

Arboricultural Inventory and Report

For:

UBC Properties Trust

Site Location:

Daycare Sites – Three Locations



Submitted to:

Sepehr Rad

UBC Properties Trust

Email:

Srad@ubcproperties.com

Date: 20181031

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.

Project Staff:



Trevor Cox, RPP, MCIP
ISA Certified Arborist (PN-1920A)
ISA Tree Risk Assessment Qualified (TRAQ)
BC Parks Wildlife and Danger Tree Assessor

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: trevor@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 a tree inventory for an area of the UBC Vancouver campus, where daycares are proposed near Revelstoke Court. It is understood that mobile daycare centers will be brought onto site which will be supported in their proposed locations on piles that will be screwed into the soil. The installation of any piles, walkways or work within the tree protection zones will need to be supervised by the project arborist. Please note that there are also a number of large trees that are to the north and west of these proposed buildings that contain defects. Many of these mature trees appear to have had broken tops about 30 years ago. Consequently, many of them have codominant stems that may have decay or issues where they are attached. These parts have the potential to strike the building and therefore it is recommended that they be climbed and inspected by a qualified arborist and tree risk assessor. A report detailing the findings should be supplied to UBC with the recommended actions and a monitoring plan (and those that were undertaken). **Please note that a full tree survey was not provided for the site. The attached map provides their locations where they were surveyed and those that were not.**

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.
- 5) Assessment areas are limited to the three select areas identified in figures 2-4. These assessment areas were field assessed by the project arborist, using their best judgement. A survey was not provided, and as such all locations are approximate and based on the project arborist field assessment.

Table of Contents

1.0	Introduction	4
1.1	Site Overview and Proposed Land Use Changes	4
1.2	Report Objective	4
2.0	Process and Methods	5
2.1	Tree Inventory	5
2.2	Tree Risk Assessment	6
2.3	Tree Protection	6
3.0	Findings: Tree Inventory and Risk Assessment	6
3.1	Tree Inventory	6
Appendix 1	Complete Tree Inventory Table.....	9
Appendix 2	Site Photographs	13
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. The three daycare sites are to be situated in areas near the middle of the photo (Air photo from Google Earth 2018.	5
Figure 2. Tree protection and removal plan	7

1.0 Introduction

1.1 Site Overview and Proposed Land Use Changes

The three sites proposed for the daycares are located to the west of the northerner end of Revelstoke Court. The forest cover in the surrounding area consists of a larger stand of trees consisting of Douglas-fir and Western redcedar trees that are about 100 years old with several ornamental landscape trees that have been planted in the grassed areas to the south consisting of flowering cherries and deodora cedars.

1.2 Report Objective

This report has been prepared to help guide tree management around the proposed daycares. Fencing has been indicated adjacent to trees where they have the potential to be impacted by construction activities. Recommendations have been made for pruning, cabling and bracing and detailed inspections of defects up in trees to reduce the risk of failure adjacent to these proposed buildings. Arborist supervision is recommended where any work is proposed within the tree protection zones, regardless of whether it is noted in the report. With the construction staging or access into the site, there may be additional trees nearby that require protection. Staging and construction access should be discussed prior to constructing the tree protection fencing.

A summary of trees proposed for removal by diameter class by species is provided. This report also outlines the existing condition of the protected trees on and adjacent to the daycares and this information is provided below.



Figure 1. The three daycare sites are to be situated in areas near the middle of the photo (Air photo from Google Earth 2018).

2.0 Process and Methods

2.1 Tree Inventory

The trees to be inventoried were identified by the project manager for UBC Properties Trust. Several stakes were in the ground indicating the edges of the proposed siting's for the Daycares under 'Option 4'. This provided guidance for the assessment of trees that could strike the potential daycares from the surrounding forest cover. On October 22, 2018 the trees on site were inventoried. Trees on site over 15cm Diameter at Breast Height were identified (if not already tagged) and assessed for attributes including: species; height; and, diameter at breast height (DBH) measured to the nearest centimeter at 1.4 m above grade. 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.

2.2 Tree Risk Assessment

Tree risk assessments were completed following methods of the ISA Tree Risk Assessment Manual¹ 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

Critical root zones were calculated for each tree according to a general 6x the diameter of the tree but may be modified in some instances based on professional judgement of the project arborist to accommodate species specific tolerances and site-specific growing conditions.

