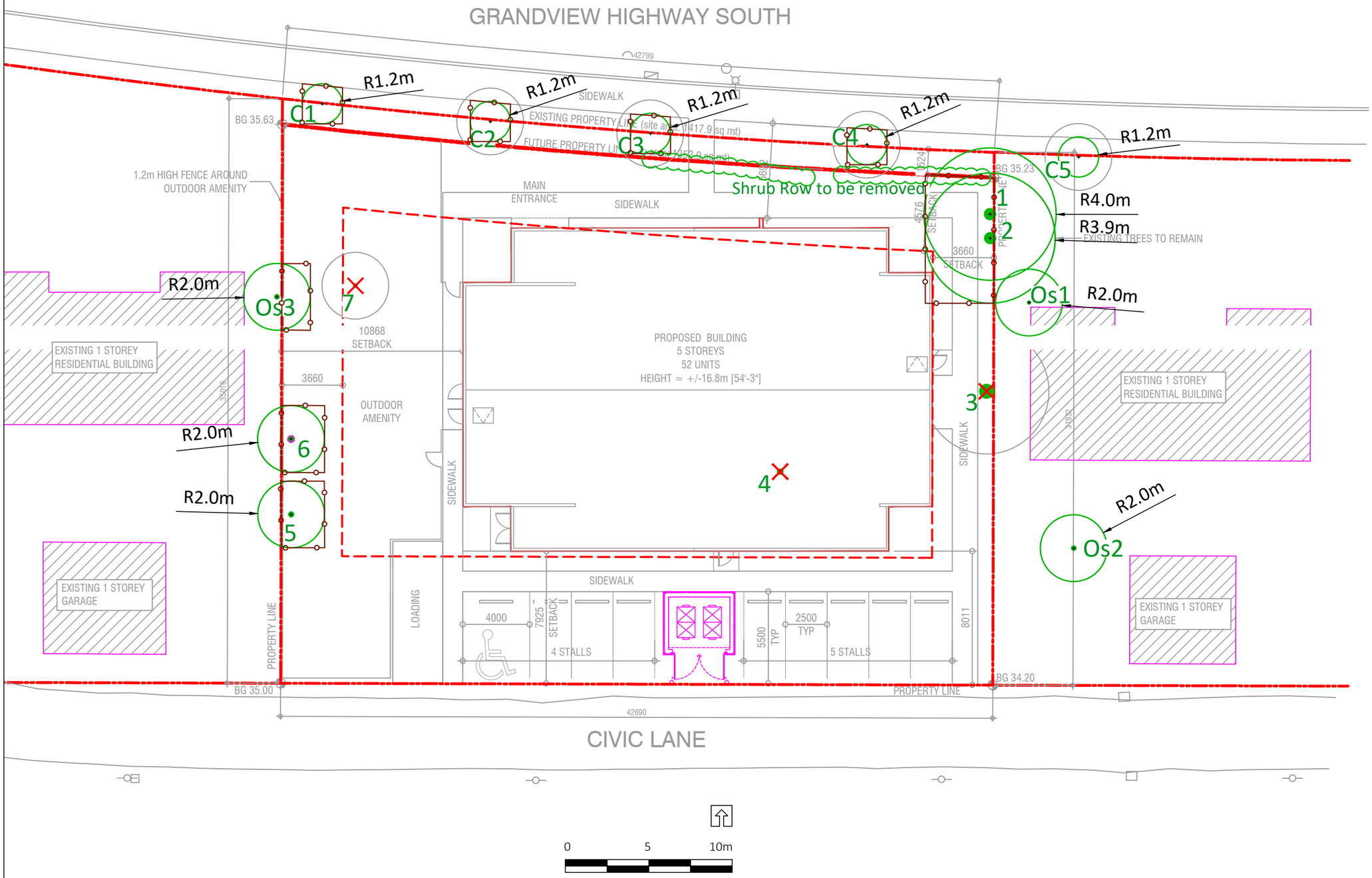
Arborist Notes: Sidewalk construction within TPZs of retained trees is to be done above existing grade using low-impact methodology.



LEGEND

- CRITICAL ROOT ZONE
- TREE PROTECTION ZONE AND FENCING
- SURVEYED TREE TO BE RETAINED
- UN-SURVEYED TREE TO BE RETAINED (MUST BE SURVEYED)
- TREE TO BE REMOVED

NOTES

1. The location of un-surveyed trees on this plan is approximate. Their location and ownership cannot be confirmed without being surveyed by a Registered BC Land Surveyor.
2. All tree protection fencing must be built to the relevant municipal bylaw specifications.The dimensions shown are from the outer edge of the stem of the tree.
3. The tree protection zone shown is a graphical representation of the critical root zone, measured from the outer edge of the stem of the tree. (½ the trees diameter was added to the graphical tree protection circles to accommodate the survey point being in the center of the tree)
4. Any construction activities or grade changes within the Root Protection Zone must be approved by the project arborist.
5. This plan is based on a topographic and tree location survey provided by the owners' Registered British Columbia Land Surveyor (BCLS) and layout drawings provide by the owners' Engineer (P Eng).
6. This plan is provided for context only, and is not certified as to the accuracy of the location of features or dimensions that are shown on this plan. Please refer to the original survey plan and engineering plans.

