance drilling of tree parts, laboratory diagnosis of fungal or plant tissue.

Mildew: Is a minute powdery or web-like fungi (of different colours) that is found on diseased or decaying substances.

Moss: A small, green, seedless plant that grows on stones, trees or ground.

No Disturbance Zone: The zone around a tree that must not be impacted by excavation, grade changes or proposed design plans. It is measured as the Drip Line (measured from the edge of trunk) + 0.60 meters (Minimum excavation over-dig required).

Nurse Log - a downed log from which another tree (s) grows off of.

Orthotropic Shoot: A shoot that is more or less vertical in orientation, upon which the leaves are usually arranged radially around the stem.

OS: Off-site trees and due to restricted access their DBH measurements are approximate. An assessment of off-site trees does not imply they are safe as the restricted access prevented a thorough review.

Plagiotropic Shoot: A shoot that is more or less horizontal in orientation, and upon which the leaves are often arranged in one plane.

Pollarding: A pruning system in which the upper branches of a tree are removed, promoting a dense head of foliage and branches.

Poor: multiple defects, disease, poor structure and or form, root and or canopy damage.

Phloem: Plant vascular tissue that transports sugar and growth regulators. Situated on the inside of the bark, just outside the cambium. Is bidirectional (transports up and down). Contrast with xylem.

Phototropic: Growth toward light source or stimulant.

Retain & Monitor: Monitor health and condition of tree every 12 months for signs of deterioration.

Root Crown: Also called the root collar, it includes the flare at the base of the trunk and the initial roots that develop below the trunk. These roots generally taper and subdivide rapidly to form the root system of the tree.

Root Plate - That part of the root system (excluding the small outermost roots) needed to keep a tree windfirm.

Root Plate Failure - The displacement of the root plate in a gale, resulting in the permanent lean or complete failure of the tree with the soil level pushed up on the windward side.

RULE - Remaining Useful Life Expectancy - The expected period of time that a particular tree will remain *relatively* free of defects or deficiencies, that would cause it to decline rapidly in either health or into an unreasonable level of risk.

Shoot: An extension of growth from the stem of a plant, young enough to be furnished with leaves, often associated with pruned trees.

Snag: In **forest** ecology, a **snag** refers to a standing, dead or dying tree, often missing a top or most of the smaller branches.

SPEA: Streamside Protection and Enhancement Area

Spiral Decline: The health and condition of the tree is deteriorating.

Stream: A small, narrow river.

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Sub-dominant Within Stand: Individual tree whose height is significantly less than adjacent trees (regardless of species) within the same stand.

Suckers: Undesirable stem growth from the roots of the lower trunk of a tree, especially those from a rootstock of a grafted tree.

Suppressed: Individual tree whose growth, health and condition is negatively impacted by adjacent tree(s).

Thrifty: Strong and healthy trees, thriving physically and growing vigorously.

TPZ: Tree Protection Zone - The area between the trunk and the Tree Protection Barrier.

Wildlife Tree: A tree or a group of trees that are identified to be retained to provide future wildlife habitat. Wildlife habitat can exist in tree risks (cavities, dead snags, broken tops). Often times the tree risk to potential targets (people & property) is reduced by removing that part of the tree posing the risk of failure, but the tree (or portion of) is retained to provide future habitat.

Windfirm - Having no elevated risk of windthrow.

Windfirm Boundary - The boundary of a stand of trees that is considered windfirm.

Windthrow - The fall of a tree in a high wind.

Witches Broom: A dense mass of shoots growing from a single point, with the resulting structure resembling a broom or a bird's nest.

Xylem: Thin overlapping cells that helps provide support and that conducts water and nutrients upward from the roots all the way to the leaves.

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APPENDIX B - PHOTOS

Fig. 1 - Western red-cedars along Ross Dr. showing signs of drought stress from cumulative years of dry summers

