Diamond Head Consulting Ltd.
Arborist Report

For:

Gage South Student Housing and Bus Loop Exchange
March 10, 2016

To be submitted with Tree Retention and Removal Plan Prepared by PFS Studio

Submitted to:

Dave Poettcker
UBC Properties Trust

Submitted by:

DIAMOND HEAD CONSULTING LTD.

342 West 8th Avenue
Vancouver, BC
V5Y 3X2
604 733-4886

Table of Contents

List of Tables

1.0 Introduction

Diamond Head Consulting Ltd. (DHC) was asked to complete an assessment of the trees on and the following proposed development occurring for Gage South Student Housing and Bus Loop Exchange.

The trees as within the scope of the proposed project and as specified by the client were assessed, including: species, diameter at breast height (dbh) measured to the nearest 1 cm at 1.4 m above natural grade (tree's base), estimated height and general health and defects. Critical root zones were calculated for each of the trees with the potential for development impacts. Tree hazards were assessed according to International Society of Arboriculture and WCB standards. **Due to the extent of the proposed development, all of the trees that have been inventoried are proposed for removal.** This report outlines the existing condition of the trees on and adjacent to the property and summarizes the proposed tree removals.

1.1 Limits of Assignment

- Our investigation is based solely on our visual inspection of the trees on January 29, 2016 (Trees 1-53). Trees 54-63 were assessed from Google Earth Street View. Detailed assessment will be required if these trees are to be retained.
- Our inspection was conducted from ground level. We did not conduct soil tests or below root examination to assess the condition of the root system of the trees.
- Only the three subject trees were assessed, no other trees have been assessed.

1.2 Purpose and Use of Report

- Provide documentation pertaining to only the three trees as directed by UBCPT within the limits of construction for this project.

2.0 Observations

2.1 Site Overview

The proposed development is adjacent the North Parkade, and this study focuses only three tree growing within a planting berm adjacent the Parkade. No other trees were assessed for this study. Subject tree attributes, critical root zones and recommendations for the trees are listed below in **Table 1**.

2.2 Tree Inventory

The following is an inventory of assessed trees: tree species, characteristics, comments, recommendations and required root protection zones have been suggested (Table 1). Their locations are illustrated on the accompanying map.

Overall Health and Structure Rating

- **Excellent =** Tree of possible specimen quality, unique species or size with no discernible defects. Or a heritage tree.
- **Normal =** Trees are in fair to good condition, considering its growing environment and species.
- **Poor =** Trees have low vigour, with noted health and/or structural defects. This tree is starting to decline from its typical species growth habits.
- **Very poor =** Trees are in serious decline from its typical growth habits, with multiple very definable health and/or structural defects.
- **Dead/Dying =** Trees were found to be dead, and/or have severe defects and are in severe decline.
- **High Risk =** Trees have been deemed hazardous by a Certified Tree Risk Assessor utilizing CTRA methods. They have a probability of failure of 3 or higher with a total overall risk rating of 8 (Moderate 3) or above.

2.3 Photographs

Photo 1. Showing trees 51-53 – Japanese maples that can be relocated.

Photo 2. Looking at the mature hedge maples – trees 22-30.

Photo 3. Trees 40-47 oaks and beeches.

Photo 4. Trees 48-50. Japanese maples that can be relocated.

Photo 5. Trees 3-5A. Black cottonwoods and maples.

Photo 6. Trees . 31-34 Black Pines and maples.

2.4 Tree Inventory Table

Table 1. Tree Inventory.

Tag #	Common Name	Botanical Name	DBH (cm)	Ht (m)	Overall Condition	Comments	Retain/ Remove	TPZ (m)
1	Shore Pine	*Pinus Ponderosa*	46	8	Normal	Located within a parking island. Roots exposed due to path over northern immediate root zone.	Remove. Within proposed development area	2.8
2	Shore Pine	*Pinus Ponderosa*	46	8	Normal	Located within a parking island. On hummock. Normal growth habit.	Remove. Within proposed development area	2.8
3	Black Cottonwood	*Populus balsimifera x trichnocarpa*	84	23	Normal	Large tree with recent scaffold breaks.	Remove. Within proposed development area	5.0
4	Black Cottonwood	*Populus balsimifera x trichnocarpa*	81	25	Normal	Close to roadway. Some of the larger branches can target the road. Large tree with recent scaffold breaks.	Remove. Within proposed development area	4.9
5	Hedge maple	*Acer campestre*	31	8	Poor	Tree is in decline. Dead top with decay in some of the upper limbs.	Remove. Within proposed development area	2.0
5A	Hedge maple	*Acer campestre*	39	7	Poor	Tree is in decline. Dead top. By sidewalk .		2.3
6	Hedge maple	*Acer campestre*	28	7	Normal	Normal structure and form. Little increment in growth. Tree has been stressed.	Remove. Within proposed development area	2.0
7	Hedge maple	*Acer campestre*	33	7	Normal	Normal structure and form. Little increment in growth. Tree has been stressed.	Remove. Within proposed development area	2.0
8	Hedge maple	*Acer campestre*	27	7	Normal	Normal structure and form. Little increment in growth. Tree has been stressed.	Remove. Within proposed development area	2.0
9	Hedge maple	*Acer campestre*	26	7	Normal	Normal structure and form. Little increment in growth. Tree has been stressed.	Remove. Within proposed development area	2.0
10	Hedge maple	*Acer campestre*	20	7	Normal	Normal structure and form. Little increment in growth. Tree has been stressed.	Remove. Within proposed development area	2.0
11	Hedge maple	*Acer campestre*	22	7	Normal	Normal structure and form. Little increment in growth. Tree has been stressed.	Remove. Within proposed development area	2.0
12	Hedge maple	*Acer campestre*	23	7	Normal	Normal structure and form. Little increment in growth. Tree has been stressed.	Remove. Within proposed development area	2.0
13	Hedge maple	*Acer campestre*	21	7	Normal	Normal structure and form. Little increment in growth. Tree has been stressed.	Remove. Within proposed development area	2.0
14	Hedge maple	*Acer campestre*	24	7	Normal	Normal structure and form. Little increment in growth. Tree has been stressed.	Remove. Within proposed development area	2.0
15	Hedge maple	*Acer campestre*	20	7	Normal	Normal structure and form. Little increment in growth. Tree has been	Remove. Within proposed	2.0

