

File No.: 04-1000-20-2018-010

May 10, 2018

s.22(1)

Dear s.22(1)

Re: Request for Access to Records under the Freedom of Information and Protection of Privacy Act (the "Act")

I am responding to your request of January 12, 2018 for:

Any available geotechnical report and excavation and shoring drawings for the following properties:

- 530 Drake Street
- 1295 Richards Street
- 1310 Richards Street
- 1321 Richards Street
- 1330 Richards Street
- 1304 Seymour Street
- 1338 Seymour Street

All responsive records are attached.

Please note: we found no records for the addresses 1330 Richards Street or 1304 Seymour Street.

Under section 52 of the Act you may ask the Information & Privacy Commissioner to review any matter related to the City's response to your request. The Act allows you 30 business days from the date you receive this notice to request a review by writing to: Office of the Information & Privacy Commissioner, <u>info@oipc.bc.ca</u> or by phoning 250-387-5629.

If you request a review, please provide the Commissioner's office with: 1) the request number assigned to your request (#04-1000-20-2018-010); 2) a copy of this letter; 3) a copy of your original request for information sent to the City of Vancouver; and 4) detailed reasons or grounds on which you are seeking the review.

Please do not hesitate to contact the Freedom of Information Office at <u>foi@vancouver.ca</u> if you have any questions.

Yours truly,

Barbara J. Van Fraassen, BA Director, Access to Information & Privacy

Barbara.vanfraassen@vancouver.ca 453 W. 12th Avenue Vancouver BC V5Y 1V4 Phone: 604 .873.7999 Fax: 604.873.7419

Encl.

:ma

# Cabuay, Malou

From: Sent: To: Subject: Attachments: Kwan, Linda Tuesday, January 27, 2015 1:01 PM DOMINO (CITYVAN) FW: Tank Closure Report - 1300 Richards Street (498 Drake) 1300 Richards (498 Drake) Closure Form - JT Signed.pdf

From: Steve Boyce [mailto:steve.boyce@activeearth.ca] Sent: Tuesday, January 27, 2015 11:46 AM To: Kwan, Linda Cc: Smith, James Subject: RE: Tank Closure Report - 1300 Richards Street (498 Drake)

Linda see attached tank closure form with additional signature as requested. Please call ASAP to confirm you've received this and that all environmental holds have been removed.

Steve Boyce, B.A. (Environment & Development)



160 - 2250 Boundary Road Burnaby, BC V5M 3Z3 t 778.888.0473 f 778.737.3488 <u>steve.boyce@activeearth.ca</u> <u>www.activeearth.ca</u>

From: Steve Boyce [mailto:steve.boyce@activeearth.ca] Sent: January-16-15 3:21 PM To: 'linda.kwan@vancouver.ca' Cc: 'James Burton'; 'Grant Myles'; 'Jason Rook' Subject: Tank Closure Report - 1300 Richards Street (498 Drake)

Linda – further to our chat, please see the attachment tank closure form. Our detailed closure report can be <u>downloaded here</u>.

We trust this provides everything you need at this time.

As discussed, we hope the City can review this immediately. <u>Please forward to Jenn as discussed and confirm whether the excavation and/or permitting process is now allowed to</u> <u>proceed</u>.

To summarize:

- The tank was appropriately decommissioned.
- CL standards apply to the Site. RL standards considered to apply to adjacent City lands.
- RL+ hydrocarbon soil identified below the tank. No CL+ soil identified.

- All RL+ hydrocarbon soil was removed. Residual impacted soils (odourous) remain along the excavation
  perimeter for geotechnical safety reasons (support for lane/sidewalk). This material will be removed during bulk
  excavation shoring as discussed.
- No RL+ hydrocarbon soil was identified along the PLs = no soil contaminant migration to City lands.

Regards,

Steve Boyce, B.A. (Environment & Development)

Active Earth

160 - 2250 Boundary Road Burnaby, BC V5M 3Z3 t 778.888.0473 f 778.737.3488 <u>steve.boyce@activeearth.ca</u> <u>www.activeearth.ca</u>



# UNDERGROUND STORAGE TANK REMOVAL/DECOMMISSIONING REPORT

This report must be completed and submitted to the City of Vancouver (Environmental Contamination Team) after completion of underground storage tank (UST) removal projects.

# 1. Site Information:

Owner's Name:	WALL FWANCIAL CORPORATION.	(title	Leld by 0888/89	BC	Ltd.)	
Site Address:	1300 Richards street					

# 2. Excavation Plan:

A scaled (about 1:200) plan including (at minimum): north arrow, nearby buildings, tank location, extents of excavation, soil sample location, and soil sample analytical results summary.

# 3. Site Photos (electronic only) Attached:

The photos must include the tank-hold excavation and the removed tank.

# 4. Tank Information:

Was oil removed from tank? Y I OILY WATER. Was all associated (e.g., feed lines, venting) piping removed? Y I N

# Tank Summary Table:

		Perfo	ration(s)	Other visible physical damage (e.g. pipe damage)		Product in tank	Date tank removed from service (YYYY/MM/DD)
Permit #	Capacity (L)	Yes	No	Yes	No		Contraction of the
FI 412002	1900	YE	5	No	2	TRACE HEATING	UNKNOWN.
							REMOVED FROM

5. Tank and Piping Disposal/Recycling:

Name/address of tank and piping disposal/recycling receiver: TBD - Havled to

South west contracting scrap metal storage yard (temporary

Tank disposal/recycling receipts attached: Y

6. Liquid Waste Disposal:

Liquid/sludge disposal (e.g., type/volume/class): 950L oily water

Receiver name/address: Sumas Remeliation

Disposal date (YYYY/MM/DD): 2015/01/05

4,000 ND JAN 5, 2015

Liquid Waste Disposal Receipt/Manifest attached: Y D N/A D TO BE PROVIDED AS AP

7.	Soil Disposal (if applicable): Soil volume (m <sup>3</sup> ) disposed: //00
	Soil disposal carrier: Various - Contracted by southwest Contracting Ltd.
	Soil receiver information: Receiver/company name: <u>RL Econvaste</u> Industries Ltd.
	Receiver's address: 15/11 Williams Rd Richmons BC
	Soil relocation agreement required: Y $\square$ N $\square$ Disposal date: YY/MM/DD $14/12/23 + 15/01/10$
	Soil disposal receipt/manifest attached: Y 🗹 N 🗆
8.	Field Observations Field-screening (e.g., soil vapour, visual observations, staining) findings summary:
	See Report Section 4
	Was product or contamination suspected of migrating into preferential pathways (e.g., perimeter drains), or beneath buildings? Y I N I Comments:
	Groundwater Observations:
	Was water present in the excavation? Y $\square$ N $\square$ (min $\circ R$ )
	Was there petroleum hydrocarbon sheen on excavation water? Y
	(Comments): trace shear withinty No shear following source soil remark
9.	Confirmatory Soil Sampling
	Total Number of discrete <i>in-situ</i> soil samples (minimum five: one from each sidewall and the base) analyzed: $\underline{19}$
	Sampler's name and company: STEVE BUYEE, ACTIVE BARTH ENGINEERING LTD.
	Sample chain of custody and laboratory certificate of analysis attached? Y
	CALA analytical laboratory name: ALS ENVIRONMENTAL /AGAT LABORATORIES
	Laboratory address: See Report Appendix D

Analysis/PCOCs (e.g., LEPH/HEPH for heating oil): LEPH/HEPH, PAK BTEK/VPH

ADDRESS: 130. Richards street

### 10. Ministry of Environment Forms:

NIA D (DENDING) YM Was notice of independent remediation (NIR) completed?

Was notice of offsite migration (NOM) required and submitted. Y N/A R

Comments: \_\_\_\_\_\_\_\_SEE Attached Report for details

### 11. Conclusion Summary Table

Address	Contractor/ Consultant	Tank Details (L, conditio n)	Liquid Waste Disposal Details	Soil Receiver and m <sup>3</sup> Disposed	Confirmatory Samples Meet Standards (Y/N, PCOCs)	Estimated Volume Residual Contaminatio n (m <sup>3</sup> , N/A)	Offsite Migration (Y/N)	MoE Forms Submitted (i.e., NIR, NOM, N/A)
1300 Richards Street	EACH ENLINGERING	POOL )	450L	GIOU M3 RLt	YES-LEPH, HEPH, PAH	N/A (100mi odark	N	NIR

# 12. Name and License of Individual/Firm Who Completed this Report:

Name (company and individual): ACTIVE EARTH ENGNEERING LTD, STEVE BEYCE Business license number: 468766 Date of tank removal (MM/DD/YYYY): 01/09/2015

### 13. Conclusion Statement:

Please select the appropriate checkmark that accurately reflects site conditions. "I confirm all information contained in this report is true and accurate. Based on this information, residual soils are less than 1, / (or) exceed 1, the applicable (select one: residential □ / commercial □ / industrial □) standards. Contamination is □ / (or) is not 1, suspected or confirmed to have migrated offsite."

JEFF TAYLOR, P.FNO., CSAP Printed Name Janvary 16, 2015 JANUARY 27, 2015 nature (with stamp



HORIZON ENGINEERING INC Unit 114 2433 Dollarton Highway North Vancouver, BC Canada V7H 1A0

Phone 604-990-0546 Fax 604-990-0583

BU442265 (see revised report C.O.V-data received guly 24/09)

# **REVISED GEOTECHNICAL REPORT**

for a

# PROPOSED SOCIAL HOUSING DEVELOPMENT

at

1338 Seymour Street, Vancouver, BC

Our File: 107-2064

September 25, 2008 Certified Professional Program OCT 2 2 2008 This stamp shall only operate to signify that it form dart of the CP Project and shall not can approval of design services rendered by the courrients titute EDWARD MACKINNON

Consulting Geotechnical Engineers of Vancouver FOI #2018-010, page 0006

HORIZON BC Housing and NSDA Architects 1338 Seymour Street, Vancouver, BC ENGINEERING INC Geotechnical Report - Revised Address

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# PART A - BACKGROUND INFORMATION AND TECHNICAL DATA

# 1.0 INTRODUCTION

This document reports on the results of the field investigation carried out on December 12, 2007, our subsequent engineering analyses, and provides geotechnical design and construction recommendations for the proposed development. This report was originally issued on February 22, 2008 with the address 1308 Seymour Street and is currently reissued with the address 1338 Seymour Street. No changes other than the address revision have been made since the original report was submitted.

# 2.0 SITE DESCRIPTION and PROPOSED DEVELOPMENT

The subject site is located at 1338 Seymour Street within the City of Vancouver and is bounded by Seymour Street to the west, a lane to the east and two private properties to the north and south. The site location is shown on Figure 1 in Appendix A.

Topography in the general vicinity of the site slopes gently down to the east and at the time of our site visit, the southern portion of the proposed area of study was used as temporary office and parking area for a construction site at 1321 Richards Street, Vancouver, BC and the northern part was occupied by an existing commercial building. The existing and neighbouring buildings appear to have been constructed at existing grades, without basements.

Based on the preliminary Architectural drawings prepared by NSDA Architects, we understand that the proposed development will be a thirteen-storey residential building with an underground parkade; therefore, we envisage that the lowest floor slab elevation will be about 2.7 metres (about 9.0 feet) below the existing ground level. Allowing about 0.6 metres (about two feet) from the floor slab to the underside of the footings, the depth of the excavation is expected to be about 3.30 metres (11.0 feet) below the existing ground level.

# 3.0 SUBSURFACE INVESTIGATION

In order to obtain engineering understanding about the geotechnical conditions in the subject site, a subsurface investigation program was carried out on December 12, 2007 and involved drilling one auger test hole. The drilling was directed and supervised by an engineer with our office and was carried out by Uniwide Drilling Co. Ltd of Burnaby BC. The information obtained during drilling was augmented with our observations of the subsurface soil conditions made at the adjacent construction site at 1321 Richards Street.

The auger test hole, AH07-1, was drilled to a depth of about 4.5 metres (15.0 feet). The test hole was advanced through the surficial asphalt pavement and was terminated within the underlying natural material. The soil stratigraphy encountered at the test hole was logged at the time of drilling and select soil samples were retrieved from the auger flights and returned to our office for further examination. The approximate location of the test hole is shown on Figure 2 in Appendix A.

HORIZON BC Housing and NSDA Architects 1338 Seymour Street, Vancouver, BC ENGINEERING INC Geotechnical Report Our File: 107-2064 September 25, 2008 Page 2

### 4.0 SUBSURFACE CONDITIONS

Based on information from the Geologic Survey of Canada (Map 1468A, Surficial Geology Vancouver) and as indicated on Figure 3 in Appendix A, surficial geology is expected to comprise Vashon Drift and Capilano Sediments, which comprise glacial drift including lodgement and minor flow till, lenses and interbeds of substratified glaciofluvial sand to gravel and interbeds of glaciolacustrine laminated stony silt, which is underlain by Tertiary Bedrock comprised of sandstone, siltstone, shale, conglomerate, and minor volcanic rocks at a depth of more than 10 metres below surface. Based on published literature from the Geological Survey of Canada (Mustard and Rouse, "Stratigraphy and evolution of Tertiary Georgia Basin and subjacent Upper Cretaceious sedimentary rocks, southwestern British Columbia and northwestern Washington State" IN "Geology and Geological Survey of Canada, 1994), Tertiary bedrock in the Vancouver area consists of the Huntingdon Formation which unconformably overlie the lower Nanaimo Group of rocks from the Cretaceous Period that in turn overlie Gambier Group to Coast Belt rock types as shown on Figure 4 in Appendix A.