3.0 Findings: Tree Inventory and Risk Assessment

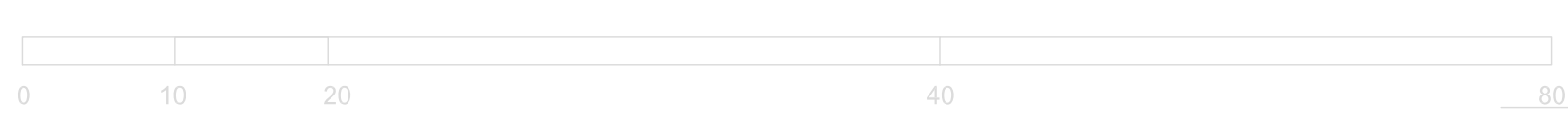
3.1 Tree Inventory

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

Trees Inventoried

There were 18 protected trees identified for the purposed of this plan either because they were directly adjacent to the proposed development or because they posed a possible risk. (see Appendix 1 for individual tree inventory information).

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



LEGEND

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

NOTES

- 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.
- 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.
- 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. (1/2 the trees diameter was added to the graphical tree protection circles to accommodate the survey point being in the center of the tree)
- Any construction activities or grade changes within the Root Protection Zone must be approved by the project arborist.
- 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).
- 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

- Base Survey by: Architect to UBCPT

Trees marked with a solid green dot have been surveyed. Those as a green outline with a white center have not been surveyed.



Tree Risk Assessment

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

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. Critical Root Zones are measured from the outer edge of a tree's stem and are generally used to delineate the Tree Protection Zone. 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 Zones are proposed to vary from the CRZ, comments will be included in the Retention/TPZ comments and shown on the Tree Retention and Removal Plan. Trees T1-T4 have not been tagged in the field.

Tag #	Location	Species	DBH (cm)	Height (m)	Health and Structure Rating	Comments	Retention Value Rating	Retain/ Remove	Retention/TPZ Comments	CRZ
70	onsite	Douglas-fir (P. menziesii)	79	32	Moderate	Codom stem with u union at 20 m	Medium	Retain	Requires that building piles are placed out of root zone and tree is lift pruned on north side. Arborist supervision required for footing work.	4.7
71	onsite	Cedar (T. plicata)	38	15	Moderate	At forest edge. Under canopy of cedar behind. Supressed Live crown pruned to 3m	Medium	Remove	Survey has not been completed but stakes indicate that this tree is right up against building edge. Not feasible to retain or work around.	2.3
72	onsite	Cedar (T. plicata)	38	15	Moderate	At forest edge. Under canopy of cedar behind. Supressed Large scar at 2 m on southwest side. Solid wood behind. Live crown pruned to 3m. Only live on south side.	Medium	Retain	Tree has not been surveyed. Appears that arborist lift pruning will be required	2.3
73	onsite	Cedar (T. plicata)	18	11	Poor	Second stem of tree to northwest. Very little live crown- shaded out. Large decay cavity at base and at 1m	Low	Remove	Remove only the tagged stem.	2

Tag #	Location	Species	DBH (cm)	Height (m)	Health and Structure Rating	Comments	Retention Value Rating	Retain/ Remove	Retention/TPZ Comments	CRZ
74	onsite	Douglas-fir (P. menziesii)	80	32	Moderate	Kink in stem at 20m inspect to retain. With the proximity to the building requires monitoring if it is retained.	Medium	Retain	Tree has not been surveyed. Appears to have sufficient space in relation to stakes. Tree protection fencing required. Inspect and Monitor/Prune	4.7
75	onsite	Douglas-fir (P. menziesii)	85	32	Moderate	Defect - Codominant stem at 20m- inspect to retain. With the proximity to the building requires monitoring if it is retained.	Medium	Retain	Inspect and Prune	4.7
76	onsite	Douglas-fir (P. menziesii)	90	32	Moderate	Single stem to 20m then splits. Inspect unions. With the proximity to the building requires monitoring if it is retained.	Medium	Retain	Inspect and Prune	4.7
77	onsite	Douglas-fir (P. menziesii)	83	32	Good	Single stem with two large kinks. Inspect at 20m. With the proximity to the building requires monitoring if it is retained.	Medium	Retain	Inspect and Prune/Monitor. The root zone conflicts with the building placement. Requires arborist supervision of any work within this zone.	5
78	onsite	Cedar (T. plicata)	95	29	Poor	Codom at 15 m with severe inclusion Little live - tree is in decline. With the proximity to the building requires monitoring if it is retained.	Nil	Remove	Inspect maybe reduce codom on out side by 2/3	5.7
79	onsite	Cedar (T. plicata)	120	30	Moderate	Included seam at 3-8m requires brace and cabling. With the proximity to the building requires monitoring if it is retained.	Medium	Retain	Inspect and Prune/Cable and Brace/Monitor.	7.2
536	onsite	Douglas-fir (P. menziesii)	76	33	Moderate	Tree was not surveyed. Forked top, U-union at about 18m. Requires assessment to determine extent of decay and potential for pruning. With the proximity to the building requires monitoring if it is retained.	Medium	Retain	Inspect and Monitor/Prune	4.6
1521	onsite	Cherry (P. x yedoensis)	46	7	Moderate	No leaves at the time of assessment. Has black canker growth. Single stem with little dieback	Medium	Retain	Protect as required. Arborist supervision required for any work within tree protection fencing	2.8