Tag #	Common Name	Botanical Name	DBH (cm)	Ht (m)	Overall Condition	Comments	Retain/ Remove	TPZ (m)
						stressed.	development area	
16	Hedge maple	*Acer campestre*	24	7	Normal	Normal structure and form. Little increment in growth. Tree has been stressed.	Remove. Within proposed development area	2.0
17	Hedge maple	*Acer campestre*	18	7	Normal	Normal structure and form. Little increment in growth. Tree has been stressed.	Remove. Within proposed development area	2.0
18	Hedge maple	*Acer campestre*	19	7	Poor	Dead top. Damage by vehicle at base.	Remove. Within proposed development area	2.0
19	Hedge maple	*Acer campestre*	18	7	Poor	Previously topped or dead top with decay.	Remove. Within proposed development area	2.0
20	Hedge maple	*Acer campestre*	18	7	Normal	Normal structure and form. Little increment in growth. Tree has been stressed.	Remove. Within proposed development area	2.0
21	Hedge maple	*Acer campestre*	20	7	Normal	Normal structure and form. Little increment in growth. Tree has been stressed.	Remove. Within proposed development area	2.0
22	Hedge maple	*Acer campestre*	43	7	Normal	Normal structure and form. Little increment in growth. Tree has been stressed.	Remove. Within proposed development area	2.6
23	Hedge maple	*Acer campestre*	42	8	Poor	Dead top	Remove. Within proposed development area	2.5
24	Hedge maple	*Acer campestre*	43	10	Normal	Normal structure and form. Little increment in growth. Tree has been stressed.	Remove. Within proposed development area	2.6
25	Hedge maple	*Acer campestre*	42	10	Normal	Normal structure and form. Little increment in growth. Tree has been stressed.	Remove. Within proposed development area	2.5
26	Hedge maple	*Acer campestre*	43	10	Normal	Normal structure and form. Little increment in growth. Tree has been stressed.	Remove. Within proposed development area	2.6
27	Hedge maple	*Acer campestre*	31	10	Normal	Normal structure and form. Little increment in growth. Tree has been stressed.	Remove. Within proposed development area	2.0
28	Hedge maple	*Acer campestre*	33	10	Normal	Normal structure and form. Little increment in growth. Tree has been stressed.	Remove. Within proposed development area	2.0
29	Hedge maple	*Acer campestre*	46	10	Normal	Normal structure and form. Little increment in growth. Tree has been stressed.	Remove. Within proposed development area	2.8
30	Hedge maple	*Acer campestre*	39	7	Poor	Dead top. Form has grown out since dead top.	Remove. Within proposed development area	2.3
31	Black pine	*Pinus Nigra*	31	9	Normal	Good form and health. Single stem.	Remove. Within proposed development area	2.0
32	Sycamore maple	*Acer pseudoplatanus*	19	7	Normal	Street tree, in good health and form.	Remove. Within proposed development area	2.0
33	Black pine	*Pinus Nigra*	22	8	Normal	Slight kink and windswept form	Remove. Within proposed	2.0

Tag #	Common Name	Botanical Name	DBH (cm)	Ht (m)	Overall Condition	Comments	Retain/ Remove	TPZ (m)
							development area	
34	Sycamore maple	*Acer pseudoplatanus*	17	7	Normal	Good health and form. Relatively recent planting.	Remove. Within proposed development area	2.0
35	Black pine	*Pinus Nigra*	18	10	Normal	Codominant stem with U-union at 2m.	Remove. Within proposed development area	2.0
36	Black pine	*Pinus Nigra*	21	9	Normal	Kink in stem at 2.0m. Good foliage growth.	Remove. Within proposed development area	2.0
37	Sycamore maple	*Acer pseudoplatanus*	21	8	Normal	Good health and form. Relatively recent planting.	Remove. Within proposed development area	2.0
38	Black pine	*Pinus Nigra*	21	9	Normal	Kink in stem at 1.5m with codominant stem at 6m. Minor inclusion.	Remove. Within proposed development area	2.0
39	London plane	*Platanus × acerifolia*	46	13	Normal	In parking island. Slight dieback in crown.	Remove. Within proposed development area	2.8
40	Fastigiate Beech	*Fagus sylvatica Dawyck*	32	9	Normal	In parking island. Slight dieback in crown.	Remove. Within proposed development area	2.0
41	Oak	*Quercus spp.*	43	10	Normal	In parking island.	Remove. Within proposed development area	2.6
42	Fastigiate Beech	*Faus sylvatica Dawyck*	24	8	Normal	In parking island.	Remove. Within proposed development area	2.0
43	Oak	*Quercus spp.*	42	9	Normal	In parking island.	Remove. Within proposed development area	2.5
44	Fastigiate Beech	*Faus sylvatica Dawyck*	28	9	Normal	In parking island.	Remove. Within proposed development area	2.0
45	Fastigiate Beech	*Faus sylvatica Dawyck*	27,11	9	Normal	In parking island.	Remove. Within proposed development area	2.0
46	Fastigiate Beech	*Faus sylvatica Dawyck*	29	9	Normal	In parking island.	Remove. Within proposed development area	2.0
47	Fastigiate Beech	*Faus sylvatica Dawyck*	33	11	Normal	In parking island.	Remove. Within proposed development area	2.0
48	Japanese maple	*Acer palmatum*	28	4	Normal	4 stems. Treat as 28cm. Minor branch dieback.	Relocate or Remove	2.0
49	Japanese maple	*Acer palmatum*	24			4 stems. Treat as 24cm. Minor branch dieback.	Relocate or Remove	2.0
50	Japanese maple	*Acer palmatum*	22			3 stens treat as 22cm	Relocate or Remove	2.0
51	Japanese maple	*Acer palmatum*	26			4 stems treat as 26cm. By stairs - boxed on 3 sides	Relocate or Remove	2.0
52	Japanese maple	*Acer palmatum*	25			3 stems, treat as 25cm. By stairs - boxed in on 3 sides	Relocate or Remove	2.0
53	Japanese maple	*Acer palmatum*	21			3 stems, treat as 21cm. By stairs - boxed in on 3 sides	Relocate or Remove	2.0