The Huntingdon Formation consists of sedimentary rocks that were identified as Kitsilano and upper Burrard Formations in previous published literature. These sedimentary rocks generally consist of mudstones and sandstones coarsening upwards to sandstones and conglomerates; but may include shale, chert, lignite, and siltstone. In the Vancouver area, these sedimentary rocks are estimated to have a minimum thickness of more than 1000 metres and possibly up to about 1200 metres to 1300 metres thick. Local outcrops and drill hole data indicate this formation dips 10 to 15 degrees to the south and there are also intrusive igneous bodies of andesitic to basaltic sills, dykes, or small laccoliths. The Huntingdon Formation was formed in a sand dominated flood plain environment with possible minor lacustrine facies and no evidence of marine environment or deposits.

The Nanaimo Group consists of sedimentary rocks up to four kilometres thick and formed mainly in a marine environment. These sedimentary rocks generally comprise sandstone-conglomerate units separated by mudstone and fine grained sandstone formations.

The Gambier Group may consist of meta-volcanic to meta-sedimentary rocks including tuff, breccia, agglomerate, andesite, argillite, greywacke, quartzite, and conglomerate.

Coast Belt plutonic bedrock generally consist of granitic rocks that include quartz diorite, granodiorite, diorite, and granite.

### 4.1 Soil Conditions

The soil stratigraphy encountered during the geotechnical investigation are described following. These conditions are consistent with those encountered during excavation for the basement at 1321 Richards Street. The Test Hole Log is presented in Appendix B.

# 4.1.1 Fill

At the test hole location, dark grey, moist to dry, medium to coarse grained sand with trace gravel was encountered below the asphalt pavement. The material was inferred to be fill and found to be about 0.6 metres (2.0 feet) thick. Based on the rate of drilling, this fill was inferred to be dense.

# 4.1.2 Stiff Silt

The fill was underlain by a layer of light brown to light grey, moist to dry silt with trace fine grained sand. This layer was inferred to be natural and measured to be 2.1 metres (7.0 feet) thick at the test hole location. Based on the rate of drilling, this stratum was inferred to be stiff to very stiff.

### 4.1.3 Till-Like Silt

The stiff to very stiff silt was underlain by a grey, moist to dry, till-like silt which was inferred to be hard. This stratum continued to a depth of at least 4.5 metres (15.0 feet) where AH07-1 was terminated.

# 4.2 Groundwater Conditions

At the time of the auger drilling, no groundwater was encountered. The materials encountered at the test hole were found to be moist to dry. It is possible that groundwater may become perched near the surface during periods of wet weather.

# PART B - DISCUSSION and RECOMMENDATIONS

# 5.0 GENERAL

From a geotechnical viewpoint, the subject site is considered suitable for a development of the type proposed, provided the following recommendations are incorporated into the design and construction.

The hard silt encountered at a depth of about 2.7 metres (9.0 feet) below the existing grade is considered suitable for supporting the proposed development on conventional spread and strip foundations.

# 6.0 GEOTHERMAL FEASIBILITY

For the purpose of this report, 'geothermal' is taken to be a colloquialism for ground source heat pumps or 'geoexchange'. It is understood that most areas of metro Vancouver have sufficiently dense soil and high water table that the thermal conductivity of the underlying stratigraphy would support ground source heat pumps.

It is understood that typical drill hole depths for the closed system wells range from 75.0 to 100.0 metres (about 250.0 to 300.0 feet), with a minimum typical depth of 45.0 metres (150.0 feet). The cost of installing these drill holes is a function of drilling difficulty. It is expected that tertiary bedrock would be encountered for most of the depth of interest at the subject site and that drilling in this deposit would be fairly routine.

A challenge associated with installing the below grade infrastructure relates to scheduling the lengthy drilling program so that it does not unduly delay construction. It is surmised that this challenge could be overcome by scheduling drilling to occur between Building Permit Application and Issuance, but this may be subject to a successful, separate permitting program (similar to Demolition or Excavation and Foundation Permits).

It is understood that the feasibility of a geoexchange system is highly influenced by the cost of above-ground infrastructure within the building structure and that the cost of this infrastructure would be most difficult to overcome for small suites, but this is an issue best-addressed by others on the project team. It should be noted that heat recovery from grey water, which does <u>not</u> require ground source infrastructure, may be cost effective for small units.

# 7.0 TEMPORARY EXCAVATION SUPPORT

It is estimated that the materials encountered in the test hole could be readily excavated using conventional hydraulic excavation equipment in good repair suitably equipped with ripping attachments. It is possible that large boulders may be encountered which may require splitting for removal.

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In general, it is recommended that unshored excavation slopes be no steeper than 4.0 vertical to 3.0 horizontal in the silt. However, if there is insufficient room to slope the excavation, temporary excavation support will be required. We envisage that tied-back shotcrete and anchors would prove to be the most practical shoring methodology for the eastern and western sides. We also envisage that the existing buildings along the northern and southern property lines should be supported by underpinning, also comprised of tied-back shotcrete installed as the excavation advances.

Any unshored excavation slope should be protected by a layer of 6 mil polyethylene sheeting securely tied to resist wind action.

# 8.0 FOUNDATIONS

### 8.1 Recommended Static Design Bearing Pressure

The grey hard till-like silt expected at design subgrade elevation is considered suitable for support of strip and pad foundations. We recommend that a maximum allowable static design bearing pressure of about 400 kPa (8,000 psf) be used for sizing the footings where founded on the hard, grey, till-like silt.

The subgrade should be prepared such that only natural, undisturbed materials are present at subgrade elevation. Any loosened, softened, disturbed or otherwise deleterious material should be removed prior to footing construction. The silt expected at subgrade elevation is considered sensitive to disturbance and water softening. As a precaution against delays, it is suggested that the footing areas be protected with an approximately 2 inch thick layer of a 3/4 inch minus clear crushed gravel, placed immediately after the detailed footing excavation is complete.

Foundation subgrades should be protected from freezing. In addition, groundwater and rainwater runoff should be directed to temporary sumps and footing subgrades should be kept free of standing water.

The Geotechnical Engineer should be provided with an opportunity to review the exposed subgrade prior to footing construction or concrete pouring.

### 8.2 Recommended Footing Characteristics - Typical

Minimum pad footing dimensions of 0.6 metres (2.0 feet) and minimum strip footing widths of 0.45 metres (1.5 feet) are recommended.

It is recommended that foundations be placed at least 0.45 metres (18 inches) below slab-on-grade and exterior grades for confinement and frost protection, respectively.

Foundations should step at no more than 1.0 vertical to 2.0 horizontal.

Table 1: NBCC 2005 Design Convert Matings for 20/ Dest shifts

### 8.3 Seismic Considerations

An ultimate bearing capacity of 800 kPa (16,000 psf) can be used for Ultimate Limit State design requirements for footings to be placed on the hard till-like SILT subgrade.

Based on the 2006 Edition of the BC Building Code, the subject site would be categorized as Site Class C. The site-specific, peak horizontal ground acceleration for the design magnitude seismic event with a 2% probability of exceedance in 50 years is 0.455g. The recommended spectral accelerations are presented following:

Table 1. NBCC 20	005 Design Ground	Motions for 2% Pl	obability of Exceed	ance in 50 Years
a concert to a		the second second		

Sa(0.2) (g)	Sa(0.5) (g)	Sa(1.0) (g)	Sa(2.0) (g)	PGA (g)
0.918	0.638	0.333	0.173	0.455

Based on the above design spectral response accelerations and Tables 4.1.8.4.B and 4.1.8.4.C on Division B - Part 4 of the BC Building Code 2006, values of the acceleration and velocity based site coefficients (Fa and Fv) would be 1.0 and 1.0, respectively.

# 8.4 Expected Settlement

The total settlement of footings, under static loading, designed in accordance with the above recommendations should be less than 25 mm (1 inch). Differential settlement would be expected to be less than 19 mm over 9.0 metres (3/4 of an inch over a span of 30 feet) or 0.002 radians angular distortion.

# 9.0 RECOMMENDED LATERAL EARTH PRESSURES

In general, backfill against foundation walls and beneath settlement-sensitive structures should be comprised of compacted, select, free-draining granular material free from deleterious material. The city of Vancouver Backfilling Manuel should be referred to for acceptable material specifications and compaction criteria. Assuming backfill is compacted to between 95% and 100% of its density when tested in accordance with ASTM D698, and the foundation walls can move 0.2% of the wall height, they should be designed to resist the following:

- a) For static loading conditions, the greater of a 20 kPa (400 psf) uniform pressure or 5.0 x h (kPa) triangular earth pressure distribution, where h is the distance from the top of the wall measured in metres.
- b) For seismic loading conditions, the effect of earthquake shaking can be assumed to add an additional triangular pressure to the top of the wall which decreases to zero at the base of the wall. The seismic surcharge pressure is estimated to be 10.0 (H-h) (kPa) where h is the distance from the top of the wall and H is the total wall height. Seismic earth pressures are not added to the 20 kPa compaction pressure, so the earth pressure distribution for seismic conditions would be the greater of either 10.0 x (H-h) or 20 kPa between the top of the wall and the full depth of excavation.

HORIZON BC Housing and NSDA Architects 1338 Seymour Street, Vancouver, BC ENGINEERING INC Geotechnical Report

Surcharge loads from the adjacent lane can be assumed to be equivalent to an additional 0.6 metres (2.0 feet) of soil against the wall.

### 10.0 FOUNDATION AND UNDERSLAB DRAINAGE

The excavation is expected to intercept zones of perched groundwater. The volumetric flowrate expected is difficult to accurately determine at this time. We recommend that the actual discharge rate encountered during construction be measured and a suitable drainage system be adopted by the professional having the responsibility for the site and foundation drainage.

The underslab drainage layer should be hydraulically connected to the foundation drainage. After preparing the subgrade as described above, we recommend that a 150 mm (6 inch) thick drainage layer of compacted 19 mm (3/4 inch) clear crushed gravel be placed beneath the slab-on-grade. This drainage layer may be separated from the slab-on-grade by a layer of 6 mil polyethylene sheeting.

# 11.0 REVIEWS

It is recommended that we be provided with the opportunity to review Building Permit Application drawings from the architect, structural engineer and landscape architect prior to tender in order that the recommendations in this report can be confirmed or augmented, as required.

In accordance with the City of Vancouver Building By-Laws and the associated Letters of Assurance program, the Geotechnical Engineer of Record will be required to perform Field Reviews and consulting services regarding the following items;

Geotechnical - Temporary

- 7.1 Excavation
- 7.2 Shoring
- 7.3 Temporary Underpinning

Geotechnical - Permanent

- 8.1 Bearing capacity of the soil
- 8.3 Compaction of engineered fill
- 8.4 Structural considerations of soil, including slope stability and seismic loading
- 8.5 Backfill
- 8.7 Permanent Underpinning
- 8.8 Removal of shoring works from adjoining streets and properties

Thus, we should be given the opportunity to witness installation of the excavation and shoring work, confirm foundation and slab-on-grade subgrades, verify the material type and degree of compaction of Engineered Fill and backfill, and confirm decommissioning of the excavation shoring.

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# 12.0 CLOSURE

This report has been prepared for the sole use of BC Housing and other consultants for this project, as described. Any use or reproduction of this report for other than the stated intended purpose is prohibited without the written permission of Horizon Engineering Inc.

We are pleased to be of assistance to you on this project and we trust that our comments and recommendations are both helpful and sufficient for your current purposes. If you would like further details or require clarification of the above, please do not hesitate to call.

For HORIZON ENGINEERING INC

Masoud Mohajeri, Ph.D. Project Engineer



N:\2007 Projects\107-2064 VAN 1338 Seymour\Report\107-2064 Geotechnical Report Final 25sep08 new address.wpd

HORIZON BC Housing 1338 Seymour Street, Vancouver, BC ENGINEERING INC Geotechnical Report

Our File: 107-2064 September 25, 2008 Appendices

# APPENDIX A

Figures





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BC HOUSING SITES
LOCATED ON SURFICIAL GEOLOGY MAP
(Map 1468A, Surficial Geology Vancouver)

SCALE:	NTS	DATE:	Feb/08	JOB NO:	107-2064
DWN:	BB	СНК:		FIGURE:	-
DES:	KS	REV:			3





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HORIZON BC Housing 1338 Seymour Street, Vancouver, BC ENGINEERING INC Geotechnical Report

Our File: 107-2064 September 25, 2008 Appendices

# APPENDIX B

**Test Hole Logs** 

**Consulting Geotechnical Engineers** 

City of Vancouver FOI #2018-010, page 0021



# Cabuay, Malou

From:Robertson, David (CSG)Sent:Tuesday, February 10, 2015 1:11 PMTo:DOMINO (CITYVAN)Subject:FW: Waste Discharge Permit - 1300 Richards Street (498 Drake) - Wall FinancialAttachments:Erosion Sediment Control Criteria.PDF

Please file under 498 Drake St.

Note to file: The application for a permit was denied as the waste water discharge can be directed to the storm sewer under the existing Erosion Sediment Control Plan.

From: Robertson, David (CSG) Sent: Wednesday, February 04, 2015 3:14 PM To: 'Steve Boyce' Cc: 'Jason Rook'; 'Grant Myles'; 'James Burton'; Elford, Douglas Subject: RE: Waste Discharge Permit - 1300 Richards Street (498 Drake) - Wall Financial

Steve:

After a review of the information submitted a Waste Discharge Permit for the treatment and discharge of groundwater and excavation water is not required. Any groundwater, excavation water and waste water resulting from construction activities may be discharged to the storm sewer pursuant to the approved Erosion Sediment Control Plan and the City of Vancouver Sewer and Watercourse Bylaw #8093.

The treatment plant is not to be used for any waste or wastewater resulting from a hazardous material spill or from the removal of a UST. Any such waste or waste water shall be managed and disposed of appropriately.

Attached for your information is the Erosion Sediment Control Criteria outlining further requirements with respect to inspecting, monitoring, reporting and maintaining the Erosion Sediment Control works.

Please contact me if you have any questions.