REFERENCE DRAWINGS

1. Base Survey by: Terra Pacific Ltd.
2. Site Plans provided by the client.

DIAMOND HEAD
3559 COMMERCIAL STREET
VANCOUVER BC | V5N 4E8
T 604.733.4886

Drawing title: Preliminary Tree Management Plan
Project address: 2518-2520 and 2538-2540 Grandview Hwy South, Vancouver
Client: Vancouver Affordable Housing Agency

Drawing No: 001
Date: 2021/10/01
Drawn by: CW
Page Size: TABLOID 11"x17"

Arboricultural Inventory and Report



For:

2518/2520 & 2538/2540 Grandview Highway South
Vancouver, BC

To be submitted with Tree Management Plan dated October 13, 2021.

Submitted to:
Vancouver Affordable Housing Agency
Email: gina.ford@vancouver.ca

Submitted by:

DIAMOND HEAD
3559 Commercial Street
Vancouver, BC 604.733.4886

The following Diamond Head Consulting staff conducted the on-site tree inventory and prepared or reviewed the report.

All general and professional liability insurance and staff accreditations are provided below for reference.

Supervisor:



Max Rathburn
ISA Certified Arborist (PN-0599A)
ISA Qualified Tree Risk Assessor (TRAQ)

Project Staff:



Calvin Wagner
ISA Certified Arborist (PN-9131A)
ISA Qualified Tree Risk Assessor (TRAQ)

Please contact us if there are any questions or concerns about the contents of this report.

Contact Information:

Phone: 604-733-4886
Fax: 604-733-4879
Email: max@diamondheadconsulting.com
Website: www.diamondheadconsulting.com

Insurance Information:

WCB: # 657906 AQ (003)
General Liability: Northbridge General Insurance Corporation - Policy #CBC1935506, $10,000,000
Errors and Omissions: Lloyds Underwriters – Policy #1010615D, $1,000,000

Scope of Assignment:

Diamond Head Consulting Ltd. (DHC) was retained to complete an arboricultural assessment to supplement the proposed development application for 2518/2520 & 2538/2540 Grandview Highway South. This report contains an inventory of protected on and off-site trees. Off-site trees are included because pursuant to municipal bylaws, site owners must include the management of off-site trees that are within the scope of the development. This report is produced with the following primary limitations, detailed limitations specified in Appendix 7:

1) Our investigation is based solely on visual inspection of the trees during our last site visit. This inspection is conducted from ground level. We do not conduct aerial inspections, soil tests or below grade root examinations to assess the condition of tree root systems unless specifically contracted to do so.

2) Unless otherwise stated, tree risk assessments in this report are limited to trees with a *high* or *extreme* risk rating in their current condition, and in context of their surrounding land use at the time of assessment.

3) The scope of work is primarily determined by site boundaries and local tree-related bylaws. Only trees specified in the scope of work were assessed.

4) Beyond six months from the date of this report, the client must contact DHC to confirm its validity because site base plans and tree conditions may change beyond the original report's scope. Additional site visits and report revisions may be required after this point to ensure report accuracy for the municipality's development permit application process. Site visits and reporting required after the first submission are not included within the original proposal fee and will be charged to the client at an additional cost.

The client is responsible for:

- Reviewing this report to understand and implement all tree **risk**, removal and protection requirements related to the project.
- Understanding that we did not assess trees off the subject property and therefore cannot be held liable for actions you or your contractors may undertake in developing this property which may affect the trees on neighboring properties.
- Obtaining a tree removal permit from the relevant municipal authority prior to any tree cutting.
- Obtaining relevant permission from adjacent property owners before removing off-site trees and vegetation.
- Obtaining a timber mark if logs are being transported offsite.
- Ensuring the project is compliant with the tree permit conditions.
- Constructing and maintaining tree protection fencing.
- Ensuring an arborist is present onsite to supervise any works in or near tree protection zones.

Table of Contents

1.0 Introduction 1
1.1 Site Overview 1
1.2 Proposed Land Use Changes 1
1.3 Report Objective 1
2.0 Process and Methods 3
2.1 Tree Inventory 3
2.2 Tree Risk Assessment 3
2.3 Tree Protection 3
3.0 Findings: Tree Inventory and Risk Assessment 4
3.1 Tree Inventory 4
3.2 Tree Risk Assessment 5
4.0 Tree Retention, Removal and Replacement 5
4.1 Tree Retention 5
4.2 Tree Removal 5
4.3 Tree Replacement 5
5.0 Discussion and Summary 6
Appendix 1 Complete Tree Inventory Table 7
Appendix 2 Site Photographs 11
Appendix 3 Tree Health and Structure Rating Criteria 15
Appendix 4 Tree Retention Value Rating Criteria 16
Appendix 5 Risk Rating Matrices 17
Appendix 6 Construction Guidelines 18
Appendix 7 Report Assumptions and Limiting Conditions 22