Tag #	Common Name	Botanical Name	DBH (cm)	Ht (m)	Overall Condition	Comments	Retain/ Remove	TPZ (m)
54	Hedge maple	*Acer campestre*	23	10	Normal	Healthy young tree, sidewalk and road within 1m of tree. Thinning crown as a result.	Remove	2.0
55	Hedge maple	*Acer campestre*	26	9	Normal	Healthy young tree. Good soil volume and the spread of limbs is significant given its height.	Remove	2.0
56	Hedge maple	*Acer campestre*	28	8	Normal	Has a sign with large cement footing to the west of tree. Some dieback in upper crown.	Remove	2.0
57	Hedge maple	*Acer campestre*	24	8	Normal	Has a sign with large cement footing to the west of tree. Some dieback in upper crown.	Remove	2.0
58	Hedge maple	*Acer campestre*	30	8	Normal	Some dieback in crown due to the sign placement in its root zone.	Remove	2.0
59	Hedge maple	*Acer campestre*	33	8	Normal	Large crown spread – healthy foliage and sufficient soil volume.	Remove	2.0
60	Hedge maple	*Acer campestre*	20	8	Normal	Has the intersection of the two roads to the east of this tree – 2m. Thinning crown as a result of the lack of soil.	Remove	2.0
61	Sycamore maple	*Acer pseudoplatanus*	26		Normal	Street tree in normal health and form. Minor dieback in upper crown.	Remove	2.0
62	Sycamore maple	*Acer pseudoplatanus*	32		Normal	Street tree in normal health and form. Minor dieback in upper crown.	Remove	2.0
63	Sycamore maple	*Acer pseudoplatanus*	30		Normal	Street tree in normal health and form. Minor dieback in upper crown.	Remove	2.0

3.0 Summary

This study inventoried 52 subject trees in relation to the proposed development. 46 of the trees are recommended to be removed to accommodate the development, and six trees are recommended for relocation.

Removal of logs from sites

Private timber marks are required for the transporting logs from private-owned land in the province of BC. It is the owner of the properties responsibility to apply for a timber mark prior to the removal of 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

The excavation and construction activities adjacent to the RPZs can influence the moisture availability to the subject trees. This is due to a reduction in the total rooting mass, changes in 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 protection zones should be monitored during hot and dry weather. When soil moisture conditions are dry, supplemental irrigation should be provided. Irrigation should wet the soil to the depth of the root system (approximately 30 cm deep).
- Any planned changes to the surface grades within the RPZ, including the placement of mulch, should be designed so that the water will flow away from the tree trunks.
- Excavation adjacent to trees can alter the soils hydrological processes by draining the water faster than it had naturally. It is recommended that when excavating within 6 m of any tree, the site be irrigated more frequently to account for this.

6.0 Limitations

1. Except as expressly set out in this report and in these Assumptions and Limiting Conditions, Diamond Head Consulting Ltd. ("**Diamond Head**") makes no guarantee, representation or warranty (express or implied) with regard to: this report; the findings, conclusions and recommendations contained herein; or the work referred to herein.
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3. The findings, conclusions and recommendations made in this report reflect Diamond Head's best professional judgment in light of 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 as at the date of this report. Except as expressly stated in this report, the findings, conclusions and recommendations set out in this report 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**", including without limitation structural defects, scars, decay, fungal fruiting bodies, evidence of insect attack, discoloured 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; and 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 the trees recommended for retention are both healthy and safe, no guarantees, representations or warranties are made (express or implied) that those trees will remain standing or will not fail. The Client acknowledges that it is both professionally and practically impossible to predict with absolute certainty the behaviour 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