David Robertson Supervisor, Environmental Protection Branch City of Vancouver Engineering Services, Sewer and Drainage Design Tel: 604.873.7892 Email: <u>david.robertson2@vancouver.ca</u>

From: Steve Boyce [mailto:steve.boyce@activeearth.ca] Sent: Monday, January 19, 2015 10:46 AM To: Robertson, David (CSG) Cc: 'Jason Rook'; 'Grant Myles'; 'James Burton' Subject: RE: Waste Discharge Permit - 1300 Richards Street (498 Drake) - Wall Financial

Thanks David. As discussed we have a courier delivering the permit application fee today (\$500) along with a hard copy of the permit application package. We understand the discharge fees (volume based) will be determined later.

We appreciate you looking at this one so quickly. Cheers

Steve Boyce Active Earth Engineering Ltd. 160 - 2250 Boundary Road Burnaby, BC V5M 3Z3 Cell 778.888.0473

On 19 Jan 2015 09:52, "Robertson, David (CSG)" < David.Robertson2@vancouver.ca> wrote:

Steve: Send the application along with the application fee (Cheque payable to City of Vancouver) to my attention at the Cross Roads Building at;

5<sup>th</sup> Floor – 507 W Broadway

Vancouver, BC V5Z 0B4.

David Robertson Supervisor, Environmental Protection Branch City of Vancouver Engineering Services, Sewer and Drainage Design Tel: 604.873.7892 Email: <u>david.robertson2@vancouver.ca</u>

From: Steve Boyce [mailto:steve.boyce@activeearth.ca]
Sent: Friday, January 16, 2015 2:30 PM
To: Robertson, David (CSG)
Cc: 'James Burton'; 'Grant Myles'; 'Jason Rook'
Subject: Waste Discharge Permit - 1300 Richards Street (498 Drake) - Wall Financial

Dave,

Please see the attached waste discharge permit application for the redevelopment of 1300 Richards Street (498 Drake) being undertaken by Wall Financial.

Per my voicemail please call to discuss when you can.

Note - we are also submitting a Tank Closure Report to Linda Kwan today, in regards to a heating oil tank that was recently removed from this Site along with hydrocarbon-impacted soils.

All soil contamination has been removed.

Cheers,

Steve Boyce, B.A. (Environment & Development)

×

160 - 2250 Boundary Road

Burnaby, BC V5M 3Z3

t 778.888.0473

f 778.737.3488

steve.boyce@activeearth.ca

www.activeearth.ca



ENGINEERING SERVICES Peter Judd, P.Eng., General Manager

# **Erosion Sediment Control Criteria**

# 1. Sediment Control

- 1.1. All work under the project shall be undertaken and completed in such a manner as to prevent the release of sediment laden water into any water course, storm sewer, or drainage system.
- 1.2. The erosion and sediment control works shall remain in place and shall be maintained until sediment laden water from the construction activities is no longer generated.
- 1.3. No sediment laden water from the work site shall be pumped out or otherwise discharged directly to a storm sewer system, water course, or other drainage system in such a manner as to bypass the sediment control system.

### 2. Inspection

- 2.1. Once the erosion and sediment control works have been completed, and before the start of any other on-site construction, the erosion and sediment control works shall be inspected to ensure that they are installed and constructed in accordance with the approved drawings. Any deficiencies in the sediment control works shall be corrected, before proceeding with any other on-site construction.
- 2.2. Throughout the duration of the project weekly inspections of all component parts of the erosion and sediment control works shall be conducted to verify that they are functioning properly and the inspections shall be documented in a log book. The log book will be made available to the City Inspector at the Inspector's request. During periods of significant rainfall, additional inspections shall be performed to ensure the sediment control works are functioning properly.

### 3. Monitoring and Sampling

- 3.1. Water samples shall be taken at the discharge point of the sediment control works:
  - · Within four hours of the initial discharge.
  - Weekly, except where there is no discharge during the week.
  - During or immediately after the first significant rainfall event (12.5 mm)

All storm water samples shall be collected in approved sample bottles. The samples shall be delivered or sent to an approved laboratory to be analysed for total suspended solids (TSS) and pH determination.

3.2. The total suspended solids (TSS) levels shall not be greater than 75 mg/L, and the pH shall be between 6.0 and 9.0.

October 27, 2014

- 3.3. If the measured TSS levels exceed the 75 mg/L limit or if the pH is less than 6.0 or greater than 9.0, the Contractor shall immediately contact the City of Vancouver, Environmental Protection Branch at 311 or 604.873.7000. The Contractor may be required to cease activities until appropriate remedial measures have been undertaken and the TSS levels are less than or equal to 75 mg/L.
- 3.4. A report shall be submitted to the City of Vancouver, Environmental Protection Branch for review following the receipt of the laboratory results. The report shall contain a copy of the analytical results, and records of any malfunctions of the erosion and sediment control works or any other conditions that would affect the quality of discharge.

Reports may be sent to environmentalprotection@vancouver.ca

3.5. The Environmental Protection Branch shall be notified prior to the decommissioning of the sediment control works and the wheel wash system. A final report shall be submitted with a spreadsheet summarizing the data and the date that the erosion and sediment controls works were decommissioned.

### 4. Maintenance

- 4.1. Should any part of the sediment control works become damaged or blocked or in any other way not function properly, then the Contractor shall take all steps necessary to repair and/or remove such damage, or blockage, or other cause of malfunction, and shall immediately contact the City of Vancouver, Environmental Protection Branch at 311 or 604.873.7000.
- 4.2. Accumulated sediment removed during the maintenance of the treatment works or the truck wheel wash, shall be disposed of in such a manner as to prevent its reentry into the site drainage system, and/or into any storm sewer system or water course.
- 4.3. All storm drains within the vicinity of the truck ramp driveway shall be inspected. Any sediment accumulated by the storm drain inlet protection device shall be removed. The drain protection device shall be cleaned and replaced when they have become blinded by sediment.

### 5. Enforcement

5.1. Failure to implement an Erosion Sediment Control Plan or comply with the Erosion Sediment Control Criteria may result in a *Stop Work Order* or other legal action under the *Sewer and Watercourse Bylaw #8093*.

Page 2 of 2



No. SC 090401

# WASTE DISCHARGE PERMIT

Issued by the Environmental Protection Branch, Licences and Inspections Department, City of Vancouver, under the provisions of the Greater Vancouver Sewerage & Drainage District Sewer Use By-law No. 299, 2007

PERMIT ISSUED T	ю:						
Name:	Van Mar Constructors						
Address: 9110 – 196A Street							
City:	Langley, BC V1M 3B4						
Telephone:	(604) 689-1160	FAX:					
FOR NON-DOMES	TIC WASTES DISCHARGE	D TO THE SEWER FROM:					
Company Name:	Company Name: Van Mar Constructors						
Address:	1338 Seymour Street, Va	ncouver, BC					
CONTACT:							
Name:	Tony Gerard	Stephen Sims					
Title:	Site Superintendent	Environmental Consultant Sortori Environmental Inc.					
Telephone:	(604) 250-9787	(604) 319-6078					
Fax:	(604) 689-1169						

NATURE OR TYPE OF BUSINESS: Site Excavation and Geothermal Drilling Remediation

This Permit has been issued under the terms and conditions prescribed in the Greater Vancouver Sewerage & Drainage District Sewer Use By-law No. 299, 2007 and in the attached Appendices: A&B

I understand the responsibilities for compliance with the Greater Vancouver Sewerage & Drainage District Sewer Use By-law No. 299, 2007 and the conditions of this Permit.

Signature of Permittee

SEWAGE CONTROL MANAGER

Date Issued:

October 23, 2009

#### APPENDIX A

### to WASTE DISCHARGE PERMIT No. SC 090401

This Appendix sets out the standard conditions, engineering units, and the requirement for emergency procedures.

#### STANDARD CONDITIONS A.

- Except where otherwise indicated in this Permit, all terms and conditions stipulated in 1. Greater Vancouver Sewerage & Drainage District Sewer Use By-law No. 299, 2007 shall apply to this Permit.
- 2. The terms and conditions of this Permit may be amended as deemed necessary by the Sewage Control Manager.
- 3. Definitions contained within Greater Vancouver Sewerage & Drainage District Sewer Use By-law No. 299, 2007 apply to the terminology in this Permit.
- 4. The Permittee shall inspect the pollution control works regularly and maintain them in good working order. The Sewage Control Manager shall be notified of any malfunctions of these works.
- The discharge of non-domestic waste which has bypassed the authorized works is 5. prohibited.
- 6. The Permittee shall notify the Sewage Control Manager prior to implementing changes to any process, authorized works, or any other condition that may affect the quality and/or quantity of the discharge.

SEWAGE CONTROL MANAGER

Date Issued:

October 23, 2009

Date Amended:

-2-

# APPENDIX A

# to WASTE DISCHARGE PERMIT No. SC 090401

### B. ENGINEERING UNITS

The engineering units specified in this Permit are in accordance with the Metric System of measure. Approximate equivalent values for the British Imperial System can be calculated using the following conversion factors.

IGPD	÷	220	= m <sup>3</sup> /day
IGPM	+	0.22	= Umin
cfs	+	35.3	$= m^3/s$
ppm	+	1	= mg/{
lb	÷	2.205	= kg

where:

m <sup>3</sup>	=	cubic metres	IGPD	=	Imperial gallons per day
8	=	litres	IGPM	=	Imperial gallons per min
mg	=	milligrams	cfs	=	cubic feet per second
kg	=	kilograms	ppm	=	parts per million
S	=	seconds	lb	=	pounds

### C. EMERGENCY PROCEDURES

In the event of an emergency or condition which prevents the continuing operation of any pollution control works or procedures designated by this Permit or results in a violation of any discharge criteria specified in this Permit, the Permittee shall notify the City of Vancouver Environmental Protection Branch at (604) 667-7285 (24 hours) immediately and shall undertake appropriate remedial action.

SEWAGE CONTROL MANAGER

Date Issued:

October 23, 2009

### to WASTE DISCHARGE PERMIT No. SC 090401

This Appendix sets out the requirements for the authorized works.

### A. AUTHORIZED WORKS

- The works authorized are as follows:
  - (a) Collection Sump
  - (b) Charcoal Filter and pH Treatment System
  - (c) Flocculant System
  - (d) Settling Tanks
  - (e) Sampling Point
  - (f) Flow Meter

### B. AUTHORIZED RATE OF DISCHARGE AND VOLUME

- (a) Maximum rate of treated groundwater discharged to the sanitary sewer is 0.10 L/second.
- (b) Maximum daily volume discharge of treated groundwater is 2.3 cubic metres per day.
- (c) Authorized volume of treated groundwater discharged to the sanitary sewer from 1338 Seymour Street during the validity of the permit is 125 cubic metres.
- (d) The authorized discharge point is the onsite sanitary sewer connection located at southeast of the site.

# C. AUTHORIZED DISCHARGE CHARACTERISTICS

- (a) The PERMITTEE shall not discharge Prohibited Waste as defined in Schedule "A" of the By-law (Greater Vancouver Sewerage and Drainage District Sewer Use Bylaw No. 299, 2007).
- (b) The PERMITTEE shall not discharge Hazardous Waste as defined in the Environmental Management Act with the exception of Hazardous Waste in compliance with the effluent standards contained in Schedule 1.2, Column 3 of the Hazardous Waste Regulation.

SEWAGE CONTROL MANAGER

Date Issued:

October 23, 2009

### to WASTE DISCHARGE PERMIT No. SC 090401

- (c) The PERMITTEE shall not discharge or allow or cause the discharge into the sewer any of the following:
  - Storm Water
  - Uncontaminated Water
  - Groundwater (exception: providing it is in compliance with an applicable Waste Discharge Permit)
- (d) The PERMITTEE shall not discharge Restricted Waste as defined in Schedule "B" of the Bylaw.

SEWAGE CONTROL MANAGER

Date Issued:

October 23, 2009

### to WASTE DISCHARGE PERMIT No. SC 090401

### D. SAMPLING AND REPORTING REQUIREMENTS

- (a) A grab sample shall be taken within the first four hours of the initial discharge and monthly sampling thereafter during the discharge period from the permit date.
- (b) Samples shall be collected in accordance with procedures in Standard Methods or other approved methods. The sample shall be analyzed within 48 hours by an approved laboratory using procedures from Standard Methods or other approved methods for the following parameters:
  - (i) Total Suspended Solids (TSS)
  - (ii) pH
- (c) The analysis of the sample taken in (a) above shall be reported to the Sewage Control Manager within two weeks after the date of sampling.
- (d) Further to (c), a closure report shall be sent to the Sewage Control Manager and shall include the volume discharged during the discharge period as well as the analytical data summary and discussion.

### E. AUTHORIZED PERIOD OF DISCHARGE

The discharge is authorized for 180 days from October 23,2009 to April 20, 2010.

#### F. PERMIT AMENDMENT/CONDITIONS

We reserve the right to change the conditions of, or revoke, this Permit, at any time.

SEWAGE CONTROL MANAGER

Date Issued:

October 23, 2009

# to WASTE DISCHARGE PERMIT No. SC 090401

G. SITE PLAN



SEWAGE CONTROL MANAGER

Date Issued:

October 23, 2009
#### APPENDIX B

### to WASTE DISCHARGE PERMIT No. SC 090401

### H. TREATMENT SYSTEM



Date Issued:

October 23, 2009

Date Amended:

SEWAGE CONTROL MANAGER

### Katigbak, Veronica

From:	Kwan, Linda
Sent:	Thursday, April 29, 2010 11:56 AM
To:	DOMINO (CITYVAN)
Subject:	FW: Karis Place 1338 Seymour Street - Waste Discharge Permit No. SC 090401 Closure Report

Attachments: Karis Place - 1338 Seymour St\_Permit No090401 Closure Report.pdf

Please domino.