List of Figures

Figure 1. 2518/2520 & 2538/2540 Grandview Highway South in context of the surrounding landscape and infrastructure. (image provided by the client) 2

List of Tables

Table 1: Summary of the tree inventory from 2518/2520 & 2538/2540 Grandview Highway South 4

List of Photographs

Photo 1. C1, along the North edge of the site. 11
Photo 2. Tree 5. Multiple stems arising from the ground. 12
Photo 3. Tree Os3. English Holly with a crown extending over property line. 13
Photo 4. Tree 7. Birch tree with signs of significant historical pruning. 14

1.0 Introduction

1.1 Site Overview

The subject site is comprised of two lot that contain the existing buildings, and approximately 1400 square meters in size. The topography is flat throughout the site. There are multiple city trees bordering the northern edge of the properties, with cedar and laurel shrubs bordering the North and South edges of the easternmost property. The trees on site are a variety of deciduous and coniferous species.

1.2 Proposed Land Use Changes

The proposed development consists of constructing a five-storey apartment complex. In preparing this report, we reviewed the following information:

- Base survey created by Terra Pacific Land Surveying Ltd, provided by the client.
- Site Plans created by S2 architecture, provided by the client.

1.3 Report Objective

This report has been prepared to ensure the proposed development is compliant with the City of Vancouver Protection of Trees Bylaw No. 9958 and the City of Vancouver Street Tree Bylaw No. 5985, which protects any City trees. Refer to Bylaw 9958 for the complete definition of protected trees, summarized below as:

- Trees with a stem diameter at breast height (DBH, measured at 1.4 m above grade) equal to or greater than 30 cm, measured for a single stem or the combined diameter of the two or three largest trunks or stems;
- Replacement trees of any size;
- All trees that are part of a hedge (counted as a group) if any single tree in the hedge has a stem diameter at breast height equal to or greater than 20 cm.

Trees on adjacent properties with a tree protection zone that extends into the subject site have also been captured in the arborist report.

This report outlines the existing condition of protected trees on and adjacent to the property.



Figure 1. 2518/2520 & 2538/2540 Grandview Highway South in context of the surrounding landscape and infrastructure. (image provided by the client)

2.0 Process and Methods

Calvin Wagner of DHC visited the site on April 13, 2021. The following methods and standards are used throughout this report.

2.1 Tree Inventory

Trees on site and trees shared with adjacent properties were marked with a numbered tag and assessed for attributes including: species; height measured to the nearest meter; and, diameter at breast height (DBH) measured to the nearest centimeter at 1.4 m above grade. Off-site trees were inventoried, but not tagged. The general health and structural integrity of each tree was assessed visually and assigned to one of five categories: *excellent; good; moderate; poor; or dying/dead*. Descriptions of the health and structure rating criteria are given in Appendix 3.

Tree retention value, categorized as *high, medium, low, or nil,* was assigned to each tree or group of trees based on their health and structure rating, and potential longevity in a developed environment. Descriptions of the retention value ratings are given in Appendix 4. Recommendations for tree retention or removal were determined by taking in to account a tree's retention value rating, its location in relation to proposed building envelopes and development infrastructure.

2.2 Tree Risk Assessment

Tree risk assessments were completed following methods of the ISA Tree Risk Assessment Manual[1] published in 2013 by the International Society of Arboriculture, which is the current industry standard for assessing tree risk. This methodology assigns risk based on the likelihood of failure, the likelihood of impact and the severity of consequence if a failure occurs. Only on-site trees that had *high* or *extreme* risk ratings in their current condition and in context of their surrounding land use were identified and reported in section 3.2. Appendix 5 gives the likelihood and risk rating matrices used to categorize tree risk. DHC recommends that on-site trees be re-assessed for risk after the site conditions change (e.g. after damaging weather events, site disturbance from construction, creation of new targets during construction or in the final developed landscape).

2.3 Tree Protection

Tree protection zones were calculated for each tree according to the City of Vancouver Protection of Trees Bylaw 9958 requirements for minimum protection around a tree but may be modified based on professional judgement of the project arborist to accommodate species specific tolerances and site-specific growing conditions.

[1] Dunster, J.A., Smiley, E.T., Matheny, N. and Lilly, S. (2013). Tree Risk Assessment Manual. *International Society of Arboriculture*. Champaign, Illinois.

3.0 Findings: Tree Inventory and Risk Assessment

3.1 Tree Inventory

The tree inventory is summarized in Table 1 and the complete tree inventory is given in Appendix 1.

Trees On-site

There were four (4) protected trees on the site.

Most of the trees on-site have a *Moderate* health rating, with only tree '#7' being classified as having a *Poor* health rating.

Trees on Adjacent Properties

There were three (3) privately owned off-site trees with tree protection zones extending into the subject site or within 4m of the property line.

There were five (5) City trees within 4m of the property line or with tree protection zones extending into the subject site.