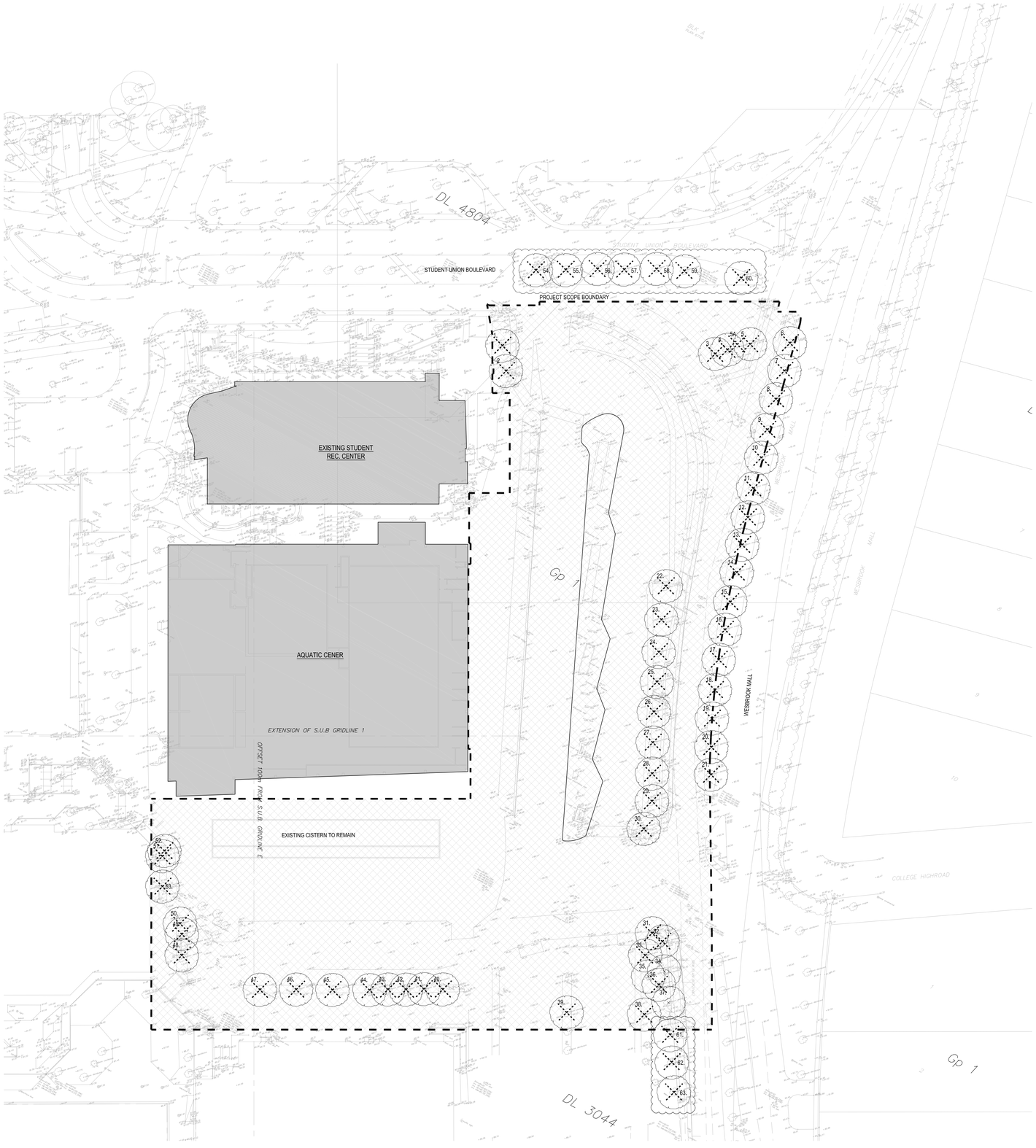
personal property and matters relating to cultural and heritage values). Diamond Head makes no guarantee, representation or warranty (express or implied) as to the requirements of or compliance with applicable laws, rules, regulations, or policies established by federal, provincial, local government 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 by-laws, 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.



SITE DEMOLITION LEGEND

SITE AREA TO BE DEMOLISHED

SITE DEMOLITION NOTES

1. PLAN BASED ON SURVEY CONDUCTED BY MURRAY & ASSOCIATES, SURREY, BC AND SUPPLIED BY UBC.
2. ALL EXISTING HARDSCAPE AND SOFTSCAPE WITHIN PROJECT BOUNDARY TO BE DEMOLISHED.
3. REMOVE AND STOCKPILE ANY EXISTING SITE FURNISHINGS WITHIN HATCHED AREAS. COORDINATE STORAGE WITH UBC PLANT OPERATIONS.
4. REMOVE AND RETAIN ANY MEMORIAL OR HISTORIC LANDSCAPE ITEMS, PLAQUES, BENCHES, TREES, ETC. AND RETURN TO OWNER.
5. LOCATION OF AT-GRADE SERVICES SHOWN ON DRAWINGS ARE INDICATIVE ONLY. CONTRACTOR TO VERIFY LOCATION AND PROTECT ALL SITE SERVICES WITHIN SCOPE OF WORK PRIOR TO COMMENCEMENT OF EXCAVATION. REFER TO CIVIL FOR SUB SURFACE UTILITY LOCATIONS.
6. REFER TO CIVIL FOR UTILITY DEMOLITION AND PROTECTION MEASURES.
7. REFER TO CIVIL FOR EROSION CONTROL MEASURES.
8. CONTRACTOR TO MAKE GOOD ANY DAMAGE DONE DURING THE CONSTRUCTION PERIOD TO EXISTING FEATURES TO BE RETAINED.
9. ANY BLUE PHONES IN CONFLICT WITH PROPOSED DESIGN TO BE EVALUATED FOR REMOVAL AND RELOCATION BY CLIENT IN COORDINATION WITH TELECOM PROVIDER.

TREE PROTECTION LEGEND

TREE TO BE REMOVED

TREE TO BE REMOVED (OUTSIDE SCOPE – SEE NOTE #9)