Thank you, Linda

From: Stephen Sims [mailto:steve@arranenvironmental.com] Sent: Wednesday, April 28, 2010 9:34 AM To: Kwan, Linda Cc: 'Brad Bunt'; 'Alex Sartori' Subject: Karis Place 1338 Seymour Street - Waste Discharge Permit No. SC 090401 Closure Report

Hi Linda,

Please find attached the closure report for Waste Discharge Permit No. SC 090401 at 1338 Seymour Street. If you have questions please contact me by email or by phone at 604-319-6078.

Thanks, Steve

J. Stephen Sims, BSc, BIT Independent Associate



Mobile: 604-319-6078 Email: steve@arranenvironmental.com

### MEMORANDUM

DATE:	April 20 <sup>th</sup> , 2010
TO:	Linda Kwan
	City of Vancouver Environmental Protection Branch
FROM:	Stephen Sims, Sartori Environmental Services Inc.
CC:	Brad Bunt, VanMar Constructors Inc.
RE:	Karis Place – 1338 Seymour Street, Vancouver
	Waste Discharge Permit No. SC 090401 Closure Report

#### Dear Linda,

Sartori Environmental Services Inc. (SESI) was retained by VanMar Constructors Inc (VanMar) to consult on site wastewater discharge issues at the Karis Place development. Due to geo-thermal drilling activities and exposed concrete and grout works, it was determined that total suspended sediment (TSS) load and pH issues may arise. SESI submitted permit applications on behalf of VanMar in order to allow the discharge of site water into the sanitary system located in the lane along the southeast side of 1338 Seymour Street. This report is intended to close the sanitary Waste Discharge Permit (No. Sc 090401), and detail the completion of sampling and reporting requirements outlined in Appendix B of the permit.

sartori

environmental services inc.

On-site sediment and pH treatment systems were operated by Storm Guard Water Treatment Inc. (Storm Guard). Initial water quality sample was completed by Storm Guard on November 7<sup>th</sup>, 2009 but no water was being discharged at this time. SESI was contacted prior to initial pumping and was onsite (within the first 4hrs) to sample discharge on November 17<sup>th</sup>, 2009. Throughout the permit period (October 23<sup>rd</sup> – April 20<sup>th</sup>, 2009), discharge was sampled periodically and results did not exceed a TSS reading of 24 mg/L and pH ranged between 6.46 and 7.8. TSS and pH readings remained within the allowable limits of less than 600mg/L and between 5.5 and 10.5, respectively. All Water quality sampling results for SESI and Storm Guard are attached to this report.

As per Appendix B of the permit, authorized and actual discharge flow rates and quantities are listed in the table below. Values were calculated by Storm Guard based on tank volumes, flow meter settings, and length of time/day water was discharged from the site. A Total Water Volume Report from Storm Guard is attached.

Authorized Total Volume during the Validity of the Permit	125m <sup>3</sup>	Calculated Total Discharge Volume (Nov. 26, 2009 – April 20, 2010)	95.2m³
Max. Daily Volume Discharged	2.3m³/day	Calculated Daily Average Discharge Volume (146 days)	0.65m³/day

As of April 20<sup>th</sup>, 2010 the water treatment system has been removed and the sanitary discharge outlet has been decommissioned. As no sediment or pH issues remain on site, future accumulated water will be discharged into the stormwater system as needed ensuring that both TSS and pH levels remain within allowable limits of less than 75mg/L and between 6.0 and 9.0, respectively. The catch basin in the alley behind the subject property has been fitted with a siltation sack which will be maintained by VanMar.

If you have any questions or comments regarding this report, please do not hesitate to contact me at your convenience.

Best Regards,

J. St.

J. Stephen Sims Associate Sartori Environmental Services Inc. 604-319-6078

#### **3 Attachments:**

- Water Quality Results Summary Sheets (Storm Guard)
- Water Quality Results Exova laboratory Analysis (SESI)
- Total Water Volume Report (Storm Guard)

## Karis Place – 1338 Seymour Street, Vancouver

Water Quality Results Summary Sheets Storm Guard Water Treatment Inc. (6 pages)

1080 Page Street Richmond, B C .V6V 2Y3 Tel: (604) 324-0089 Fax: (604) 324-0086

Unit : FS 125 Company : VanMar Constructors 1033 Inc. Location : 1338 Seymour St, Vancouver, BC.V6B 3P3

Date	Time	Weather	PH In	PH Out	Tss In	Tss Out	Remarks
07/11/2009	11:30 AM			6.5	876	12	Not pumping water
			-	-		_	
	-			-	100		
	-			-			
			-				
			-	-			
	-			-		-	
21						-	
			-	-			
11-1-1			-				
0.00						100	1111
			1				
						6.2	
			1.0		1.1		1. 11
1							

1080 Page Street Richmond, B C .V6V 2Y3 Tel: (604) 324-0089 Fax: (604) 324-0086

Unit:FS 125Company:VanMAR Constructors 1033 Ltd.Location:1338 Seymour St. Vancouver, BC. V6B 3P3

Date	Time	Weather	PH In	<b>PH Out</b>	Tss In	<b>Tss Out</b>	Remarks
12/1/2009	9:45 AM		9.1	7.5	1258	9	
12/3/2009	12:15 PM	the Asia	9.2	7.2	1973	8	
12/7/2009	9:45 AM		9.7	7.5	1008	9	
12/14/2009	11:30 AM	244 H	8.9	6.8	1698	10	
12/30/2009	10;00 AM		8.8	7.1	2042	12	
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	1.1.53						
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	ELSIN						
FILL							

1080 Page Street Richmond, B C . V6V 2Y3 Tel: (604) 324-0089 Fax: (604) 324-0086

Unit:FS 125Company:VanMAR Constructors 1033 Ltd.Location:1338 Seymour St. Vancouver, BC. V6B 3P3

Date	Time	Weather	PH In	<b>PH Out</b>	Tss In	<b>Tss Out</b>	Remarks
1/4/2010	1:00 PM		8.9	6.9	1472	12	
1/6/2010	1:10 PM	196 34 31	8.3	7.1	1041	10	N. 11 13.11
1/12/2010	2:10 PM		9.1	6.8	1338	4	
1/28/2010	9:10 AM		8.7	6.8	98	2	
		25	2.4				
	-						
		1					
1.1.1.1							

1080 Page Street Richmond, B C .V6V 2Y3 Tel: (604) 324-0089 Fax: (604) 324-0086

Febuary /10	
Unit :	FS 125
Company :	VanMAR Constructors 1033 Ltd.
Location :	1338 Seymour St. Vancouver, BC. V6B 3P3

Date	Time	Weather	PH In	PH Out	Tss In	<b>Tss Out</b>	Remarks
01/02/2010	10:35 AM		9.8	7.5	171	4	CORD CONTRACTOR
12/02/2010	11:15 AM	- 2 - 1 al	2.16	7.1		8	
26/02/2010	9:45 AM	1. N. A.	9.4	7.1	984	3	
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	1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 - 1999 -						
TENY SALAR							

1080 Page Street Richmond, B C .V6V 2Y3 Tel: (604) 324-0089 Fax: (604) 324-0086

#### Mar-10

 Unit :
 FS 125

 Company :
 VanMAR Constructors 1033 Ltd.

 Location :
 1338 Seymour St. Vancouver, BC. V6B 3P3

Date	Time	Weather	PH In	PH Out	Tss In	Tss Out	Remarks
04/03/2010	12:05 PM			7.8			Not Pumping water
12/03/2010	9:10 AM		9.8	7.6	1		
24/03/2010	12:10 PM		1-2-22	7.1			
25/03/2010						ALC: N	Unit done work
Constant of	1.061			Contractory of		2 2 2 2	
		AND DE STORES					
	11 - 11 - 11 - 11						
		ALC: NO		100	19-17-11		
CONTRACTOR OF							

1080 Page Street Richmond, B C .V6V 2Y3 Tel: (604) 324-0089 Fax: (604) 324-0086

Apr-21 /10Unit :CO228Company :VanMar Constructors 1033 Ltd.Location :1338 Seymour St. Vancouver BC. V6B 3P3

Date	Time	Weather	PH In	<b>PH Out</b>	Tss in	<b>Tss Out</b>	Remarks
24/03/2010	12:20 PM		8.9	6.8		12	
30/03/2010	10:05 AM		8.7	7.7		14	
12/04/2010	10:20 AM			7.3		10	Not pumping water
15/04/2010	7:30 AM	- Commence	11	7.6		15	
20/04/2010	11:27 AM		9.4	7.3		8	
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	-						
ada ata a					and and		
					-		

### Karis Place – 1338 Seymour Street, Vancouver

## Water Quality Results – Exova Laboratory Analysis Sartori Environmental Services Inc. (4 pages)

Exoya	
#104, 19575-55 A Ave.	
Surrey, British Columbia	
V3S 8P8, Canada	

T. +1 (604) 514-3322 F +1 (604) 514-3323 E: Surrey@exova.com W: www.exova.com

#### **Analytical Report**

Terms and Conditions www.exova.ca/terms&conditions.html





Bill To: Report To: Attn: Sampled By: Company:	Arran Environmental Services Arran Environmental Services 103 - 1600 W. 6th Avenue Vancouver, BC, Canada V6J 1R3 Steve Sims Stephen Sims Arran	Project: ID: Name: Location: LSD: P.O.: Acct code:	Kari's Place 1338 Seymour Street	Lot ID: Control Number: Date Received: Date Reported: Report Number:	<b>713686</b> Nov 17, 2009 Dec 2, 2009 1277946	
--	---	--	-------------------------------------	--	---	--

		Reference Number Sample Date Sample Time Sample Location Sample Description Matrix	713686-1 Nov 17, 2009 09:30 Outlet Water			
Analyte		Units	Results	Results	Results	Nominal Detection
Physical and Aggreg	ate Properties					100
Solids	Total Suspended	mg/L	22			1
Routine Water						
pH	@ 25 °C		7.22			

Approved by:

Marie Ingland Marie England **Consulting Scientist** 

City of Vancouver FOI #2018-010, page 0047

Exova
#104, 19575-55 A Ave.
Surrey, British Columbia
V3S 8P8, Canada

T: +1(604) 514-3322 F +1(604) 514-3323 E: Surrey@exova.com W: www.exova.com

#### Analytical Report



Bill To: Report To:	Arran Environmental Services Arran Environmental Services 103 - 1600 W. 6th Avenue Vancouver, BC, Canada	Project: ID: Name: Location:	Kan's Place	Lot ID: Control Number: Date Received: Date Reported:	<b>720344</b> A137714 Jan 6, 2010 Jan 8, 2010	
Attn: Sampled By: Company:	V6J 1R3 Steve Sims S. Sims AES	LSD: P.O.: Acct code:		Report Number:	1289089	

		Reference Number Sample Date Sample Time Sample Location Sample Description Matrix	720344-1 Jan 06, 2010 09:00 Tank Outlet Water			
Analyte		Units	Results	Results	Results	Nominal Detection
Physical and Aggrega	ate Properties	and the second second				
Solids	Total Suspended	mg/L	4			1
Routine Water						
pH	@ 25 °C		6.46			

andren Carnarl Approved by:

Andrew Garrard, BSc General Manager

Terms and Conditions www.exova.ca/terms&conditions

Exova #104, 19575-55 A Ave. Surrey, Britsh Columbia V3S 8P8, Canada

T: +1(604) 514-3322 F +1(604) 514-3323 E: Surrey@exova.com W. www.exova.com

#### **Analytical Report**

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Exova

Bill To: Report To:	Arran Environmental Services Arran Environmental Services 103 - 1600 W. 6th Avenue Vancouver, BC, Canada V6J 1R3	Project: ID: Name: Location: LSD:	Kari's Place 1338 Seymour St	Lot ID: Control Number: Date Received: Date Reported: Report Number:	<b>729927</b> A150974 Mar 5, 2010 Mar 11, 2010 1302239	
Attn:	Steve Sims	P.O.:			a submanal.	
Sampled By:	S. Sims	Acct code:				
Company:	AES					

		Reference Number Sample Date Sample Time	729927-1 Mar 04, 2010 13:30			
	A Sector	Sample Description Matrix	Tank Outlet Water	18.68	1	
Analyte		Units	Results	Results	Results	Nominal Detection
Physical and Aggreg	ate Properties					
Solids	Total Suspended	mg/L	24			1
Routine Water						
pH	@ 25 °C		6.58			

Approved by: andren Carnarl

Andrew Garrard, BSc General Manager

### MEMORANDUM

DATE:	April 20 <sup>th</sup> , 2010
TO:	Linda Kwan
	City of Vancouver Environmental Protection Branch
FROM:	Stephen Sims, Sartori Environmental Services Inc.
CC:	Brad Bunt, VanMar Constructors Inc.
RE:	Karis Place – 1338 Seymour Street, Vancouver
	Waste Discharge Permit No. SC 090401 Closure Report

#### Dear Linda,

Sartori Environmental Services Inc. (SESI) was retained by VanMar Constructors Inc (VanMar) to consult on site wastewater discharge issues at the Karis Place development. Due to geo-thermal drilling activities and exposed concrete and grout works, it was determined that total suspended sediment (TSS) load and pH issues may arise. SESI submitted permit applications on behalf of VanMar in order to allow the discharge of site water into the sanitary system located in the lane along the southeast side of 1338 Seymour Street. This report is intended to close the sanitary Waste Discharge Permit (No. Sc 090401), and detail the completion of sampling and reporting requirements outlined in Appendix B of the permit.

sartori

environmental services inc.

On-site sediment and pH treatment systems were operated by Storm Guard Water Treatment Inc. (Storm Guard). Initial water quality sample was completed by Storm Guard on November 7<sup>th</sup>, 2009 but no water was being discharged at this time. SESI was contacted prior to initial pumping and was onsite (within the first 4hrs) to sample discharge on November 17<sup>th</sup>, 2009. Throughout the permit period (October 23<sup>rd</sup> – April 20<sup>th</sup>, 2009), discharge was sampled periodically and results did not exceed a TSS reading of 24 mg/L and pH ranged between 6.46 and 7.8. TSS and pH readings remained within the allowable limits of less than 600mg/L and between 5.5 and 10.5, respectively. All Water quality sampling results for SESI and Storm Guard are attached to this report.