Table 1: Summary of the tree inventory from 2518/2520 & 2538/2540 Grandview Highway South containing the number of trees categorized by retention value and the recommended number to be retained or removed. The complete tree inventory is given in Appendix 1.

Tree Species	Retention value				Recommendation		
	High	Medium	Low	Nil	Remove	Retain	Total
On-site and shared trees							
Eastern White Cedar		2				2	**2**
Japanese Maple		1			1		**1**
Cedar Spp.		1			1		**1**
On-site totals		**4**			**2**	**2**	**4**
Off-site trees							
English Holly		1				1	**1**
Boxwood spp.		1				1	**1**
Apple spp.			1			1	**1**
Off-site totals		**2**	**1**			**3**	**3**
City trees							
Black tupelo	5					5	**5**
City totals	**5**					**5**	**5**
				GRAND TOTAL		**12**	**12**

3.2 Tree Risk Assessment

There were no trees on this site that posed a *high* or *extreme* risk at the time of assessment.

4.0 Tree Retention, Removal and Replacement

4.1 Tree Retention

The potential for tree retention on the outside edges of the property are subject to the proposed sidewalk and outside amenities. In the East side of the property where the proposed sidewalk crosses over the tree protection zones of trees 1 and 2, the sidewalk is to be constructed above the existing grade while using low impact methodology to reduce the potential impact to the Tree Protection Zones. Trees on adjacent properties and the City trees along the North end of the property are recommended for retention and are to be protected as required.

4.2 Tree Removal

There is limited retention potential for tree #3 as the root zone of this tree is already limited due to the existing grading and adjacent buildings. Tree #4 is in direct confliction with the proposed building and #7 is already in poor condition and has a low potential for retention. The shrubs in the front of the property are undersized and block the proposed sidewalk.

Tree removals have been recommended to accommodate the proposed development and/or due to tree health and structure. Refer to Appendix 1 for the tree removal comments by tree and to the Tree Protection and Removal Plan for the location of trees to be removed. The following trees are recommended for removal per the criteria outlined in Section 4.5 of the City of Vancouver Protection of Trees Bylaw No. 9958:

Tree #3

a) the location of the tree is within a building envelope defined or described under a development permit or building permit, and changing the siting of an accessory building within that envelope to allow retention of the tree is not possible;

Tree#4

b) the location of the tree is within a building envelope defined or described under a development permit or building permit, and changing the siting of an accessory building within that envelope to allow retention of the tree is not possible;

4.3 Tree Replacement

The City of Vancouver Tree Bylaw requires that replacement trees be planted for trees that are removed. The City will decide the quantity of replacement trees required and the project arborist or landscape architect can then prepare a tree replacement plan showing the location and species.

5.0 Discussion and Summary

Demolition is to be monitored by an on-site arborist to limit the impact to on-site and off-site trees prior to tree removal. Work in or within 1.5m of the critical root zone of any protected tree is to be monitored by an on-site arborist.

Appendix 1 Complete Tree Inventory Table

The complete tree inventory below contains information on tree attributes and recommendations for removal or retention. Tree ownership in this inventory table is not definitive, its determination here is based on information available from the legal site survey, GPS locations, and field assessment during site visits. Tree protection Zones are measured from the outer edge of a tree's stem. If using these measurements for mapping the tree protection zone, ½ the tree's diameter must be added to the distance to accommodate a survey point at the tree's center. Where tree protection fencing is proposed to vary from the minimum municipal TPZ, comments will be included in the Retention/TPZ comments and shown on the Tree Retention and Removal Plan.

*TPZ is the tree protection zone size required by the relevant municipal bylaw or, if not defined, the project arborist.

Surveyed?	Tag #	Location	Species Common Name	Botanical Name	DBH (cm)	Height (m)	LCR	Dripline Radius (m)	Health and Structure Rating	Comments	Retention Value Rating	Retain/ Remove	Retention/TPZ Comments	*TPZ (m)
Yes	C1	Shared-City	Black tupelo	Nyssa sylvatica	6	2		1	Good	City tree planted along sidewalk	High	Retain	Protect as required.	1.2
Yes	C2	Shared-City	Black tupelo	Nyssa sylvatica	7	3		1	Good	City tree planted along sidewalk	High	Retain	Protect as required.	1.2
Yes	C3	Shared-City	Black tupelo	Nyssa sylvatica	7	3		1	Good	City tree planted along sidewalk	High	Retain	Protect as required.	1.2
Yes	C4	Shared-City	Black tupelo	Nyssa sylvatica	7	4		1	Good	City tree planted along sidewalk	High	Retain	Protect as required.	1.2
Yes	C5	Shared-City	Black tupelo	Nyssa sylvatica	4	2		1	Good	City tree planted along sidewalk	High	Retain	Protect as required.	1.2
Yes	Shrub	On Site	Eastern White Cedar	Thuja occidentalis	26	4	80-100%	1	Moderate	Undersized. Row of shrubs, approximately 20 stems.	Medium	Remove	Under bylaw sized tree. Conflicts with proposed sidewalk development.	2