TREE TO BE RELOCATED

TREE PROTECTION FENCE

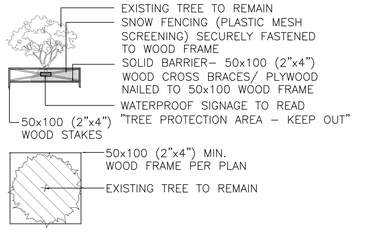
EXISTING TREE TO REMAIN

TREE REMOVAL SCHEDULE

1. 460mm, PINE	26. 430mm, MAPLE	52. 250mm, MAPLE*
2. 460mm, PINE	27. 310mm, MAPLE	53. 210mm, MAPLE*
3. 840mm, COTTONWOOD	28. 330mm, MAPLE	54. 230mm, MAPLE
4. 810mm, COTTONWOOD	29. 460mm, MAPLE	55. 260mm, MAPLE
5. 310mm, MAPLE	30. 390mm, MAPLE	56. 280mm, MAPLE
5A. 390mm, MAPLE	31. 310mm, PINE	57. 240mm, MAPLE
6. 280mm, MAPLE	32. 190mm, DECIDUOUS	58. 300mm, MAPLE
7. 330mm, MAPLE	33. 220mm, PINE	59. 330mm, MAPLE
8. 270mm, MAPLE	34. 170mm, DECIDUOUS	60. 200mm, MAPLE
9. 260mm, MAPLE	35. 180mm, PINE	61. 260mm, MAPLE
10. 200mm, MAPLE	36. 210mm, PINE	62. 320mm, MAPLE
11. 220mm, MAPLE	37. 210mm, MAPLE	63. 300mm, MAPLE
12. 230mm, MAPLE	38. 210mm, PINE	
13. 210mm, MAPLE	39. 460mm, PLATINUS	
14. 240mm, MAPLE	40. 320mm, BEECH	
15. 200mm, MAPLE	41. 230mm, OAK	
16. 240mm, MAPLE	42. 240mm, BEECH	
17. 180mm, MAPLE	43. 420mm, OAK	
18. 190mm, MAPLE	44. 280mm, BEECH	
19. 180mm, DECIDUOUS	45. 270mm/110mm, BEECH	
20. 180mm, DECIDUOUS	46. 290mm, BEECH	
21. 180mm, DECIDUOUS	47. 330mm, BEECH	
22. 430mm, MAPLE	48. 280mm, MAPLE*	
23. 420mm, MAPLE	49. 240mm, MAPLE*	
24. 430mm, MAPLE	50. 220mm, MAPLE*	
25. 420mm, MAPLE	51. 260mm, MAPLE*	

TREE PROTECTION NOTES (TREES TO BE PROTECTED OR RELOCATED TBD IN COORDINATION WITH CLIENT)

1. ARBORIST REPORT PROVIDED BY DIAMOND HEAD CONSULTING LTD, FEBRUARY 3, 2016, 342 WEST 8TH AVENUE, VANCOUVER, BC V5Y 3X2 – 604-733-4886
2. NO STORAGE OF BUILDING /CONSTRUCTION MATERIALS WITHIN PROTECTED AREAS OR AGAINST PROTECTION BARRIER.
3. ANY PRUNING OF BRANCHES OR ROOTS MUST BE DONE BY THE PROJECT ARBORIST.
4. CONTRACTOR TO UNDERTAKE TREE PROTECTION MEASURES TO UNIVERSITY OF BRITISH COLUMBIA STANDARDS.
5. HAND EXCAVATE ONLY WITHIN DRIPLINE OF TREES TO BE RETAINED. SEVER ROOTS CLEANLY. CONTACT PROJECT ARBORIST FOR APPROVAL PRIOR TO SEVERING ROOTS IN EXCESS OF 100mm DIA.
6. TREE PROTECTION FENCE IS NOT TO BE LIFTED OR REMOVED AT ANY TIME FOR VEHICULAR ACCESS. VEHICLES AND HEAVY EQUIPMENT CAN CAUSE SOIL COMPACTION IN THE ROOT ZONE DEPLETING THE AIR SPACE THAT IS ESSENTIAL TO THE TREE'S HEALTH.
7. LOCATION OF TREE PROTECTION FENCING AND LIMIT OF ACCESS FENCING TO BE VERIFIED WITH CONSULTANT AND PROJECT ARBORIST PRIOR TO INSTALLATION.
8. BASED ON CONTRACTOR'S STAGING AND ACCESS REQUIREMENTS, ADDITIONAL TREE PROTECTION FENCING MAY BE REQUIRED.
9. TREES IDENTIFIED TO BE RELOCATED (*) REQUIRE ASSESSMENT AND COORDINATION WITH THE PROJECT ARBORIST AND CAMPUS LANDSCAPE ARCHITECT. RELOCATION TO BE DETERMINED BY CAMPUS LANDSCAPE ARCHITECT.



1 - PLAN VIEW
SCALE: 1:500

2 - TREE PROTECTION FENCE
SCALE: N.T.S.

DIALOG

PFS STUDIO
PLANNING + URBAN DESIGN + LANDSCAPE ARCHITECTURE
1777 West 7th Avenue
Vancouver BC V6J 1S7
604.736.3540
info@pfs.ca
www.pfs.ca

ISSUED FOR:

DEVELOPMENT PERMIT - NOV. 16, 2015 - PFS STUDIO - NT

FOR INFORMATION ONLY
NOT FOR CONSTRUCTION

METRIC

SEAL

UBC GAGE SOUTH

TREE MAINTENANCE AND SURFACE DEMOLITION PLAN

DRAWN: NST CHECKED: RD

L001

PLOT DATE: 11/10/2015 11:57:12 AM

GEOPACIFIC
VANCOUVER KAMLOOPS CALGARY

P (604) 439 0922
F (604) 439 9189
www.geopacific.ca
#215-1200 West 73rd Ave.
Vancouver, B.C. Canada V6P 6G5

UBC Properties Trust
200 – 3313 Shrum Lane
Vancouver, BC
V6S 0C8

December 14, 2015
File: 12970

Attention: Dave Poettcker

Re: Geotechnical Report: UBC Exchange Project – Proposed Bus Loop, Wesbrook Mall & Student Union Boulevard, UBC Campus, Vancouver, BC

1.0 INTRODUCTION

As requested, GeoPacific Consultants Ltd. (GeoPacific) has carried out a geotechnical site investigation for the proposed bus loop which forms part of the UBC Exchange development located on the UBC campus.