As per Appendix B of the permit, authorized and actual discharge flow rates and quantities are listed in the table below. Values were calculated by Storm Guard based on tank volumes, flow meter settings, and length of time/day water was discharged from the site. A Total Water Volume Report from Storm Guard is attached.

Authorized Total Volume during the Validity of the Permit	125m <sup>3</sup>	Calculated Total Discharge Volume (Nov. 26, 2009 – April 20, 2010)	95.2m³
Max. Daily Volume Discharged	2.3m³/day	Calculated Daily Average Discharge Volume (146 days)	0.65m³/day

As of April 20<sup>th</sup>, 2010 the water treatment system has been removed and the sanitary discharge outlet has been decommissioned. As no sediment or pH issues remain on site, future accumulated water will be discharged into the stormwater system as needed ensuring that both TSS and pH levels remain within allowable limits of less than 75mg/L and between 6.0 and 9.0, respectively. The catch basin in the alley behind the subject property has been fitted with a siltation sack which will be maintained by VanMar.

If you have any questions or comments regarding this report, please do not hesitate to contact me at your convenience.

Best Regards,

J. St.

J. Stephen Sims Associate Sartori Environmental Services Inc. 604-319-6078

#### **3 Attachments:**

- Water Quality Results Summary Sheets (Storm Guard)
- Water Quality Results Exova laboratory Analysis (SESI)
- Total Water Volume Report (Storm Guard)

## Karis Place – 1338 Seymour Street, Vancouver

Water Quality Results Summary Sheets Storm Guard Water Treatment Inc. (6 pages)

1080 Page Street Richmond, B C .V6V 2Y3 Tel: (604) 324-0089 Fax: (604) 324-0086

Unit :	F\$ 125
Company :	VanMar Constructors 1033 Inc.
ocation :	1338 Seymour St, Vancouver, BC.V6B 3P3

Date	Time	Weather	PH In	PH Out	Tss In	Tss Out	Remarks
07/11/2009	11:30 AM			6.5	876	12	Not pumping water
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	-			-	100		
	-			-			
			-				
			-	-			
	-			-		-	
21						-	
			-	-			
11-1-1			-				
0.00						100	1111
			1				
						6.2	
			1.0		1.1		1. 11
1					11		

1080 Page Street Richmond, B C .V6V 2Y3 Tel: (604) 324-0089 Fax: (604) 324-0086

Unit:FS 125Company:VanMAR Constructors 1033 Ltd.Location:1338 Seymour St. Vancouver, BC. V6B 3P3

Date	Time	Weather	PH In	<b>PH Out</b>	Tss In	<b>Tss Out</b>	Remarks
12/1/2009	9:45 AM		9.1	7.5	1258	9	
12/3/2009	12:15 PM	the Asia	9.2	7.2	1973	8	
12/7/2009	9:45 AM		9.7	7.5	1008	9	
12/14/2009	11:30 AM	C+1 -	8.9	6.8	1698	10	
12/30/2009	10;00 AM		8.8	7.1	2042	12	
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	-						
	1.2.3						
FILL							

1080 Page Street Richmond, B C . V6V 2Y3 Tel: (604) 324-0089 Fax: (604) 324-0086

Unit:FS 125Company:VanMAR Constructors 1033 Ltd.Location:1338 Seymour St. Vancouver, BC. V6B 3P3

Date	Time	Weather	PH In	<b>PH Out</b>	Tss In	<b>Tss Out</b>	Remarks
1/4/2010	1:00 PM		8.9	6.9	1472	12	
1/6/2010	1:10 PM	196 34 31	8.3	7.1	1041	10	N. 11 13.11
1/12/2010	2:10 PM		9.1	6.8	1338	4	
1/28/2010	9:10 AM		8.7	6.8	98	2	
		25	2.4				
	-						
		1					
1.1.1.1					1		

1080 Page Street Richmond, B C .V6V 2Y3 Tel: (604) 324-0089 Fax: (604) 324-0086

Febuary /10	
Unit :	FS 125
Company :	VanMAR Constructors 1033 Ltd.
Location :	1338 Seymour St. Vancouver, BC. V6B 3P3

Date	Time	Weather	PH In	PH Out	Tss In	<b>Tss Out</b>	Remarks
01/02/2010	10:35 AM		9.8	7.5	171	4	CORD CORD
12/02/2010	11:15 AM		2.16	7.1		8	
26/02/2010	9:45 AM	N. 44	9.4	7.1	984	3	1.1.1.1.1.1
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	or her to can be						
					143. 7. 1		
TENY SALE							

1080 Page Street Richmond, B C .V6V 2Y3 Tel: (604) 324-0089 Fax: (604) 324-0086

#### Mar-10

 Unit :
 FS 125

 Company :
 VanMAR Constructors 1033 Ltd.

 Location :
 1338 Seymour St. Vancouver, BC. V6B 3P3

Date	Time	Weather	PH In	PH Out	Tss In	Tss Out	Remarks
04/03/2010	12:05 PM			7.8			Not Pumping water
12/03/2010	9:10 AM		9.8	7.6	1		
24/03/2010	12:10 PM		1-2-22	7.1			
25/03/2010						ALC: N	Unit done work
Constant of	1.061			Contractory of		2 2 2 2	
		AND DE STOREST					
	11-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1						
		1. ALC 1. AL		100	10-11-11		
CONTRACTOR OF							

1080 Page Street Richmond, B C .V6V 2Y3 Tel: (604) 324-0089 Fax: (604) 324-0086

Apr-21 /10Unit :CO228Company :VanMar Constructors 1033 Ltd.Location :1338 Seymour St. Vancouver BC. V6B 3P3

Date	Time	Weather	PH In	<b>PH Out</b>	Tss in	<b>Tss Out</b>	Remarks
24/03/2010	12:20 PM		8.9	6.8		12	
30/03/2010	10:05 AM		8.7	7.7		14	
12/04/2010	10:20 AM			7.3		10	Not pumping water
15/04/2010	7:30 AM	- Commence	11	7.6		15	
20/04/2010	11:27 AM		9.4	7.3		8	
					-		
	-						
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					-		

### Karis Place – 1338 Seymour Street, Vancouver

## Water Quality Results – Exova Laboratory Analysis Sartori Environmental Services Inc. (4 pages)

Exoya	
#104, 19575-55 A Ave.	
Surrey, British Columbia	
V3S 8P8, Canada	

T. +1 (604) 514-3322 F +1 (604) 514-3323 E: Surrey@exova.com W: www.exova.com

#### **Analytical Report**

Terms and Conditions www.exova.ca/terms&conditions.html





Bill To: Report To: Attr: Sampled By:	Arran Environmental Services Arran Environmental Services 103 - 1600 W. 6th Avenue Vancouver, BC, Canada V6J 1R3 Steve Sims Stephen Sims	Project: ID: Name: Location: LSD: P.O.: Acct code:	Kari's Place 1338 Seymour Street	Lot ID: Control Number: Date Received: Date Reported: Report Number:	<b>713686</b> Nov 17, 2009 Dec 2, 2009 1277946	
Company:	Arran					

		Reference Number Sample Date Sample Time Sample Location Sample Description Matrix	713686-1 Nov 17, 2009 09:30 Outlet Water			
Analyte	and the second	Units	Results	Results	Results	Nominal Detection
Physical and Aggreg	ate Properties					
Solids	Total Suspended	mg/L	22			1
Routine Water						
pH	@ 25 °C		7.22			

Approved by:

Marie Ingland Marie England **Consulting Scientist** 

Exova
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Surrey, British Columbia
V3S 8P8, Canada

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#### Analytical Report



Bill To: Report To:	Arran Environmental Services Arran Environmental Services 103 - 1600 W. 6th Avenue Vancouver, BC, Canada V6J 183	Project: ID: Name: Location:	Kari's Place	Lot ID: Control Number: Date Received: Date Reported:	<b>720344</b> A137714 Jan 6, 2010 Jan 8, 2010	
Attn: Sampled By: Company:	Steve Sims S. Sims AES	P.O.: Acct code:		Report Number:	1289089	

		Reference Number Sample Date Sample Time Sample Location Sample Description Matrix	720344-1 Jan 06, 2010 09:00 Tank Outlet Water			
Analyte		Units	Results	Results	Results	Nominal Detection
Physical and Aggrega	ate Properties					
Solids	Total Suspended	mg/L	4			1
Routine Water						
pH	@ 25 °C		6.46			

andren Carnarl Approved by:

Andrew Garrard, BSc General Manager

Terms and Conditions www.exova.ca/terms&conditions

Exova #104, 19575-55 A Ave. Surrey, Britsh Columbia V3S 8P8, Canada

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#### **Analytical Report**

Terms and Conditions. www.exova.ca/terms&conditions





Bill To: Report To:	Arran Environmental Services Arran Environmental Services 103 - 1600 W. 6th Avenue Vancouver, BC, Canada V6J 1R3	Project: ID: Name: Location: LSD:	Kan's Place 1338 Seymour St	Lot ID: Control Number: Date Received: Date Reported: Report Number	<b>729927</b> A150974 Mar 5, 2010 Mar 11, 2010 1302239	
Attn:	Steve Sims	P.O.:				
Company:	AES	Acci code.				

		Reference Number Sample Date Sample Time Sample Location	729927-1 Mar 04, 2010 13:30			
1.00	1.0	Sample Description Matrix	Tank Outlet Water	1. 1. 1. 1.	in sec	1
Analyte		Units	Results	Results	Results	Nominal Detection
Physical and Aggrega	te Properties					
Solids	Total Suspended	mg/L	24			1
Routine Water						
pH	@ 25 °C		6.58			

Approved by: andren Carnarl

Andrew Garrard, BSc General Manager

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#104, 19575-55 A Ave.
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V3S 8P8, Canada

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#### **Analytical Report**

Terms and Conditions: www.exova.ca/terms6.conditions



Bill To: Report To:	Arran Environmental Services Arran Environmental Services 103 - 1600 W. 6th Avenue Vancouver, BC, Canada V6J 1R3	onmental Services Project: onmental Services ID: W. 6th Avenue Name: Karis Place BC, Canada Location: 1338 Seymour Stree LSD:	Karis Place 1338 Seymour Street	Lot ID: Control Number: Date Received: Date Reported: Report Number:	<b>732146</b> A150973 Mar 18, 2010 Mar 22, 2010	
Attn:	Steve Sims	P.O.:		noper nemero	(Verse aller	
Sampled By:	SS	Acct code:				
Company:	Arran					

		Reference Number Sample Date Sample Time Sample Location	732146-1 Mar 18, 2010 10:00			
	1. A. C.	Sample Description Matrix	Tank Outlet Water	West St	Ser and	1
Analyte		Units	Results	Results	Results	Nominal Detection Limit
Physical and Aggreg	ate Properties	and the state of the second				
Solids	Total Suspended	mg/L	12			1
Routine Water						
pH	@ 25 °C		7.02			

Approved by: andrew Carnarl

Andrew Garrard, BSc General Manager

## Karis Place – 1338 Seymour Street, Vancouver

Total Water Volume Report Storm Guard Water Treatment Inc. (1 page)

### STORM GUARD WATER TREATMENT INC.

1080 Page Street Richmond, BC V6V 2Y3

Telephone: (604) 324-0089 Fax: (604) 324-0086

#### TOTAL WATER VOLUME REPORT

RE: VANMAR CONSTRUCTORS 1033 KARIS PLACE - 1338 SEYMOUR STREET VANCOUVER, BC V6B 3P3

NOV. 26 - DEC. 24/09	TOTAL WATER VOLUME	27 CUBIC METRES
DEC. 25 - JAN. 22/10	TOTAL WATER VALUME	23.8 CUBIC METRES
JAN. 23 - FEB. 20/10	TOTAL WATER VOLUME	21.9 CUBIC METRES
FEB. 21 - MAR. 20/10	TOTAL WATER VOLUME	14.5 CUBIC METRES
MAR. 21 - APR. 20/10	TOTAL WATER VOLUME	8.0 CUBIC METRES
	and the second se	

TOTAL = 95.2 CUBIC METRES



COMMUNITY SERVICES GROUP Development Services Processing Centre - Subdivision and Strata

## MEMORANDUM

October 8, 2008

то:	Al Zacharias, City Surveyor Lauren Petersen, Environmental Protection Branch				
FROM:	David Murphy, Subdivision and Strata Title Group				
SUBJECT:	Dedication: 1338 Seymour Street				
Legal:	Parcel F, Block 114, DL 541, Plan BCP32313				
Zoning:	DD				
Permit:	DE411958				

Proposal: To dedicate the northwest 1.5 m (4.92 ft.) of Lot F for road widening purposes. The construction of an 11-storey multiple dwelling development (social housing) containing 105 dwelling units with one level of underground parking having vehicular access from the rear lane is proposed.

Please send comments for this application. You can contact me if you have any additional questions.

David Murphy David Murphy

Phone: 604.873.7556 Fax: 604.873.7060

DM/dm

-no schedulo zuses e-mentad.