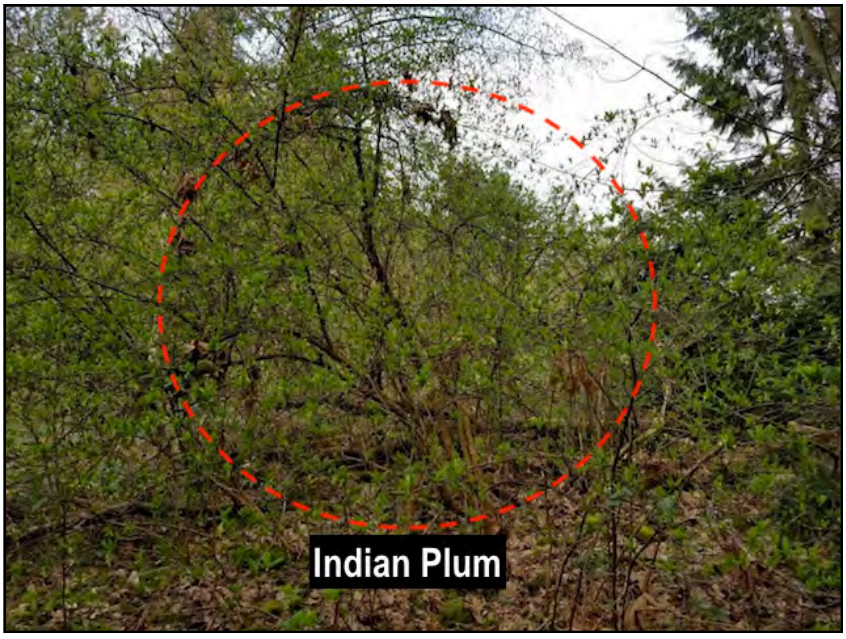

Fig. 2 - Very large Indian Plum (*Oemleria cerasiformis*) within the understory

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Fig. 3 - Tree #3011 Cascara (*Rhamnus purshiana*)

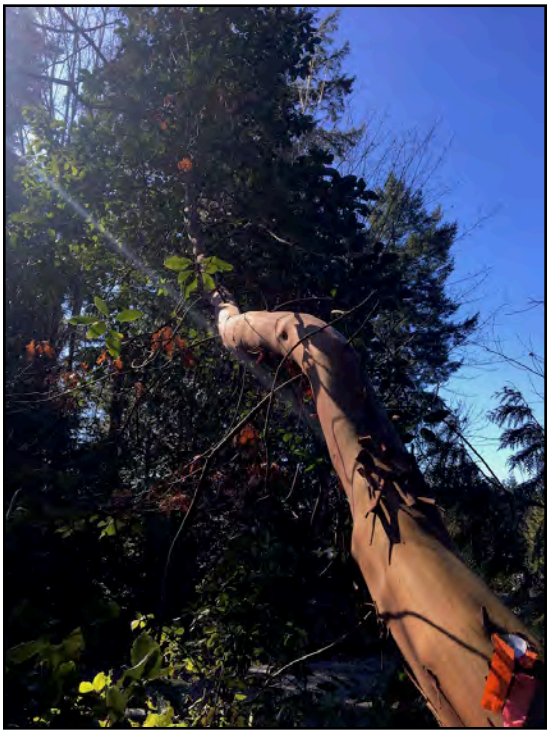

Fig. 4 - Tree #6605 (*Arbutus menziesii)*

Fig. 5 - Unusually large Red elderberry (*Sambucus racemosa*)

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Fig. 6 - Charred Western red-cedar from 1919 forest fire.

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Fig. 7 - Tree #11097 Large Douglas-fir with Eagles nest along Ross Drive near UBC Farm parking lot.

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Fig. 8 - Wildlife ‘snag’

Fig. 9 - Wildlife tree

Fig. 10 - Nurse stump for Western red-cedar

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Fig. 11 - Trees #6681 & #6682 are hazardous trees requiring removal


Fig. 12 - Hazardous Offsite Western Hemlock requiring removal

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Fig. 13 - Tree #7344 Resinosis along lower bole of Douglas-fir

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Fig. 14 - Douglas-fir failure caused by root rot

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APPENDIX C - REFERENCES

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APPENDIX D - ASSUMPTIONS AND LIMITING CONDITIONS OF THIS REPORT/ ASSESSMENT

It is the policy of Koome Urban Forestry (KUF) to attach the following clauses regarding limitations. We do this to ensure that developers, owners, and approving officers are clearly aware of what is technically and professionally realistic in retaining trees.

This Assessment is based on the circumstances and observations as they existed at the time of the site inspection of the Client's Property and the tree(s) situate thereon by Koome Urban Forestry and upon information provided by the Client to KUF. The opinions in this Assessment are given based on observations made and using generally accepted professional judgment, however, because trees and plants are living organisms and subject to change, damage and disease, the results, observations, recommendations, and analysis as set out in this Assessment are valid only as at the date any such testing, observations and analysis took place and no guarantee, warranty, representation or opinion is offered or made by KUF as to the length of the validity of the results, observations, recommendations and analysis contained within this Assessment.