The area investigated is located between the adjacent to the new Aquatic Centre and the War Memorial buildings. Our investigation did not include the main bus terminal and the future road realignment along Wesbrook Mall due to access restrictions as these areas are part of the operational bus terminal. We have referenced preliminary design drawings prepared by Dialog dated April 28, 2015, in preparation of this report.

The new bus loop includes new roads, sidewalks, curbs, a vegetated boulevard and departure platforms on both sides of the road. Due to the heavy regular loads induced by the busses, we understand that a robust road structure is required.

This report presents the results of our geotechnical investigation and makes geotechnical recommendations for the design and construction of the proposed improvements.

2.0 SITE DESCRIPTION

The portion of the site investigated is currently a parking lot accessed from Wesbrook Mall. The site is bounded by the new Aquatic Centre to the west, the existing bus loop to the north, Wesbrook Mall to the south, the War Memorial Gymnasium to the east. The site is relatively flat.

At the time of our investigation existing site improvement included a paved parking lot and access roads, concrete sidewalks, curbs, and concrete islands. Along the southwest side of the site a boulevard with large trees separates the War Memorial Gymnasium parking lot and the access road leading to the old Aquatic Centre. There is a small grass covered mound, with a row of large trees, located south of the bus terminal.

3.0 SITE INVESTIGATION

GeoPacific carried out a geotechnical investigation on June 10 and November 5, 2015. Two test holes and four test pits were advanced to depths ranging from 0.7 m to 3.0 m below site grades.

In general, the soil conditions encountered consist of 50 mm of asphalt, underlain by fill materials comprised of compact sand and gravel, sand, and silty sand. A layer of organics was identified within the fill materials in all of our test pits, however, organic materials were not encountered in our test holes TH15-3 and TH15-4. The fill materials extended to depths ranging from 0.6 m to 1.8 m were they are underlain by dense glacial till.

The groundwater table was not encountered at our test locations and is expected to be well below excavation depths for this project. However, perched groundwater may be encountered within the fill materials.

Please refer to the attached test pit and test hole logs for detailed soil description. The test locations are shown on our drawing 12970-1 included with this report.

4.0 RECOMMENDATIONS

4.1 Site Stripping

Site stripping for the proposed improvements includes the removal of any topsoil, organics, fill materials, debris, asphalt, loose/soft or otherwise disturbed soil to expose a subgrade of dense glacial till. These materials should be removed to allow for placement of new engineered fill on the proposed subgrade in its natural undisturbed state. We note that up to 1.2 m of poor quality fill materials were identified at our test locations, however, actual stripping depth could be greater or lesser at other locations.

Some of the surficial fills could potentially be reused as engineered fill provided that they are found to be primarily granular and free if organics. GeoPacific should be asked to review the suitability of these materials for re-use at the time of excavation.

Stripping should extend beyond the outer edge of the pavement, sidewalk and/or curbs a distance equal to the total thickness of fill required including all engineered subgrade fill, sub-base and base materials. For example, if 1 m of fill is to be placed beneath the new asphalt, then stripping should extend a minimum distance of 1 m beyond the outer edge of the asphalt.

4.2 Site Filling

Where grade reinstatement is required to meet the underside of the recommended road structure, engineered fill should be used. In the context of this report "engineered fill" is defined as clean sand to sand and gravel fill, compacted in 300 mm loose lifts to a minimum standard of 95% of its Modified Proctor Maximum Dry Density (ASTM D1557) while at moisture content that is within 2% of its optimum for compaction.

4.3 Road Structures

Following the site preparation described above, we are of the opinion that the subgrade will be suitable to support the proposed road structure provided by Coast Mountain Bus Company (CMBC) and shown in Table 1 below.

Minimum Pavement Structure From CMBC, UBC Exchange – Proposed Bus Loop

Material	Thickness (mm)
Reinforced concrete slab (Surface Course)	200
19 mm minus CBC (Crushed Base Course)	150
75 mm minus SGSB (Select Granular Sub-base)	300

All base and sub-base materials and any required grading fill should be compacted to a minimum of 95% of their Modified Proctor (ASTM D1557) dry density (MPDD) at a moisture content within 2% of optimum for compaction.

We recommend that sidewalks be supported on a minimum of 150 mm of 19 mm minus crushed granular over a prepared subgrade as described above

In-situ density testing should be conducted during the site filling to ensure that the specified level of compaction is being achieved.

5.0 FIELD REVIEWS

The preceding sections make recommendations for the design and construction of the improvement at the new bus loop. We have recommended the review of certain aspects of the construction within this report. It is the responsibility of the contractors carrying out the work to contact GeoPacific at least 24 hours in advance of construction to arrange for field reviews. Field reviews are recommended at the following stages of construction.

1. Stripping - Review stripped subgrade in pavement, sidewalk and curb areas
2. Materials - Review of materials for road subgrade, sub-base and base
3. Compaction - Review compaction of road subgrade, sub-base and base materials

It is critical that these reviews are carried out to ensure that our recommendations have been adequately communicated and that any contractors working on this project review this report prior to commencing their work.

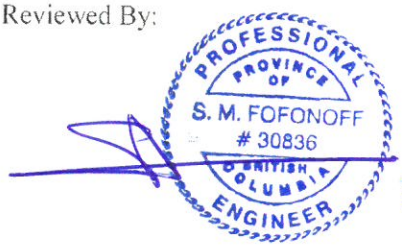
6.0 CLOSURE

This report has been prepared exclusively for UBC Properties Trust, and for the use of others within their design and construction team, for the purpose of providing geotechnical recommendations for the project. This report remains the property of GeoPacific Consultants Ltd. and any unauthorized use or duplication of this report is prohibited.

If you would like further details or clarification please contact the undersigned.

For:
GeoPacific Consultants Ltd.