Q:\Subdivision & Strata\Dave\memos\1338seymour circ.doc

# SEYMOUR STREET



LANE

City of Vancouver FOI #2018-010, page 0067

#215 -1200 West 73<sup>rd</sup> Avenue, Vancouver, BC, V6P 6G5 Phone (604) 439-0922 / Fax (604) 439-9189



FEB 2 8 2014

Wall Financial Corporation Ltd. 3502 - 1088 Burrard Street Vancouver, BC V6Z 2R9

Attention: Bruno Wall

4 2 4

RECEIVED JAN 27 2015

February 28, 201 File: 9760 BUUL60645-Rev. 01

Re: Geotechnical Investigation Report - Proposed Mixed-Use High Rise Development 498 Drake Street, Vancouver, BC

#### **1.0 INTRODUCTION**

We understand that a new mixed use high rise development is proposed for the above referenced site. Based on the architectural drawings prepared by Dialog BC Architecture Engineering Interior Design Planning Inc., the proposed development will consist of a 46 storey residential tower with a 6 story podium for office and retail spaces, over 7 levels of below grade parkade. The proposed development is expected to be heavily reinforced concrete construction.

This report has been prepared exclusively for our client, for their use and the use of others on their design team for this project. This report describes the results of our geotechnical site investigation and makes recommendations for the design and construction of the proposed building and temporary excavation.

#### 2.0 SITE DESCRIPTION

The site is located on the south corner of Richards Street and Drake Street in Vancouver, BC. The site is bounded by Richards Street to the northwest, Drake Street to the northeast, a City lane to the southeast and an existing commercial property to the southwest. At the time of our investigation, the site consisted of 2 properties and each property was occupied by a building.

The site is rectangular in shape with a length of about 31 m on the southwest property line and 54 m on the northwest property line. Based on the surveyed topographical plan provided by McElhanney Associates Land Surveying Ltd., the site elevations vary from 14.0 to 12.5 m geodetic, and the site slopes gently downward to the southeast with an elevation differential about 1.5 m across the site.

The location of the site and the existing improvements are shown on the attached Drawing No. 9760-01.

#### 3.0 FIELD INVESTIGATION

GeoPacific Consultants Ltd. was on site September 6, 2011 to conduct a site investigation of the subsurface soil and groundwater conditions. One sonic test hole was drilled to a depth of 40.2 m below current grades using a truck mounted sonic drilling rig supplied by Mud Bay Drilling Co. Ltd. of Surrey, BC. As the site was occupied by the existing buildings the test hole was located on the City lane. Prior to the sonic test hole, the test hole location was hydro-vacuumed to a depth of 3.6 m to ensure potential conflict to existing

underground utilities. Upon completion of the drilling, a 64 mm outside diameter PVC pipe was installed in order to conduct a seismic downhole shear wave survey to measure shear wave velocities of soils. The test hole was sealed immediately in accordance with provincial abandonment requirement upon completion of logging. The site investigation was supervised and the soils encountered were logged and collected for laboratory analysis in the field by qualified personnel from our office.

On October 19, 2011, the seismic downhole survey was carried out in the PVC pile installed by GeoPacific Consultants Ltd.

The sonic test hole is presented in Appendix A and the laboratory test results are presented in Appendix B. The results of the downhole shear wave survey is presented in Appendix C. The approximate test hole location is shown on our Drawing No. 9760-01, following the text of this report.

#### 4.0 SUBSURFACE CONDITIONS

#### 4.1 Subsurface Conditions

1 1

x

The soil classification used herein is based on the "Unified Soil Classification System", except as otherwise noted.

According to "Surficial Geology - Vancouver (MAP 1486A)" published by Geological Survey of Canada, this region is understood to be underlain by Vashon Drift deposits. It is believed that the Vashon Drift deposits are underlain by Tertiary bedrock at depths.

In general, the soil profile noted in our test hole location, from the surface downwards, consists of about 3 m of stiff to dense sandy silt to silty sand overburden soils, overlying dense to very dense GLACIAL TILL. The glacial till was noted to consist of well graded silty sand to silt and sand with some gravel and cobbles.

Please refer to the test hole log located in Appendix A for specific subsurface soil descriptions, and our Drawing No. 9760-01 for the test hole location, following the text of this report.

#### 4.2 Groundwater Conditions

Static groundwater was not encountered within our exploration depths of the test holes. However, some seepage should be anticipated from sandy zones of the glacial till.

#### 5.0 DISCUSSION

#### 5.1 General

The proposed development will consist of a mixed-use 46 storey residential tower with 6 storey podium for office and retail spaces, over 7 levels of below grade parkade. It is assumed that the building would be founded about 21 m below present site grades to accommodate the 7 levels of below grade parkade. We expect loading induced by the new building to be very heavy with loading of up to 10,000 kN or less on columns and 350 kN per lineal metre or less on walls. Floor loadings are expected to be, in the range of 6 to 8 kPa.

As the proposed parkade will extend to the property lines shored excavation will be required to allow vertical



cuts. Underpinning will be required on the southwest property line to support the existing building on the neighboring property. Some seepage should be expected from sandy zones of the glacial tills as described in Section 4.2. Staged excavation with a conventionally pumped de-watering system is expected to be adequate to maintain the groundwater inflows.

Based on the observed ground conditions, the proposed buildings can be constructed on conventional pad and strip foundations that are placed on the very dense glacial till.

We confirm, from a geotechnical point of view, that the proposed development is feasible provided that the recommendations outlined in the following sections are incorporated into the overall design and construction.

#### 5.2 Seismic Analysis

We did not encounter any soils considered to be prone to liquefaction or strain softening during cyclic loading caused by the design earthquake defined in the 2007 Vancouver Building By-law.

#### 6.0 SITE PREPARATION & TEMPORARY EXCAVATION RECOMMENDATIONS

#### 6.1 Site Preparation for Building

Existing structures, pavements, underground services, all organic materials, fills, and loose or otherwise disturbed soils must be removed from the construction area.

We expect that the depths of stripping at this site will be dictated by the proposed underground parkade elevations rather than the conditions of the soils presented on-site.

It is very important that the stripped subgrade of the glacial till should be protected with a lean mixed concrete (unconfined compressive strength of 5.0 MPa) immediately after final trimming and review to preserve its bearing qualities so that it remains dry and free of ponded water. Any soften, disturbed subgrade should be removed and replaced with lean mix concrete (unconfined compressive strength of 5.0 MPa) beneath the foundations. Crushed gravel as described in Section 7.3 or engineering fill can be placed beneath the slab-on-grade or non-structural wall <u>only</u>.

"Engineered Fill" is generally defined as *clean sand to sand and gravel* containing silt and clay less than 5% by weight, compacted in 300 mm loose lifts to a minimum of 98% of the ASTM D698 (Standard Proctor) maximum dry density at a moisture content that is within 2% of optimum for compaction.

#### 6.2 Temporary Excavation & Shoring

Due to an extension of the proposed below grade parkade in relation to the property lines, proximity to existing City improvements and underground utilities, all excavation faces need to be shored to allow vertical cuts. It is our opinion that the natural soils are sufficiently strong so that vertical cuts may be supported with the use of shotcrete shoring with ground soil anchors, which is the most economical system available in Greater Vancouver. Hollow core (self-drilling) anchors should be anticipated in the sandy zone of the glacial till.

As noted in Section 5.1, excavation depths will be up to 21 m below the existing site grades. Some ground movements should be expected during installation of the shoring system. Based on the soil conditions
identified in our test holes and our experience with similar sites, we expect movements of up to 12 mm should be expected at face of excavation, decreasing to 6 mm at 3 m back of the excavation face. Normally improvements on the City properties can tolerate this magnitude of movement without sustaining damage.

Our observations during our site investigation as well as our experience in this area indicate that cobbles and boulders may be present within the glacial till. Cobbles and small boulders can typically be removed with conventional excavation equipment. However, large boulders may require splitting/blasting to facilitate their removal from site.

Some seepage into excavations from surficial fill and sandy zones of the glacial till. We envisage that groundwater inflows can generally be controlled with conventional sumps and sump pumps.

# 6.3 Re-Used of Excavated Material as Fill

1 \*

Non of excavated soils derived from excavation will be suitable for use as engineered fill since they are silt predominant.

## 7.0 BUILDING FOUNDATION RECOMMENDATIONS

#### 7.1 Foundations and Bearing Capacity

Based on the design information provided and our test hole information we envisage that the proposed building foundations will be constructed on the very dense glacial till.

We recommend that foundations placed on the very dense glacial till can be designed using a serviceability limit state (SLS) bearing pressure of 750 kPa, and ultimate limit states (ULS) bearing pressure of 1,125 kPa for transient loading such as those induced by winds or earthquakes.

We expect that the settlement of footings designed as recommended should be within the normally acceptable limits of 25 mm maximum and up to about 20 mm differential over a 10 m span.

Irrespective of bearing pressures, footings should not be less than 450 mm in width for strip foundations and not less than 600 mm in width for square or rectangular foundations. Foundations should also be buried a minimum of 450 mm below the surface for frost protection.

Adjacent foundations constructed at differing elevations should be offset from each other by a minimum distance of twice the difference in elevation 2:1 (H:V). For example, two foundations separated by 1.0 m in elevation should be offset horizontally from each other by a minimum distance of 2.0 m as measured from the inside edges of those foundations. Foundations constructed within 2:1 (H:V) of each other may impose additional vertical and horizontal forces on lower foundations, columns, and/or foundation walls. GeoPacific should review foundation layouts which do not achieve the minimum 2:1 (H:V) offset.

All foundation subgrade must be reviewed by a geotechnical engineer prior to foundation construction.

#### 7.2 Seismic Design of Foundations

As shown in Appendix C, the shear wave velocities in the upper 39 m of the site were noted to vary from 280 to 710 m/sec, and 540 m/sec on average.

Proposed Mixed-Use High Rise Development, 498 Drake Street, Vancouver, BC

Following our review, the site is defined to be classified as <u>Site Class C</u> as defined in Table 4.1.8.4.A of the 2007 Vancouver Building By-law.

# 7.3 Slab-On-Grade Floors Preparation

The floor slab should be underlain by a minimum 150 mm thick of 19 mm clear crushed gravel fill to inhibit upward migration of moisture beneath the slab.

The crushed gravel fill should be compacted to a minimum of 95% of the ASTM D1557 (Modified Proctor) maximum dry density at a moisture content that is within 2% of optimum for compaction.

# 7.4 Foundation Drainage

. 6

A perimeter drainage system will be required for the below grade structure to prevent the development of water pressure on the foundation walls and the basement floor slabs. The slab underlying gravel layer must be hydraulically connected to the perimeter drainage system.

Groundwater flows into the excavation are expected to be moderate, likely in the range of 50 to 80 litres/minute for the entire excavation. These flow rates should be confirmed at the time of construction.

## 7.5 Earth Pressures on Foundation Walls

We recommend that foundation walls be designed for static and seismic earth pressures.

We recommend that the wall be designed for a static pressure distribution of 3.0H (kPa) triangular, where H is the height of the restrained soil in metres. Dynamic loading induced by the design earthquake should be added to the static loads and should be taken as 3.0H (kPa) inverted triangular. The preceding loading recommendations assume that the backfill is a clean, free draining sand and gravel, the backfill is level behind the wall, and the wall is frictionless.

Our calculations assume that a back-of-wall drainage system will be installed to prevent the build up of any water pressure behind the walls. All earth pressures provided herein are unfactored soil parameters and are assumed to be unfactored loads.

Backfill materials and procedures on or adjacent to the City properties should be in accordance with "The City of Vancouver Street Restoration Manual (Rev. August 2008)" by the City of Vancouver.

#### 7.6 Utility Design and Installation

Site utilities will be required beneath the slabs-on-grade. The design of these systems must be consider the locations and elevations of the foundations. The service trenches and excavations required for the installation of the underground pipes, vaults and/or manholes must be located outside of a 2:1 (H:V) slope measured downward from the edge of adjacent foundations.

All excavations and trenches must conform to the latest Occupational Health and Safety Regulation supplied by the Worker Compensation Board of British Columbia. Any excavation in excess of 1.2 m in depth requiring man-entry must be reviewed by a professional geotechnical engineer.

# 7.7 Methane Potential

No methane prevention or extraction system are required for the proposed building since no organic soils exist on the building envelope.

# 8.0 DESIGN REVIEWS AND CONSTRUCTION INSPECTIONS

The preceding section make recommendations for the design and construction of the proposed development. We have recommended the review of certain aspects of the design and construction. It is important that these reviews are carried out to ensure that our intentions have been adequately communicated. It is also important that any contractors working on the site review this document prior to commencing their work.

It is the responsibility of the contractors working on-site to inform GeoPacific a minimum of 48 hours in advance that a filed review is required. In summary, reviews are required by geotechnical engineer for the following portions of the work.

1. StrippingReview of stripping depth.2. ExcavationReview of temporary slopes and soil conditions.3. ShoringReview of shoring installation and anchor testing.4. Engineered FillReview of materials and compaction degree.5. FoundationReview of foundation subgrade.6. Slab on GradeReview of foundation subgrade / under slab fill materials and compaction.7. BackfillReview of placement of backfill along foundation walls.



File: 9760

# 9.0 CLOSURE

This report is prepared solely for used by our client's Design Team for this project as described to the general standards of similar work for similar projects in this area. GeoPacific Consultants Ltd. accepts no responsibility for any other use of this report.

We are pleased to assist you with this project and we trust this information is helpful and sufficient for your purposes at this time. However, please do not hesitate to call if you should require any clarification.

For: GeoPacific Consultants Ltd.

Reviewed by KOKAN 21364 **FEB 28** 2014

Carolina Lazaro, B.Eng., E.I.T. Geological Engineer Maft Kokan, M.A.Sc., P.Eng. Principal

Kazunori Fujita, B.Sc. Project Manager

Distribution List:

2 hard copies to Don Chow, Design Dialog Ltd.