Tag #	Location	Species	DBH (cm)	Height (m)	Health and Structure Rating	Comments	Retention Value Rating	Retain/ Remove	Retention/TPZ Comments	CRZ
1522	onsite	Cherry (P. x yedoensis)	36	7	Moderate	No leaves at the time of assessment. Has black canker growth. Single stem with little dieback	Medium	Retain	Protect as required. Arborist supervision required for any work within tree protection fencing	2.2
1523	onsite	Cherry (P. x yedoensis)	40	7	Moderate	No leaves at the time of assessment. Has black canker growth. Single stem with little dieback	Medium	Retain	Protect as required. Arborist supervision required for any work within tree protection fencing	2.4
1524	onsite	Cherry (P. x yedoensis)	41	7	Moderate	No leaves at the time of assessment. Has black canker growth. Single stem with little dieback	Medium	Remove	Within building envelope.	2.5
1538	onsite	Cedrus (C. deodara)	48	23	Moderate	Compacted at base, trail 2.5m south. Heavy lean south but corrected. Likely root failure in past; scar at base and 2m. Lifts pruned to 4m	Medium	Remove	Within building envelope.	2.9
1541	onsite	Cedar (T. plicata)	68	22	Moderate	Slight compaction around base. Lift pruned to 4m. Upper canopy has 3 stems emerging at 18m. 10cm attachments. Prune to retain. Could use mulch around base within dripline.	Medium	Retain	Protect as required. Arborist supervision required for any work within tree protection fencing	4.1
1542	onsite	Cedar (T. plicata)	81	23	Good	Slight compaction around base. Lift pruned to 3m. Could use mulch around base within dripline.	High	Retain	Protect as required. Arborist supervision required for any work within tree protection fencing	4.9
T1	onsite	Cedrus (C. deodara)	48	23	Moderate	Compacted around base. Trail to the west. Single stem.	Medium	Retain	Protect as required. Arborist supervision required for any work within tree protection fencing	2.9
T2	onsite	Cedrus (C. deodara)	52	23	Moderate	Compacted around base. Trail to the west. Single stem.	Medium	Retain	Protect as required. Arborist supervision required for any work within tree protection fencing	3.1
T3	onsite	Cedrus (C. deodara)	47	23	Moderate	Compacted around base. Trail to the west. Single stem.	Medium	Retain	Protect as required. Arborist supervision required for any work within tree protection fencing	2.8

Tag #	Location	Species	DBH (cm)	Height (m)	Health and Structure Rating	Comments	Retention Value Rating	Retain/ Remove	Retention/TPZ Comments	CRZ
T4	onsite	Cedrus (C. deodara)	56	23	Moderate	Compacted around base. Trail to the west. Single stem.	Medium	Retain	Protect as required. Arborist supervision required for any work within tree protection fencing	3.4

Appendix 2 Site Photographs



Photo 1. Looking at tree 1524 to the right and 1521-1523 in the background.



Photo 2. Looking up into the 'U' union located in tree #70. Note that many of the trees have similar attachments that require inspection were noted in the tree tables.



Photo 3. Looking up into trees 76 and 77. Both have similar topping points that require inspection.



Photo 4. Looking at trees 1541 and 1542.

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 an 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 them 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.

Critical Root Zones

Critical root zones (CRZs) are specifically intended to protect a tree's roots from negative construction impacts. CRZs are required to retain good health and vigor of the tree during development and in the future landscape. The CRZ boundary is measured as a radius in all directions from the outer surface of the tree's stem. The CRZ radius is typically determined according to local municipal bylaw specifications or guidelines and may be modified based on professional judgement of the project arborist to accommodate species specific tolerances and site specific growing conditions.

Tree Protection Zones

Tree protection zones (TPZs) are fenced areas around the recommended CRZ. 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.

Tree Protection Fences

Prior to any construction activity, tree protection fences must be constructed at the root protection zone perimeter. 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 fences must be

constructed prior to tree removal, excavation or construction and remain intact throughout 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 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 survey. 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.