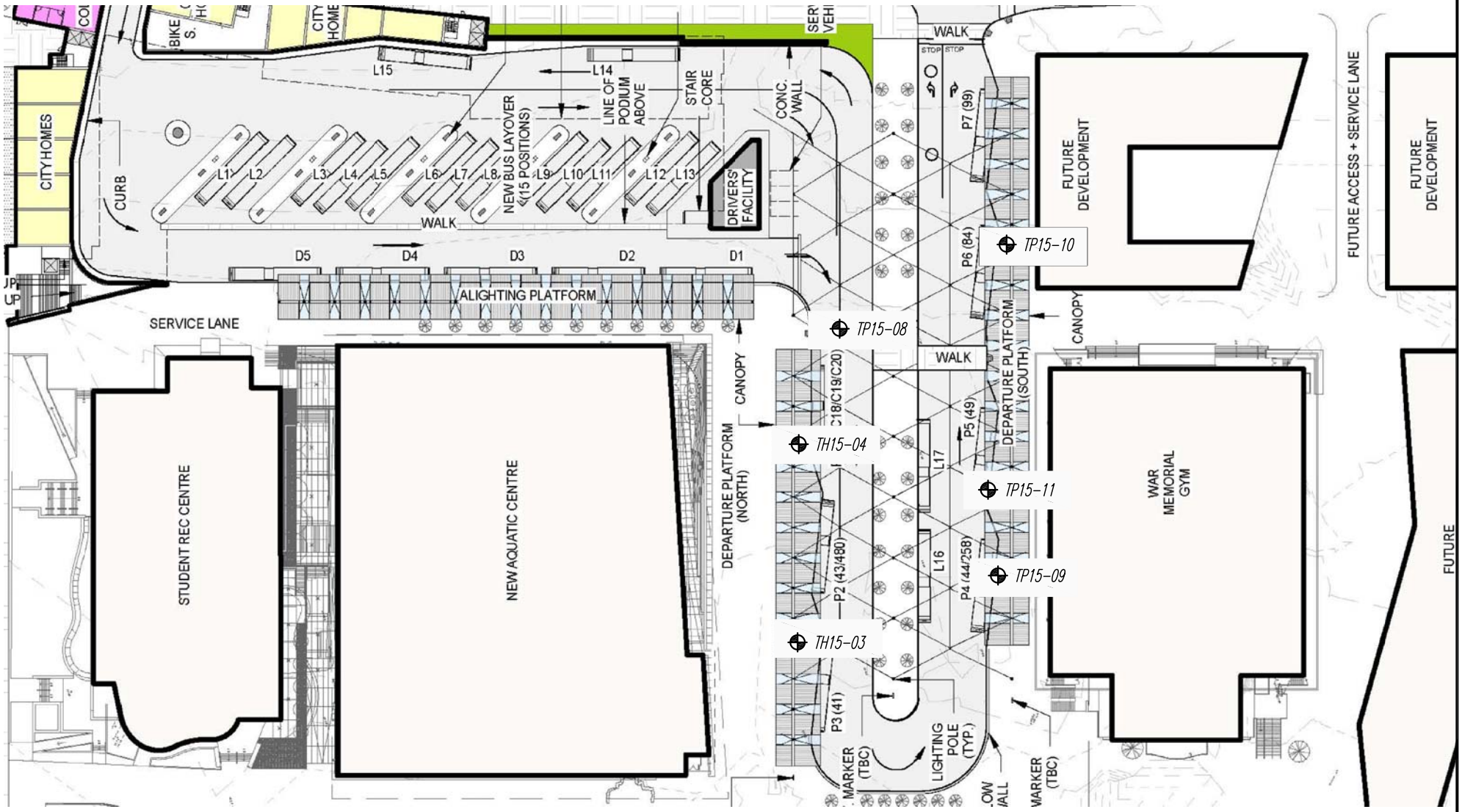
Reviewed By:



Dec 15, 15

Arye Lipshitz
Geotechnical Technician

Steve Fofonoff, M. Eng., P. Eng.
Project Manager



LEGEND:

TP15 & TH15-# – TEST PIT (TP) & TEST HOLE (TH) LOCATIONS

SITE PLAN

SCALE = NTS

N E S W

REFERENCE:

GEOPACIFIC
VANCOUVER KAMLOOPS CALGARY
#215-1200 West 73rd Ave.
Vancouver, B.C. V6P 6G5
P 604.439.0922
F 604.439.9189

DATE: June 10 & November 5, 2015		
DRAWN BY: AL	APPROVED BY: SMF	REVIEWED BY:
SCALE: SEE ABOVE		

UBC EXCHANGE–PROPOSED BUS LOOP

WESBROOK MALL, VANCOUVER, BC

TEST PITLOCATIONS

FILE NO.: 12970

DWG. NO.: 12970-2

REVISIONS:
A.
B.
C.

ORIGINAL PAPER SIZE 8.5"x11"

Test Hole Log: TH15-03

File: 12970
Project: Gage South - Bus Terminal & Residential Development
Client: UBC Properties Trust
Site Location: Wesbrook Mall at Student Union Blvd, Vancouver, BC

GeoPacific Consultants Ltd.
215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax:604-439-9189

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth/Elev (ft)
0 / 0		Ground Surface	
0		***Asphalt***	0.0
1		***Sand and Gravel (FILL)*** Compact, moist, brown to dark brown, trace to some ogranics	
3 / 1		***Sand (TILL FILL)*** Compact, some silt, trace fine gravel,moist, brown to grey	3.0
6 / 2		***Sand (TILL)*** Dense to very dense, trace silt, some fine sub-angular gravel, moist, grey	6.0
10 / 3		End of Borehole	10.0

Moisture Content (%)