PDF document to Bruno Wall, Wall Financial Corporation Ltd. via brunowall@wallcentre.com Don Chow, Dialog BC Architecture Engineering Interior Design Planning Inc. via dchow@designdialog.ca



# **APPENDIX A - TEST HOLE LOGS**

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## File: 9760

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Project: Proposed Development Client: Wall Financial Corporation Site Location: 1300 Richards Street, Vancouver, BC



215-1200 West 73rd Avenue, Vancouver, BC, VBP 635 Tel: 804-439-0922 Fax: 804-439-9169

INFERRED PROFILE			(9)				
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev (ft)	Moisture Content (%	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
0 1 2 3 4 5 6 7 8 9 10 11 2 13 14 15 16 17 18 19 20 11 22 23 24 25		Silty Sand Dense silty SAND, trace gravel, fine grained, brown, moist. Organic Silt Firm organic Silt, some sand, dark brown, moist. Silty Sand Dense silty SAND, some gravel, fine grained, brown, moist. Silt and Sand Till Yery dense silt and sand TilLL, some gravel, fine grained, grey, moist.	0.0 8.0 9.5 10.2 12.0	26.1			@ 16' - 8.0% Gravel, 41.8% Sand, 50.2% Silt
Logg Meth Date	ed: RF iod: So : Septe	R onic Drilling ember 6th, 2011			D F P	atum: igure N age: 1	Ground Surface lumber: A.01 of 6

## File: 9760



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

Project: Proposed Development Client: Wall Financial Corporation Site Location: 1300 Richards Street, Vancouver, BC

-	_	INFERRED PROFILE	-	(%)			
Uepui	Symbol	SOIL DESCRIPTION	Depth/Elev (ft)	Moisture Content (	DCPT (blows per foot) 10 20 30 40	Groundwater / Wel	Remarks
-8	<i>D</i>		-	2		0	
- 9							
- 10							
- 11							
- 12							
- 13							
- 15							@ 50' - 8.0% Gravel, 36.8% Sand, 55.2% Silt
ogged: Aethod:	RR Sonic [	Drilling			C	atum: igure N	Ground Surface
)ate: Se	eptembe	er 6th, 2011			P	age: 2	of 6

# File: 9760

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215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 8G5 Tel: 604-439-0922 Fax:604-439-9189

Project: Proposed Development Client: Wall Financial Corporation Site Location: 1300 Richards Street, Vancouver, BC

INFERRED PROFILE		INFERRED PROFILE	(9)				
Depth	Symbol	SOIL DESCRIPTION	Depth/Elev (ft)	Moisture Content (	DCPT (blows per foot) 10 20 30 40	Groundwater / Wel	Remarks
16							
Andrew 17							
Alinfurfundin the							
nhuhuhuhuh							
- 20							
- 22							
ta hadanda							
Logge Metho Date:	ed: RR od: Sonic I Septembe	Drilling er 6th, 2011				Datum: Gro Figure Num Page: 3 of 6	und Surface ber: A.01

## File: 9760

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Project: Proposed Development Client: Wall Financial Corporation Site Location: 1300 Richards Street, Vancouver, BC



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

-	INFERRED PROFILE		(9)			
Symbol	SOIL DESCRIPTION	Depth/Elev (ft)	Moisture Content (	DCPT (blows per foot) 10 20 30 40	Groundwater / Well	Remarks
23 24 25 26 27 28 29	Sand         Dense SAND, trace gravel and cobble, well         graded, grey, moist.         Sand and Gravel         Dense SAND and GRAVEL, trace silt and         cobble, wet, grey.         Sity Sand         Dense SAND, some gravel, fine         grained, wet, grey.         Sand         Dense SAND, some gravel, trace silt, medium grained, wet, grey.         Sity Sand         Dense silty SAND, trace gravel, fine         grained, wet, grey.         Sity Sand         Dense silty SAND, trace gravel, fine         grained, wet, grey.         Sity Sand         Dense silty SAND, trace gravel, fine         grained, wet, grey.         Sity Sand         Dense gravely SAND, trace gravel, fine         grained, wet, grey.	84.0 86.0 88.0 90.5 93.0 95.5				@ 84' - 17.4% Fines content @ 92' - 8.2% Fines conten
30	grained, wet, grey.	99.0				@ 100' - 5.9% Fines

City of Vancouver FOI #2018-010, page 0080

File: 9760

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Project: Proposed Development Client: Wall Financial Corporation



GeoPacific

Consultants Ltd.

File: 9760

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Project: Proposed Development Client: Wall Financial Corporation Site Location: 1300 Richards Street, Vancouver, BC



215 - 1200 West 73rd Avenue, Vancouver, BC, V6P 6G5 Tel: 604-439-0922 Fax:804-439-9169

**INFERRED PROFILE** Moisture Content (%) Groundwater / Well Depth/Elev (ft) Remarks SOIL DESCRIPTION Symbol DCPT Depth (blows per foot) 10 20 30 40 26 11 27-127.0 Silt 28-39 Very stiff SILT, some sand, grey. 29-@ 129' Trace gravel. 30-31 E 40 32-132.0 End of Borehole 33-134 41 135 136-37-42 138-139 40-41-43 42-143-44 44 46-47 45 48-49-50-Datum: Ground Surface Logged: RR Figure Number: A.01 Method: Sonic Drilling Date: September 6th, 2011 Page: 6 of 6

City of Vancouver FOI #2018-010, page 0082

# APPENDIX B - LABORATORY TEST RESULTS



# GEOPACIFIC CONSULTANTS LTD.

215-1200 West 73rd Avenue Vancouver, B.C V6P 6G5 604-439-0922 lab@geopacific.ca

# SIEVE ANALYSIS REPORT (ASTM C136)

CLIENT:	WALL FINANCIAL	PROJECT #	9760
PROJECT NAME:	MIXED USE DEVELOPMENT		
PROJECT LOCATION:	1300 RICHARDS STREET, VANCOUVER	Contraction of the	
SPECIFICATION:	MMCD	TEST #:	TH11-01 16'
TYPE OF SAMPLE:	SAND AND GRAVEL	METHOD:	Wash
SOURCE:		DATE SAMPLED:	6-Sep-11
COLOUR:	GREY	DATE TESTED:	9-Sep-11



# \* \* \* \* \* \* \* \* \* \* \* \* \* \* \* \* \*

Sieve Sizes (mm)

GRAVE	L SIZES	% PASSING	GRADATION	SAND SIZES		% PASSING	GRADATION
(inch)	(mm)		LIMITS	(No.)	(mm)		LIMITS
3	75		-	4	4.75	92.0	
2	50			8	2.36	89.5	1
1.5	37.5			16	1.18	86.7	
1	25			30	0.6	82.0	
0.75	19	97.7		50	0.3	71.1	
0.5	12.5	95.2		100	0.15	58.5	
0.375	9.5	94.3		200	0.075	50.2	

Comments:

Per

Rory Beirne, M.Eng.

Reviewed by: Dion Lauriente, B.A.Sc., EIT



Lab Technician





# SIEVE ANALYSIS REPORT (ASTM C136)

215-1200 West 73rd Avenue Vancouver, B.C V6P 6G5 604-439-0922 lab@geopacific.ca

CLIENT:	WALL FINANCIAL	PROJECT #	9760
PROJECT NAME:	0		
PROJECT LOCATION:	1300 RICHARDS STREET, VANCOUVER		
SPECIFICATION:	MMCD	TEST #:	TH11-01 50'
TYPE OF SAMPLE:	SAND AND GRAVEL	METHOD:	Wash
SOURCE:		DATE SAMPLED:	6-Sep-11
COLOUR:	GREY	DATE TESTED:	9-Sep-11



Sieve Sizes (mm)

GRAVE	L SIZES	% PASSING	GRADATION	SAND SIZES		%PASSING	GRADATION
(inch)	(mm)		LIMITS	(No.)	(mm)		LIMITS
3	75			4	4.75	92.0	1
2	50			8	2.36	90.0	
1.5	37.5			16	1.18	87.7	
1	25			30	0.8	83.7	
0.75	19	97.9		50	0.3	74.4	
0.5	12.5	96.1		100	0.15	63.2	
0.375	9.5	95.1		200	0.075	55.2	

Comments:

Per.

Reviewed by: Dion Lauriente, B.A.Sc., EIT



Lab Technician

Rory Beime, M.Eng.





# FINES CONTENT REPORT (ASTM D1140)

#### GEOPACIFIC CONSULTANTS LTD. 215-1200 West 73rd Avenue

Vancouver, B.C V6P 6G5 604-439-0922 lab@geopacific.ca

CLIENT:	WALL FINANCIAL	PROJECT #	9760
PROJECT NAME:			
PROJECT LOCATION:	1300 RICHARDS STREET, VANCOUVER		
SAMPLED BY:	RR	DATE SAMPLED:	6-Sep-11
COLOUR:		DATE TESTED:	9-Sep-11

Hole #:	TH11-01	TH11-01	TH11-01	TH11-01
Depth:	84'	92'	100'	104'
Fines Content:	17.4%	8.2%	5.9%	12.3%

Hole #:	TH11-01	
Depth:	110'	
Fines Content:	6.8%	

Hole #:			
Depth:			
Fines Content:		and the second s	

Hole #:		
Depth:		
Fines Content:		

Hole #:			
Depth:	And the second		112
Fines Content:			

Hole #:			
Depth:			
Fines Content:	1000		

Comments:

Per:

Rory Beime, M.Eng.

Reviewed by: Dion Lauriente, B.A.Sc., EIT

Lab Technician



# GEOPACIFIC CONSULTANTS LTD.

MOISTURE CONTENT REPORT (ASTM D2216) 215-1200 West 73rd Avenue Vancouver, B.C V6P 6G5 604-439-0922 lab@geopacific.ca

CLIENT:	WALL FINANCIAL	PROJECT#	9760
PROJECT NAME:			
PROJECT LOCATION:	1300 RICHARDS STREET, VANCOUVER		
SAMPLED BY:	RR	DATE SAMPLED:	6-Sep-11
COLOUR:		DATE TESTED:	9-Sep-11

Hole #:	TH11-01	
Depth:	9.5'	Interview Constitution in the second
Moisture:	26.1%	

Hole #			
Depth:			
Moisture	e:		

Hole #:			
Depth:	1		
Moisture:			

Hole #:		
Depth:	41	
Moisture:		

Hole #:		
Depth:		
Moisture:		

Hole #:		
Depth:		
Moisture:		

Comments:

Per: R

Rory Beime, M.Eng.

Reviewed by: Dion Lauriente, B.A.Sc., EIT

Lab Technician

# **APPENDIX C - SHEAR WAVE VELOCITY TESTING**

\*\* \*\* \*



Seismic Source:

Source to cone (m):

.

Project: Client: Location: Sounding: Date:

File:

9760 Proposed Development Wall Financial Corporation 1300 Richards Street, Vancouver, BC SCPT11-01 19-Oct-11

Beam 1

## Shear Wave Velocity Data (Vs)

Depth (m)	Depth (ft)	Geophone Depth (m)	Ray Path (m)	Ray Path Difference (m)	Time Difference (ms)	Shear Wave Velocity (m/s)	Midpoint (m
2.00	6.56	2.00	2.24				
3.00	9.84	3.00	3.16	0.93	3.30	281	2.50
4.00	13.12	4.00	4.12	0.96	2.50	384	3.50
5.00	16.40	5.00	5.10	0.98	1.60	610	4.50
6.00	19.68	6.00	6.08	0.98	1.40	703	5.50
7.00	22.96	7.00	7.07	0.99	1.50	659	6.50
8.00	26.24	8.00	8.06	0.99	1.70	583	7.50
9.00	29.52	9.00	9.06	0.99	1.80	552	8.50
10.00	32.80	10.00	10.05	0.99	1.70	585	9.50
11.00	38.08	11.00	11.05	1.00	1.75	569	10.50
12.00	39.36	12.00	12.04	1.00	1.83	543	11.50
13.00	42.64	13.00	13.04	1.00	1.65	604	12.50
14.00	45.92	14.00	14.04	1.00	1.73	575	13.50
15.00	49.20	15.00	15.03	1.00	1.40	713	14.50
16.00	52.48	16.00	16.03	1.00	1.75	570	15.50
17.00	55.76	17.00	17.03	1.00	1.40	713	16.50
18.00	59.04	18.00	18.03	1.00	1.70	587	17.50
19.00	62.32	19.00	19.03	1.00	1.80	555	18.50
20.00	65.60	20.00	20.02	1.00	1.85	540	19.50
21.00	68.88	21.00	21.02	1.00	1.80	555	20.50
22.00	72.16	22.00	22.02	1.00	2.07	483	21.50
23.00	75.44	23.00	23.02	1.00	1.90	526	22.50
24.00	78.72	24.00	24.02	1.00	1.70	588	23.50
25.00	82.00	25.00	25.02	1.00	1,55	645	24.50
26.00	85.28	26.00	26.02	1.00	2.08	482	25.50
27.00	88.56	27.00	27.02	1.00	2.03	493	26.50
28.00	91.84	28.00	28.02	1.00	1.90	526	27.50
29.00	95.12	29.00	29.02	1.00	1.80	555	28.50
30.00	98.40	30.00	30.02	1.00	1.93	519	29.50
31.00	101.68	31.00	31.02	1.00	1.85	540	30.50
32.00	104.96	32.00	32.02	1.00	1.83	545	31.50
33.00	108.24	33.00	33.02	1.00	2.40	416	32.50
34.00	111.52	34.00	34.01	1.00	2.30	435	33.50
35.00	114.80	35.00	35.01	1.00	2.10	476	34.50
36.00	118.08	36.00	36.01	1.00	1.97	508	35.50
37.00	121.36	37.00	37.01	1.00	2.10	476	36.50
38.00	124.64	38.00	38.01	1.00	2.10	476	37.50
39.00	127.92	39.00	39.01	1.00	2.00	500	38.50



#### File: 9760 Project: Proposed Development Client: Wall Financial Corporation Site: 1300 Richards Street, Vancouver, BC Sounding: SCPT11-01