As a result the Client shall not rely upon this Assessment, save and except for representing the circumstances and observations, analysis and recommendations that were made as at the date of such inspections. It is recommended that the trees discussed in this Assessment should be re-assessed periodically. Only the subject tree(s) was inspected and no others.

Restriction of Assessment
Notwithstanding the recommendations and conclusions made in this Assessment, it must be realized that trees are living organisms, and their health and vigour constantly changes over time. They are not immune to changes in site conditions, or seasonal variations in the weather. The tendency of trees or parts of trees to fall due to environmental conditions and internal problems are unpredictable. Defects are often hidden within the tree or underground.

The Assessment carried out was restricted to the Property. No Assessment of any other trees or plants has been undertaken by KUF. Koome Urban Forestry is not legally liable for any other trees or plants on the Property except those expressly discussed herein. The conclusions of this Assessment do not apply to any areas, trees, plants or any other property not covered or referenced in this Report. The conclusions of this Assessment does not imply or in any way infer that other trees on this site or near this site are sound and healthy.

While reasonable efforts have been made to ensure that the tree(s) recommended for retention are healthy, no guarantees are offered, or implied, that these trees, or all parts of them, will remain standing. It is both professionally and practically impossible to predict with absolute certainty the behaviour of any single tree -- or group of trees --, or all their component parts, in all given circumstances. Inevitably, a standing tree will always pose some risk. Most trees have the potential for failure in the event of adverse weather conditions, and this risk can only be eliminated if the tree is removed.

Although every effort has been made to ensure that this assessment is reasonably accurate, the tree(s) should be re-assessed periodically. In accordance with standard practice, the Assessment presented in this Report is valid at the time it was undertaken. It is not a guarantee of safety. It is the owner's responsibility to maintain the tree(s) and inspect the tree(s) to reasonable standards and to carry out recommendations for mitigation suggested in this Report.

Professional Responsibility
In carrying out this Assessment, Koome Urban Forestry and any Assessor appointed for and on behalf of KUF to perform and carry out the Assessment has exercised a reasonable standard of

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care, skill and diligence as would be customarily and normally provided in carrying out this Assessment.

The Assessment of the tree(s) presented in this Report has been made using accepted arboricultural techniques. These include a visual examination of each tree for structural defects, scars, external indications of decay such as fungal fruiting bodies, evidence of insect attack, discoloured foliage, the condition of any visible root structures, the degree and direction of lean (if any), the general condition of the tree(s) and the surrounding site, and the current or planned proximity of property and people. Except where specifically noted in the Report, none of the trees examined were dissected, cored, probed, or climbed, and detailed root crown examinations involving excavation were not undertaken.

Without limiting the foregoing, no liability is assumed by Koome Urban Forestry or its directors, officers, employers, contractors, agents or Assessors for:

a) any legal description provided with respect to the Property;
b) issues of title and or ownership respect to the Property;
c) the accuracy of the Property line locations or boundaries with respect to the Property; and
d) the accuracy of any other information provided to KUF by the Client or third parties;
e) any consequential loss, injury or damages suffered by the Client or any third parties, including but not limited to replacement costs, loss of use, earnings and business interruption; and
f) the unauthorized distribution of the Report.

The total monetary amount of all claims or causes of action the Client may have as against KUF, including but not limited to claims for negligence, negligent misrepresentation and breach of contract, shall be strictly limited solely to the total amount of fees paid by the Client to KUF.

Further, under no circumstance may any claims be initiated or commenced by the Client against Koome Urban Forestry or any of its directors, officers, employees, contractors, agents or Assessors, in contract or in tort, more than 12 months after the date of this Assessment.

Assumptions
The Client is hereby notified and does hereby acknowledge and agree that where any of the facts and information set out and referenced in this Assessment are based on assumptions, facts or information provided to KUF by the Client and/or third parties and unless otherwise set out within this Assessment, KUF will in no way be responsible for the veracity or accuracy of any such information.

Further, the Client acknowledges and agrees that KUF has, for the purposes of preparing their Report, assumed that the Property, which is the subject of this Assessment is in full compliance with all applicable federal, provincial, municipal and local statutes, regulations, by-laws, guidelines and other related laws. KUF explicitly denies any legal liability for any and all issues with respect to non-compliance with any of the above-referenced statutes, regulations, bylaws, guidelines and laws as it may pertain to or affect the Property to which this Assessment applies.