DCPT (blows per foot) 10 20 30 40

9
14
13
14
17
39
>50

Groundwater / Well

Remarks

Effective DCPT Refusal at 6'

Logged: AL
Method: Solid Stem Auger
Date: 2015-06-10

Datum: Existing Grade
Figure Number:
Page: 1 of 1

Test Hole Log: TH15-04

File: 12970
Project: Gage South - Bus Terminal & Residential Development
Client: UBC Properties Trust
Site Location: Wesbrook Mall at Student Union Blvd, Vancouver, BC

GeoPacific Consultants Ltd.
215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax:604-439-9189

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth/Elev (ft)	Moisture Content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
0 / 0		Ground Surface					
		Asphalt	0.0				
1		***Sand and Gravel (FILL)*** Compact, angular gravel, brown, moist	1.5				
2 / 1		***Sand (TILL FILL)*** Compact, some fine gravel, trace to some silt, dense to very dense, brown grey to dark brown, moist					
6 / 2		***Sand (TILL)*** Dense to very dense, fine to medium sand, some fine sub-angular gravel, moist, grey	6.0				
10 / 3		End of Borehole	10.0				
13 / 4							
16 / 5							
20 / 6							
23 / 7							
25							

Logged: AL
Method: Solid Stem Auger
Date: 2015-06-10

Datum: Existing Grade
Figure Number:

Test Hole Log: TP15-8

File: 12970
Project: UBC Exchange - Proposed Bus Loop
Client: UBC Properties Trust
Site Location: Wesbrook Mall at Student Union Blvd, Vancouver, BC

GEOPACIFIC CONSULTANTS
215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax:604-439-9189

INFERRED PROFILE

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)	Fines content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
0 / 0		Ground Surface					
		Asphalt	0.0				50mm of asphalt
		Sand and Gravel (FILL) Compact, angular, medium sand, moist, brown	0.1				
1		***Silty Sand and Gravel (Till Fill)*** Compact, trace organics, trace construction debris, brown, moist	0.3				
2		***Silty Sand (Till)*** Dense, some gravel, medium grained sand, brown-grey, moist	0.6				
			0.8				
3 / 1		End of Borehole					
4							
5							
6 / 2							
7							
8							
9							
10 / 3							

Logged: AL
Method: Excavator
Date: November 5, 2015

Datum: Existing Grade
Figure Number: A.8

Test Hole Log: TP15-9

File: 12970
Project: UBC Exchange - Proposed Bus Loop
Client: UBC Properties Trust
Site Location: Wesbrook Mall at Student Union Blvd, Vancouver, BC

GEOPACIFIC CONSULTANTS
215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax:604-439-9189

INFERRED PROFILE

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)	Fines content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
0 / 0		Ground Surface					
		Asphalt	0.0				50mm of asphalt
		Sand and Gravel (FILL) Compact, angular, medium sand, moist, brown	0.1				
1		***Sand (Fill)*** Compact, some silt, some gravel, medium grained sand, rusty brown, moist to wet	0.3				
2							
3 / 1		***Sand (Fill)*** Compact, some organics, trace to some gravel, trace silt, dark brown, moist to wet	0.8				
		Sand (Till) Dense, trace silt and gravel, medium grained sand, golden-brown, moist	1.1				
4		End of Borehole	1.2				
5							
6 / 2							
7							
8							
9							
10 / 3							

Logged: AL
Method: Excavator
Date: November 5, 2015

Datum: Existing Grade
Figure Number: A.9.

Test Hole Log: TP15-10

File: 12970
Project: UBC Exchange - Proposed Bus Loop
Client: UBC Properties Trust
Site Location: Wesbrook Mall at Student Union Blvd, Vancouver, BC

GEOPACIFIC CONSULTANTS
215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax:604-439-9189

INFERRED PROFILE							
Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)	Fines content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
0 ft / 0 m		Ground Surface					
		Asphalt	0.0				50mm of asphalt
		Silty Sand (Fill) Compact, some gravel, grey-brown, moist	0.1				
1 ft		***Sand (Fill)*** Compact, some organics, trace to some gravel, trace silt, dark brown, moist to wet	0.3				
2 ft							
3 ft / 1 m							
4 ft		***Sand (Till)*** Dense, trace silt and gravel, medium grained sand, golden-brown, moist	1.1				
		End of Borehole	1.2				
5 ft							
6 ft / 2 m							
7 ft							
8 ft							
9 ft							
10 ft / 3 m							

Logged: AL
Method: Excavator
Date: November 5, 2015

Datum: Existing Grade
Figure Number: A.10.

Test Hole Log: TP15-11

File: 12970
Project: UBC Exchange - Proposed Bus Loop
Client: UBC Properties Trust
Site Location: Wesbrook Mall at Student Union Blvd, Vancouver, BC

GEOPACIFIC CONSULTANTS
215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5
Tel: 604-439-0922 Fax:604-439-9189

INFERRED PROFILE

Depth (ft / m)	Symbol	SOIL DESCRIPTION	Depth (m)/Elev (m)	Fines content (%)	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
0 / 0		Ground Surface					
		Asphalt	0.0				50mm of asphalt
		Sand and gravel (Fill) Compact, trace silt, angular, brown, moist	0.1				
1		***Sand (Till Fill)*** Compact, trace silt, trace gravel, rustybrown, moist	0.5				
2							
3 / 1		***Silty Sand (Fill)*** Compact, some organics, trace gravel, trace roots and branches, dark brown, wet	0.9				
4		***Sand (Till)*** Dense, some silt, some gravel, brown-grey, moist	1.2				
			1.4				
5		End of Borehole					
6 / 2							
7							
8							
9 / 3							
10							

Logged: AL
Method: Excavator
Date: November 5, 2015

Datum: Existing Grade
Figure Number: A.11.
Page: 1 of 1