Surveyed?	Tag #	Location	Species Common Name	Botanical Name	DBH (cm)	Height (m)	LCR	Dripline Radius (m)	Health and Structure Rating	Comments	Retention Value Rating	Retain/ Remove	Retention/TPZ Comments	*TPZ (m)
Yes	1	On Site	Eastern White Cedar	Thuja occidentalis	66	11	80-100%	3	Moderate	Codominant at base (36, 30). Signs of pruning near base. Larger stem becomes codominant again at 2m.	Medium	Retain	Protect as required. Sidewalk to be built above grade using low impact methodology.	3.96
Yes	2	On Site	Eastern White Cedar	Thuja occidentalis	65	11	80-100%	3	Moderate	Signs of pruning near base. Main stem splits into 4 codominants at 2m.	Medium	Retain	Protect as required. Sidewalk to be built above grade using low impact methodology.	3.9
Yes	3	On Site	Cedar spp.	Thuja spp.	82	7	80-100%	2	Moderate	Multistemmed at base. Largest stems (36, 26, 20). CRZ adjusted from 4.92 to 3.75	Medium	Remove	Conflicts with proposed sidewalk development.	4.92
Yes	4	On Site	Japanese Maple	Acer palmatum	30	5		3	Moderate	3 main stems (12,10,8) codominant near base. Asymmetrical crown due to adjacent structure.	Medium	Remove	Conflicts with proposed development.	2

Surveyed?	Tag #	Location	Species Common Name	Botanical Name	DBH (cm)	Height (m)	LCR	Dripline Radius (m)	Health and Structure Rating	Comments	Retention Value Rating	Retain/ Remove	Retention/TPZ Comments	*TPZ (m)
Yes	5	On Site	Eastern White Cedar	Thuja occidentalis	29	5	80-100%	3	Moderate	Undersized. 6 stems arising from base. Largest 3 stems stems (11, 10, 8). Signs of minor pruning.	Medium	Retain	Under Bylaw sized tree.	2
No	6	On Site	Common Lilac	Syringa vulgaris	26	3		2	Moderate	Undersized. 6 stems arising from base. Largest 3 stems stems (10, 9, 6). Signs of pruning. Grows through asphalt. Branches extend over property line.	Medium	Retain	Under Bylaw sized tree.	2
Yes	7	On Site	Paper Birch	Betula papyrifera	22	8		3	Poor	Undersized. Leans away from building. Signs of significant historical pruning. Codominant at 2m.	Low	Remove	Under Bylaw sized tree. Conflicts with proposed outdoor amenity. Poor condition.	2
Yes	Os1	Off Site	Boxwood spp.	Buxus spp.	17	4		1	Moderate	Multistemmed at base.	Medium	Retain	Protect as required.	2
No	Os2	Off Site	Apple spp.	Malus spp.	25	6		4	Poor	Stem shows signs of previous failure. Cavity at 1m.	Low	Retain	Protect as required.	2

Surveyed?	Tag #	Location	Species Common Name	Botanical Name	DBH (cm)	Height (m)	LCR	Dripline Radius (m)	Health and Structure Rating	Comments	Retention Value Rating	Retain/ Remove	Retention/TPZ Comments	*TPZ (m)
Yes	Os3	Off Site	English Holly	Ilex aquifolium	25	5		2	Moderate	Invasive species along property line. Relatively full crown.	Low	Retain	Protect as required.	2

Appendix 2 Site Photographs



Photo 1. C1, along the North edge of the site.



Photo 2. Tree 5. Multiple stems arising from the ground.



Photo 3. Tree Os3. English Holly with a crown extending over property line.



Photo 4. Tree 7. Birch tree with signs of significant historical pruning.

Appendix 3 Tree Health and Structure Rating Criteria

The tree health and structure ratings used by Diamond Head Consulting summarize each tree based on both positive and negative attributes using five stratified categories. These ratings indicate health and structural conditions that influence a tree's ability to withstand local site disturbance during the construction process (assuming appropriate tree protection) and benefit a future urban landscape.

Excellent: Tree of possible specimen quality, unique species or size with no discernible defects.

Good: Tree has no significant structural defects or health concerns, considering its growing environment and species.

Moderate: Tree has noted health and/or minor to moderate structural defects. This tree can be retained, but may need mitigation (e.g., pruning or bracing) and monitoring post-development. A moderate tree may be suitable for retention within a stand or group, but not suitable on its own.

Poor: Tree is in serious decline from previous growth habit or stature, has multiple defined health or structural weaknesses. It is unlikely to acclimate to future site use change. This tree is not suitable for retention within striking distance of most targets.

Dying/Dead: Tree is in severe decline, has severe defects or was found to be dead.

Appendix 4 Tree Retention Value Rating Criteria

The tree retention value ratings used by Diamond Head Consulting provide guidance for tree retention planning. Each tree in an inventory is assigned to one of four stratified categories that reflect its value as a future amenity and environmental asset in a developed landscape. Tree retention value ratings take in to account the health and structure rating, species profile*, growing conditions and potential longevity assuming a tree's growing environment is not compromised from its current state.