Third Party Liability
This Report was prepared by Koome Urban Forestry exclusively for the Client. The contents reflect KUF's best Assessment of the tree(s) and plant(s) situate on the Property in light of the information available to it at the time of preparation of this Assessment. Any use which a third party makes of this Assessment, or any reliance on or decisions made based upon this Assessment, are made at the sole risk of any such third parties. KUF accepts no responsibility

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for any damages or loss suffered by any third party or by the Client as a result of decisions made or actions based upon the use or reliance of this Assessment by any such party.

Further Services
Notwithstanding the recommendations made in this Assessment, Koome Urban Forestry accept no responsibility for the implementation of all or any part of this plan, unless we have specifically been requested to examine said implementation activities. Approval and implementation of this plan in no way implies any inspection or supervisory role on the part of Koome Urban Forestry. In the event that inspection or supervision of all or part of the implementation of the plan is requested, said request shall be in writing and the details agreed to in writing by both parties. Any on site inspection or supervisory work undertaken by Koome Urban Forestry shall be recorded in written form and submitted to the client as a matter of record.

Koome Urban Forestry nor any of its representatives shall be required to give testimony, or to act as an expert witness or to attend court by reason of this Report unless the Client has first made specific arrangements with respect to such further services, including, without limitation, providing the payment of Koome Urban Forestry's regular hourly billing fees.

Koome Urban Forestry, nor any of its representatives shall be required to provide any further consultation or services to the Client, save and except as already carried out in the preparation of this Report unless the Client has first made specific arrangements with respect to such further services, including, without limitation, providing the payment of Koome Urban Forestry's regular hourly billing fees.

General
Any plans and/or illustrations in this Assessment are included only to help the Client visualize the issues in this Assessment and shall not be relied upon for any other purpose.

KUF shall not be held responsible for the manner of use of the interpretations that other parties may attach to the report. This report is not to be re-printed, copied, published or distributed without prior approval by Koome Urban Forestry.

The Report shall be considered a whole, no sections are severable, and the Report shall be considered incomplete if any pages are missing.

This Report is best viewed in colour. Any copies printed in black and white may make some details difficult to properly understand. Koome Urban Forestry accepts no liability for misunderstandings due to a black and white copy of the Report.

Sketches, drawings and photographs in this Report, being intended as visual aids, are not necessarily to scale and should not be construed as engineering or architectural Report of surveys unless expressed otherwise. The reproduction of any information generated by architects, engineers, or other consultants on any sketches, drawings, or photographs is for the express purpose of co-ordination and ease of reference only. Inclusion of said information on any drawings or other documents does not constitute a representation by Koome Urban Forestry as to the sufficiency or accuracy of said information.

Publication
The Client acknowledges and agrees that all intellectual property rights and title, including without limitation, all copyright in this Report shall remain solely with Koome Urban Forestry. Possession of this Report, or a copy thereof, does not entitle the Client or any third party to the right of publication or reproduction of the Report for any purpose save and except where KUF

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has given its prior written consent. This Report may not be used for any other project or any other purpose without the prior written consent of Koome Urban Forestry.

Unless required by law otherwise, possession of this Report or a copy thereof does not imply right of publication or use for any purpose by any other than the person, parties or agencies to whom it is addressed, without the prior expressed written consent of Koome Urban Forestry.

Neither all nor any part of the contents of this Report shall be disseminated to the public through advertising, public relations, news, sales, the Internet or other media (including, without limitation, television, radio, print or electronic media) without the prior written consent of Koome Urban Forestry.

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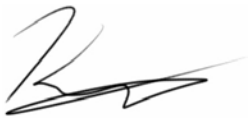
APPENDIX E - CERTIFICATE OF PERFORMANCE

I, Kelly Koome, certify that:

1. I have personally inspected the trees and property referred to in this report and have stated my findings accurately.
2. I have no current or prospective interest in the trees or the property that is the subject of this report and have no personal interest or bias with respect to the parties involved.
3. The analysis, opinions and conclusions stated herein are my own and are based on current scientific procedures and facts.
4. My analysis, opinions and conclusions were developed and this report has been prepared according to commonly accepted arboricultural practices.
5. No one provided significant professional assistance to me, except as indicated within the report.
6. My compensation is not contingent upon the reporting of a predetermined conclusion that favours the cause of the client or any other party nor upon the results of the assessment, the attainment of stipulated results, or the occurrence of any subsequent events.

I further certify that I am a member in good standing with the International Society of Arboriculture, and the Pacific Northwest Chapter of the ISA.

Koome Urban Forestry,



Kelly Koome, Project Arborist
ISA Certified Arborist PN 5962A
ISA Tree Risk Assessment Qualified

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APPENDIX B

SELECTED SITE PHOTOGRAPHS

Photograph 1: Habitat conditions within CWHxm1 04 Douglas-fir – Salal

Photograph 2: Habitat conditions within CDFmm 01 Douglas-fir – Sword Fern

Photograph 3: Understorey in central small forest with oak leaves

Photograph 4: Bald eagle nest located in a Douglas-fir adjacent to the Site

APPENDIX C

VEGETATION INVENTORY

PLANT SPECIES OBSERVED DURING TERRESTRIAL SURVEY MARCH 28, 2018.

TREES

arbutus (*Arbutus menziesii*)
big-leaf maple (*Acer macrophyllum*)
black cottonwood (*Populus tremuloides*)
bitter cherry (*Prunus emerginata*)
Douglas-fir (*Pseudotsuga menziesii* var. *menziesii*)
Grand fir (*Abies grandis*)
oak (*Quercus* sp.)
red alder (*Alnus rubra*)
western hemlock (*Tsuga heterophylla*)
western redcedar (*Thuja plicata*)

SHRUBS

bracken fern (*Pteridium aquilinum*)
Indian plum (*Oemleria cerasiformis)*
Oregon grape (*Mahonia nervosa*)
red elderberry (*Vaccinium parvifolium*)
salal (*Gaultheria shallon*)
salmonberry (*Rubus spectabilis*)

HERBACEOUS PLANTS AND GROUNDCOVER

Pacific bleeding heart (*Dicentra formosa*)
Oregon beaked moss (*Kinderbergia oregana*)
Step moss (*Hylocomium splendens*)
sword fern (*Polystichum munitum*)

NON-NATIVE PLANTS

English holly (*Ilex aquifolium*)
Himalayan blackberry (*Rubus armeniacus*)
laurel (Prunus laurocerasus)
licorice fern (Polypodium glycyrrhiza)
trailing blackberry (Rubus ursinus)

APPENDIX D

WILDLIFE SPECIES OF MANAGEMENT CONCERN

Wildlife Species of Management Concern

Species Group	Common Name	Scientific Name	BC List	SARA	On-Site Habitat Association	Historical Occurrences[1]	Likelihood of Occurrence
Mammals	Keen's Myotis	*Myotis keenii*	Blue	—	Breeding; wildlife trees[2]	—	Moderate
	Little Brown Myotis	*Myotis lucifugus*	Yellow	Endangered			
Birds	Great Blue Heron	*Ardea herodias fannini*	Blue	Special Concern	Breeding; mature forest within 10 km of suitable foraging waterbodies[3]	On-Site July 2016	Present
	Common Nighthawk	*Chordeiles minor*	Yellow	Threatened	Breeding; open, flat areas, including recently cleared areas[4]	UBC Main Campus June 2015	High
	Olive-sided Flycatcher	*Contopus cooperi*	Blue	Threatened	Breeding; mature forest near a natural or artificial edge[5]	On-Site August 2011	Present
	Barn Swallow	*Hirundo rustica*	Blue	Threatened	Breeding; wildlife trees[6]	On-Site July 2017	Present
	Band-tailed Pigeon	*Patagioenas fasciata*	Blue	Special Concern	Breeding; coniferous forest with understory of fruit-bearing shrubs	On-Site June 2016	Present

[1] Historical occurrence records include observations within 2 km of the Site and were obtained from publicly available online databases and reports (eBird 2018)
[2] ECCC 2015
[3] Butler and Vennesland 2015
[4] Boyd 2015, ECCC 2016a
[5] Weber 2015, ECCC 2016b
[6] Hearne 2015

BRITISH COLUMBIA

CDC Occurrence Map
UBC

Legend

Species and Ecosystems at Available Occurrences - CD

FEATURE_CODE

- Animal - Vertebrate
- Animal - Invertebrate
- Plant - Vascular
- Plant - Non-vascular
- Ecological Community

Species and Ecosystems at Secured) Publicly Available

Species and Ecosystems at and Historical) Publicly Avail CDC

FEATURE_CODE

- Animal - Vertebrate

0 0.41 0.81 km

1: 20,000

Copyright/Disclaimer

Datum: NAD83
Projection: NAD_1983_BC_Environment_Albers

Key Map of British Columbia