High: Tree suitable for retention. Has a good or excellent health and structure rating. Tree is open grown, an anchor tree on the edge of a stand or dominant within a stand or group. Species of *Populus, Alnus* and *Betula* are excluded from this category.

Medium: Tree suitable for retention with some caveats or suitable within a group**. Tree has moderate health and structure rating, but is likely to require remedial work to mitigate minor health or structural defects. Includes trees that are recently exposed, but wind firm, and trees grown on sites with poor rooting environments that may be ameliorated.

Low: Tree has marginal suitability for retention. Health and structure rating is moderate or poor; remedial work is unlikely to be viable. Trees within striking distance of a future site developments should be removed.

Nil: Tree is unsuitable for retention. It has a dying/dead or poor health and structure rating. It is likely that the tree will not survive, or it poses and unacceptable hazard in the context of future site developments.

* The species profile is based upon mature age and height/spread of the species, adaptability to land use changes and tree species susceptibility to diseases, pathogen and insect infestation.

** Trees that are 'suitable as a group' have grown in groups or stands that have a single, closed canopy. They have not developed the necessary trunk taper, branch and root structure that would allow then to be retained individually. These trees should only be retained in groups.

Appendix 5 Risk Rating Matrices

Trees with a *probable* or *imminent* likelihood of failure, a *medium* or *high* likelihood of impacting a specified target, and a *significant* or *severe* consequence of failure have been assessed for risk and included in this report (Section 3.2). These two risk rating matrices showing the categories used to assign risk are taken without modification to their content from the International Society of Arboriculture Tree Risk Assessment Qualification Manual.

Matrix 1: Likelihood

Likelihood of Failure	Likelihood of Impacting Target			
	Very Low	**Low**	**Medium**	**High**
Imminent	Unlikely	Somewhat Likely	Likely	Very Likely
Probable	Unlikely	Unlikely	Somewhat Likely	Likely
Possible	Unlikely	Unlikely	Unlikely	Somewhat Likely
Improbable	Unlikely	Unlikely	Unlikely	Unlikely

Matrix 2: Risk Rating

Likelihood of Failure and Impact	Consequences of Failure			
	Negligible	**Minor**	**Significant**	**Severe**
Very Likely	Low	Moderate	High	Extreme
Likely	Low	Moderate	High	High
Somewhat Likely	Low	Low	Moderate	Moderate
Unlikely	Low	Low	Low	Low

Appendix 6 Construction Guidelines

Tree management recommendations in this report are made under the expectation that the following guidelines for risk mitigation and proper tree protection will be adhered to during construction.

Respecting these guidelines will prevent changes to the soil and rooting conditions, contamination due to spills and waste, or physical wounding of the trees. Any plans for construction work and activities that deviate from or contradict these guidelines should be discussed with the project arborist so that mitigation measures can be implemented.

Tree Protection Zones

A Tree protection zone (TPZ) is determined using either dripline or a DBH multiplier to define a radius measured in all directions from the outside of a tree's trunk. It is typically determined according to local municipal bylaw specifications and may be modified based on professional judgement of the project arborist to accommodate species specific tolerances and site specific growing conditions. For retained trees, the TPZ and fencing indicated in this report are proposed as suitable in relation to the level of disturbance proposed on the site plan provided to the project arborist. Arborist consultation is required if any additional work beyond the scope of the plans provided is proposed near the tree. Work done in addition to the proposed impacts discussed in this report may cause the tree to decline and die.

Tree Protection Fencing: Tree protection zones (TPZs) will be protected by Tree Protection Fencing except where site features constrict roots (e.g., retaining walls or roads), where continual access is required (e.g., sidewalks), or when an acceptable encroachment into the TPZ is proposed, in which case the fencing will be modified. Tree Protection Fencing is shown on the Tree Protection Plan and, where it varies from the TPZ, the rationale is described in the inventory table in Section 3.1.

Within a TPZ, no construction activity, including materials storage, grading or landscaping, may occur without project arborist approval. Within the TPZ, the following are tree preservation guidelines based on industry standards for best practice and local municipal requirements:

- No soil disturbance or stripping.
- Maintain the natural grade.
- No storage, dumping of materials, parking, underground utilities or fires within TPZs or tree driplines.
- Any planned construction and landscaping activities affecting trees should be reviewed and approved by a consulting arborist.
- Install specially designed foundations and paving when these structures are required within TPZs.
- Route utilities around TPZs.
- Excavation within the TPZs should be supervised by a consultant arborist.
- Surface drainage should not be altered in such a way that water is directed in or out of the TPZ.

- Site drainage improvements should be designed to maintain the natural water table levels within the TPZ.

Prior to any construction activity, Tree Protection Fencing must be constructed as shown on the Tree Protection Plan. The protection barrier or temporary fencing must be at least 1.2 m in height and constructed of 2" by 4" lumber with orange plastic mesh screening. Tree Protection Fencing must be constructed prior to tree removal, excavation or construction and remain intact for the entire duration of construction.

Tree Crown Protection and Pruning

All heavy machinery (excavators, cranes, dump trucks, etc.) working within five meters of a tree's crown should be made aware of their proximity to the tree. If there is to be a sustained period of machinery working within five meters of a tree's crown, a of line of colored flags should be suspended at eye-level of the machinery operator for the length of the protected tree area. Any concerns regarding the clearance required for machinery and workers within or immediately outside tree protection zones should be referred to the project arborist so that a zone surrounding the crowns can be established or pruning measures undertaken. Any wounds incurred to protected trees during construction should be reported to the project arborist immediately.

Unsurveyed Trees

Unsurveyed trees identified by DHC in the Tree Retention Plan have been hand plotted for approximate location only using GPS coordinates and field observations. The location and ownership of unsurveyed trees cannot be confirmed without a legal surveyed. The property owner or project developer must ensure that all relevant on- and off-site trees are surveyed by a legally registered surveyor, whether they are identified by DHC or not.

Removal of logs from sites

Private timber marks are required to transport logs from privately-owned land in BC. It is property owner's responsibility to apply for a timber mark prior to removing any merchantable timber from the site. Additional information can be found at: http://www.for.gov.bc.ca/hth/private-timber-marks.htm

Regulation of Soil Moisture and Drainage

Excavation and construction activities adjacent to TPZs can influence the availability of moisture to protected trees. This is due to a reduction in the total root mass, changes in local drainage conditions, and changes in exposure including reflected heat from adjacent hard surfaces. To mitigate these concerns the following guidelines should be followed:

- Soil moisture conditions within the tree root protection zones should be monitored during hot and dry weather. When soil moisture is inadequate, supplemental irrigation should be provided that penetrates soil to the depth of the root system or a minimum of 30 cm.
- Any planned changes to surface grades within the TPZs, including the placement of mulch, should be designed so that any water will flow away from tree trunks.

- Excavations adjacent to trees can alter local soil hydrology by draining water more rapidly from TPZs more rapidly than it would prior to site changes. It is recommended that when excavating within 6 m of any tree, the site be irrigated more frequently to account for this.

Root Zone Enhancements and Fertilization

Root zone enhancements such as mulch, and fertilizer treatments may be recommended by the project arborist during any phase of the project if they deem it necessary to maintain tree health and future survival.

Paving Within and Adjacent to TPZs

If development plans propose the construction of paved areas and/or retaining walls close to TPZs, measures should be taken to minimize impacts. Construction of these features would raise concerns for proper soil aeration, drainage, irrigation and the available soil volume for adequate root growth. The following design and construction guidelines for paving and retaining walls are recommended to minimize the long-term impacts of construction on protected trees:

- Any excavation activities near or within the TPZ should be monitored by a certified arborist. Structures should be designed, and excavation activities undertaken to remove and disturb as little of the rooting zone as possible. All roots greater than 2 cm in diameter should be hand pruned by a Certified Arborist.
- The natural grade of a TPZ should be maintained. Any retaining walls should be designed at heights that maintain the existing grade within 20 cm of its current level. If the grade is altered, it should be raised not reduced in height.
- Compaction of sub grade materials can cause trees to develop shallow rooting systems. This can contribute to long-term pavement damage as roots grow. Minimizing the compaction of subgrade materials by using structural soils or other engineered solutions and increasing the strength of the pavement reduces reliance on the sub-grade for strength.
- If it is not possible to minimize the compaction of sub-grade materials, subsurface barriers should be considered to help direct roots downward into the soil and prevent them from growing directly under the paved surfaces.

Plantings within TPZs

Any plans to landscape the ground within the TPZ should implement measures to minimize negative impacts on the above or below ground parts of a tree. Existing grass layer in TPZs should not be stripped because this will damage surface tree roots. Grass layer should be covered with mulch at the start of the project, which will gradually kill the grass while moderating soil moisture and temperatures. Topsoil should be mixed with the mulch prior to planting of shrubs, but new topsoil layer should not be greater than 20 cm deep on top of the original grade. Planting should take place within the newly placed topsoil mixture and should not disturb the original rooting zone of the trees. A two-meter radius around the

base of each tree should be left unplanted and covered in mulch; a tree's root collar should remain free from any amendments that raise the surface grade.

Monitoring during construction

Ongoing monitoring by a consultant arborist should occur for the duration of a development project. Site visits should be more frequent during activities that are higher risk, including the first stages of construction when excavation occurs adjacent to the trees. Site visits will ensure contractors are respecting the recommended tree protection measures and will allow the arborist to identify any new concerns that may arise.

During each site visit the following measures will be assessed and reported on by a consulting arborist:

- Health and condition of protected trees, including damage to branches, trunks and roots that may have resulted from construction activities, as will the health of. Recommendations for remediation will follow.
- Integrity of the TPZ and fencing.
- Changes to TPZ conditions including overall maintenance, parking on roots, and storing or dumping of materials within TPZ. If failures to maintain and respect the TPZ are observed, suggestions will be made to ensure tree protection measures are remediated and upheld.
- Review and confirmation of recommended tree maintenance including root pruning, irrigation, mulching and branch pruning.
- Changes to soil moisture levels and drainage patterns; and
- Factors that may be detrimentally impact the trees.

Appendix 7 Report Assumptions and Limiting Conditions

1) Unless expressly set out in this report or these Assumptions and Limiting Conditions, Diamond Head Consulting Ltd. ("Diamond Head") makes no guarantee, representation or warranty (express or implied) regarding this report, its findings, conclusions or recommendations contained herein, or the work referred to herein.

2) The work undertaken in connection with this report and preparation of this report have been conducted by Diamond Head for the "Client" as stated in the report above. It is intended for the sole and exclusive use by the Client for the purpose(s) set out in this report. Any use of, reliance on or decisions made based on this report by any person other than the Client, or by the Client for any purpose other than the purpose(s) set out in this report, is the sole responsibility of, and at the sole risk of, such other person or the Client, as the case may be. Diamond Head accepts no liability or responsibility whatsoever for any losses, expenses, damages, fines, penalties or other harm (including without limitation financial or consequential effects on transactions or property values, and economic loss) that may be suffered or incurred by any person as a result of the use of or reliance on this report or the work referred to herein. The copying, distribution or publication of this report (except for the internal use of the Client) without the express written permission of Diamond Head (which consent may be withheld in Diamond Head's sole discretion) is prohibited. Diamond Head retains ownership of this report and all documents related thereto both generally and as instruments of professional service.

3) The findings, conclusions and recommendations made in this report reflect Diamond Head's best professional judgment given the information available at the time of preparation. This report has been prepared in a manner consistent with the level of care and skill normally exercised by arborists currently practicing under similar conditions in a similar geographic area and for specific application to the trees subject to this report on the date of this report. Except as expressly stated in this report, the findings, conclusions and recommendations it sets out are valid for the day on which the assessment leading to such findings, conclusions and recommendations was conducted. If generally accepted assessment techniques or prevailing professional standards and best practices change at a future date, modifications to the findings, conclusions, and recommendations in this report may be necessary. Diamond Head expressly excludes any duty to provide any such modification if generally accepted assessment techniques and prevailing professional standards and best practices change.

4) Conditions affecting the trees subject to this report (the "Conditions", include without limitation, structural defects, scars, decay, fungal fruiting bodies, evidence of insect attack, discolored foliage, condition of root structures, the degree and direction of lean, the general condition of the tree(s) and the surrounding site, and the proximity of property and people) other than those expressly addressed in this report may exist. Unless otherwise stated information contained in this report covers only those Conditions and trees at the time of inspection. The inspection is limited to visual examination of such Conditions and trees without dissection, excavation, probing or coring. While

every effort has been made to ensure that any trees recommended for retention are both healthy and safe, no guarantees, representations or warranties are made (express or implied) that those trees will not be subject to structural failure or decline. The Client acknowledges that it is both professionally and practically impossible to predict with absolute certainty the behavior of any single tree, or groups of trees, in all given circumstances. Inevitably, a standing tree will always pose some risk. Most trees have the potential for failure and this risk can only be eliminated if the risk is removed. If Conditions change or if additional information becomes available at a future date, modifications to the findings, conclusions, and recommendations in this report may be necessary. Diamond Head expressly excludes any duty to provide any such modification of Conditions change or additional information becomes available.

5) Nothing in this report is intended to constitute or provide a legal opinion and Diamond Head expressly disclaims any responsibility for matters legal in nature (including, without limitation, matters relating to title and ownership of real or personal property and matters relating to cultural and heritage values). Diamond Head makes no guarantee, representation or warranty (express or implied) as to the requirements of or compliance with applicable laws, rules, regulations, or policies established by federal, provincial, local government or First Nations bodies (collectively, "Government Bodies") or as to the availability of licenses, permits or authorizations of any Government Body. Revisions to any regulatory standards (including bylaws, policies, guidelines an any similar directions of a Government Bodies in effect from time to time) referred to in this report may be expected over time. As a result, modifications to the findings, conclusions and recommendations in this report may be necessary. Diamond Head expressly excludes any duty to provide any such modification if any such regulatory standard is revised.

6) Diamond Head shall not be required to give testimony or to attend court by reason of this report unless subsequent contractual arrangements are made, including payment of an additional fee for such services as described in the fee schedule and contract of engagement.

7) In preparing this report, Diamond Head has relied in good faith on information provided by certain persons, Government Bodies, government registries and agents and representatives of each of the foregoing, and Diamond Head assumes that such information is true, correct and accurate in all material respects. Diamond Head accepts no responsibility for any deficiency, misinterpretations or fraudulent acts of or information provided by such persons, bodies, registries, agents and representatives.

8) Sketches, diagrams, graphs, and photographs in this report, being intended as visual aids, are not necessarily to scale and should not be construed as engineering or architectural reports or surveys.

9) Loss or alteration of any part of this report invalidates the entire report.