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				ionic		(Version -
. Contact	Identificati	5n				
A. Name o	f Site Owne	r				
ast: Wall		First	Bruno	Middle In	nitial(s):	and/or, if applicable
Company: 1	300 Richard	s Street Deve	alopment Lim	nited Partnershi	P	
Owner's Civic	Address.	3502-1088 E	Jurrard Stree	et		
City: V	ancouver		Pr	ovince/State:	BC	
Country C	Canada		Po	stal Code/ZIP:	V6Z 2R9	
B. Person	Completing	Site Profile				
.ast:		First		Middle In	nitial(s):	and/or, if applicable
Company	Pottinger Ga	herty Environ	mental Con	sultants Ltd. (PC	GL)	
. Person	to Contact I	Regarding th	e Site Profil	e		
ast Gagné		First	Keith		Middle Initia	ai(s):
Company: P	ottinger Gah	erty Environm	nental Consi	altants Ltd.		
Mailing Addres	s: Suite 1	1200, 1185 W	est Georgia	Street		
City V	ancouver		Pri	ovince/State:	BC	
Country: C	anada		Po	stal Code/ZIP:	V6E 4E6	
elephone.	(604) 895-7	618	Fa	x: (604) 683	2-3497	
I. Site Ider	ntification					The state of the s
		Pleas	e attach a s	ite location ma	ip	and another a second
II Property						
oordinates (u	sing the Nor	th American [	Datum 1983	convention) for	the centre of	the sile:
atitude	Deg	rees:49	N	linutes:16	S	econds:27.72
ongitude:	Deg	prees:123	N	linutes:7	S	econds:33.78
lease attach a	a map of app	ropriate scale	a showing the	e boundaries of	the site.	
egally Titled,	Registered	Property				
ite Street Add f applicable)	ress 132	0 Richards S	ireet			

-1-

(Version 4.0)

11.7	Les	al Descrip	non						
008-236-267	Lot	B, Block 1	15. District L	ot 541. Plan 5	210				
Total Number	of Titled Parc	els repres	ented by this	Site Profile:	1		40) -#4		
F Untitled Cr	ownLand								
1) PIN number	s and associ	ated Land	Description	Atlach addit	ional	sheet if n	ecess	ary.	
PIN	Lan	d Descrip	tion						
					_				
and, If availa	of untitled cro ble)	wn land pa	arcels repres	ented by this :	site pr	ofile is:	9		
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and, If availal Crown land file It: Comme Please Indicate Surposes and a Please Print Le Schedule 2 F7	of untitled cro ble) in numbers. A rolal and ind below, in th activities from egibly. Attach Descript petroleu in above	wn land pa ttach addi ostrial Pu a format of Schedule additional ion m produce ground i	tional sheet	ented by this : if necessary ctivitles e provided, wt irred or are or essary an compress ound tanks	nich of sed ga	the indus g on this a	trial ar	nd comi	mercial er storage
and, If availal Crown land file It: Comme Please indicate urposes and a Please Print Le ichedule 2 F7	of untitled cro ble) in numbers. A rolal and ind below, in th activities from egibly. Attach Descript petroleu in above	wn land pa ttach addi ustrial Pu a format of Schedule additional ion m produce ground i	tional sheet	ented by this : if necessary ctivitles e provided, wh irred or are or essary an compress bund tanks	nich of currin	the indus g on this a	trial ar	d wate	mercial

-		(Ven	sion 4.
IV.	Areas of Potential Concern	-	
Is the	ere currently or to the best of your knowledge has there previously been on site any (please mark the appropriate column opposite the question):	Yes	No
A.	Petroleum, solvent or other polluting substance spills to the environment greater than 100 litres?		×
B.	Residue left after removal of piled materials such as chemicals, coal, ore, smelter slag, air quality control system baghouse dust?		x
C.	Discarded barrels, drums or tanks?		X
D.	Contamination resulting from migration of substances from other properties?		X
V.	Fill Materials		
is th the s	ere currently or to the best of your knowledge has there previously been on site any deposit of (please mark the appropriate column opposite the question):	Yes	No
A	Fill dirt, soil, gravel, sand or like materials from a contaminated site or from a source used for any of the activities listed under Schedule 2?		x
В.	Discarded or waste granular materials such as sand blasting grit, asphalt paving or rooting material, spent foundry casting sands, mine ore, waste rock, or float?		×
C.	Diecgeo sediments, or sediments and debris materials originating from locations adjacent to foreshore industrial activities, or municipal sanitary or stormwater discharges?		x
VI.	Waste Disposal		
ls th the s mate	are currently or to the best of your knowledge has there previously been on lite any landfilling, deposit, spillage or dumping of the following rials/please mark the appropriate column opposite the question):	Yes	No
4.	Motentals such as household garbage mixed municipal refuse, or demolition debria?		x
8.	Waste or byproducts such as tank bottoms, residues, sludge, or flocculation precipitates from industrial processes or wastewater treatment?		x
G.	Waste products from smelling or mining activities, such as smelter slag, mine tailings or cull materials from coal processing?		x
0.	Ivaste products from natural gas and oil well drilling activities, such as drilling Finds and muds?		x
u.	Waste products from photographic developing or finishing laboratories; asphalt tar manufacturing, boilers, incinerators or other thermal facilities (e.g., ash), appliance, small en ipment or engine repair or salvage, dry cleaning operations (e.g., solvents), or from the cleaning or repair of parts of boats, ships, barges, automotiles or trucks, including sandblasting ort or paint screpings?		x

	(Ves	sion 4.0
Tanks or Containers Used or Stored, Other Than Tanks Used for Residential H	eating F	uel
there currently or to the best of your knowledge have there previously been on site any (please mark the appropriate column opposite the question);	Yes	No
Underground fuel or chemical storage tanks other than storage tanks for compressed gases?	x	
Above ground fuel or chemical storage tanks other than storage tanks for compressed gases?		x
Hazardous Wastes or Hazardous Substances		
there currently or to the best of your knowledge have there previously been on ite any please mark the appropriate column opposite the question):	Yes	No
PCB-containing electrical transformers or capacitors either at grade, attached above ground to poles, located within buildings, or stored?		x
Waste asbestos or asbestos-containing materials such as pipe wrapping, blown-in insulation or panelling buried?		x
Paints, solvents, mineral spirits or waste pest control products or pest control product containers stored in volumes greater than 205 litres?		x
Legal or Regulatory Actions or Constraints	3	100
te cleast of your knowledge are there any of the following pertaining to the site se mark the appropriate column opposite the question):	Yes	No
Government orders or other notifications pertaining to environmental conditions or a sailty of soil water, groundwater or other environmental media?		x
Liens to recover costs, restrictive covenants on land use, or other charges or encumbrances, stemming from contaminants or wastes remaining onsite or from strenge or contaminants?		x
Government notifications relating to past or recurring environmental violations at the site or any facility located on the site?		x
Additional Comments and Explanations	. 1	-
	<ul> <li>Tanks or Containers Used or Stored, Other Than Tanks Used for Residential Halts or currently or to the best of your knowledge have there previously been on site any iplease mark the appropriate column opposite the question):</li> <li>Underground fuel or chemical storage tanks other than storage tanks for compressed gases?</li> <li>Above ground fuel or chemical storage tanks other than storage tanks for compressed gases?</li> <li>Mazardous Wastes or Hazardous Substances</li> <li>there a currently or to the best of your knowledge have there previously been on site any please mark the appropriate column opposite the question):</li> <li>PGB-containing electrical transformers or capacitors either at grade, attached above ground to poles, located within buildings, or stored?</li> <li>Waste esbestos or asbestos-containing materials such as pipe wrapping, blown-in incutation or panelling buried?</li> <li>Parits, solvents, mineral spirits or waste pest control products or pest control product containings or toor Constraints</li> <li>te gal or Regulatory Actions or Constraints</li> <li>te uset of your knowledge are there any of the following pertaining to the site smark the appropriate column opposite the question):</li> <li>Government orders or other notifications pertaining to environmental conditions or a sitily at soil water, groundwater or other environmental media?</li> <li>Lens to recover costs, restrictive covenants on land use, or other charges or subtrances, stemming from containing in wastes remaining onsite or from menter or any facility located on the site?</li> <li>Acofitional Comments and Explanations</li> </ul>	Tanks or Containers Used or Stored, Other Than Tanks Used for Residential Heating F         there currently or to the best of your knowledge have there previously been on site any (please mark the appropriate column opposite the question):       Yes         Underground fuel or chemical storage tanks other than storage tanks for compressed gases?       X         Above ground fuel or chemical storage tanks other than storage tanks for compressed gases?       X         Mazardous Wastes or Hazardous Substances       Yes         Hazardous Wastes or Hazardous Substances       Yes         PCB-containing electrical transformers or capacitors either at grade, attached above ground to poles, located within buildings, or stored?       Yes         PCB-containing buried?       Yes         Parists solvents, mineral spirits or waste pest control products or pest control product containers stored in volumes greater than 205 litres?       Yes         Legal or Regulatory. Actions or Constraints       Yes         Government orders or other notifications pertaining to environmental conditions or a with a soll water, groundwater or other environmental media?       Yes         Covernment orders or stored or other notifications pertaining to environmental conditions or a with a soll water, groundwater or other environmental media?       Yes         Covernment orders or other notifications pertaining to environmental conditions or a with a soll water, groundwater or other environmental media?       Yes         Covernment orders or other notifications pertaining to en

FGL uncerstands based on our 2005 Phase\* that the "underground fuel or chemical storage tanks other If an sic lage to we for compressed gases" it section XVII was used for the storage of heating oil

XL Sign	alares Pression		
The person person's of Signature XIL Offic	E.K.H. GAGNE	ve information is 1 7-11 : completed: (YY-M	nue based on the M-DD)
	Local Authority	(inclusion)	
Sol Re	in Subalhanakana (Prinadar Chick case of more of meric moval Excludivision Application potent Pecnit E Vanance Permit	VZooing Apple VZooing Apple	calion ermit
Date received	Local Government contact Nearres James Junith Agency City of Vancouver Address 515 W 10th Ave. Vancouver. BC V52 448	Dote sulemities to Site Registrar	Date knowskied to Director of Waster Management Aug 14 /13
-	604-871-6289 Fax		
	Director of Waste Manag		
Reason to Under (	n Sedaniasian (Please check one or more of the lo Inder II Sile Decommissioning	Foreciosure	
Date received.	Absessed by Name Region Telephone Fax F sile profile entered, SITE ID #	Ves	Decusies date
	Site Registrar		141 ····
Date	Entered into site registry by	SITE ID#	Entry date:

(Viension 4.6)



LICENCES AND INSPECTIONS ENVIRONMENTAL PROTECTION BRANCH

1321 Richards. CHECKED ....



COPY

# REGISTERED MAIL

February 21, 2008

Mr. Bob Florko City of Vancouver Real Estate Services Regional File: Victoria File: SITE ID: 26250-20/10523 26250-20/10523 10523

IS IS IC II II IS COMMENTY STINUC SHITLE Ettvindminestral Protection of Astro-

Dear Mr. Florko:

453 West 12th Ave

Vancouver, BC V5Z 4A8

# Re: Certificate of Compliance – 1321 Richards Street, Vancouver, British Columbia

Please find enclosed a Certificate of Compliance for the lands referenced above.

In addition to the conditions provided in the Certificate of Compliance please be advised of the following:

- Information about the site will be included in the Site Registry established under the Environmental Management Act.
- The provisions of this Certificate of Compliance are without prejudice to the right of the Director to make orders or to require additional remediation measures as the Director may deem necessary in accordance with applicable laws. Nothing contained in this Certificate of Compliance will in any way restrict or impair the Director's power in this regard.
- Groundwater wells that are no longer required shall be properly decommissioned in accordance with the Water Act's Groundwater Protection Regulation.

Pursuant to *Environmental Management Act* section 53 (3) a Director may rescind a Certificate of Compliance if conditions imposed in the Certificate are not complied with or any fees payable under Part 4 of the Act or the regulations are outstanding. If a new Certificate of Compliance is required, the submission of an application and associated fees for a new Certificate of Compliance would be necessary.

Ministry of Environment

Land Remediation Environmental Management Environmental Protection Division This Certificate is a decision that may be appealed under Part 8 of the Environmental Management Act.

If you require clarification of any aspect of the certificate, please contact the undersigned at (250) 387-9513.

Yours truly,

W. David Lockhart Contaminated Sites Officer

Enclosure

cc: Neil McCreedy, City of Vancouver 301 - 456 West Broadway, Vancouver, B.C. V5Y 1R3

William R. Donald, P.Eng., Keystone Environmental Ltd. 320-4400 Dominion Street, Burnaby, B.C. V5G 4G3

Donna Barlow, Ministry of Environment, Surrey, B.C.

CSAP Society



No. SC 090401

# WASTE DISCHARGE PERMIT

## Issued by the Environmental Protection Branch, Licences and Inspections Department, City of Vancouver, under the provisions of the Greater Vancouver Sewerage & Drainage District Sewer Use By-law No. 299, 2007

PERMIT ISSUED T	0:	
Name:	Van Mar Constructors	
Address:	9110 - 196A Street	
City:	Langley, BC V1M 3B4	
Telephone:	(604) 689-1160	FAX:
FOR NON-DOMES	TIC WASTES DISCHARGE	TO THE SEWER FROM:
Company Name:	Van Mar Constructors	
Address:	1338 Seymour Street, Van	couver, BC
CONTACT:		
Name:	Tony Gerard	Stephen Sims
Title:	Site Superintendent	Environmental Consultant Sortori Environmental Inc.
	(604) 250-9787	(604) 319-6078
Telephone:	(	

NATURE OR TYPE OF BUSINESS: Site Excavation and Geothermal Drilling Remediation

This Permit has been issued under the terms and conditions prescribed in the Greater Vancouver Sewerage & Drainage District Sewer Use By-law No. 299, 2007 and in the attached Appendices: A & B

I understand the responsibilities for compliance with the Greater Vancouver Sewerage & Drainage District Sewer Use By-law No. 299, 2007 and the conditions of this Permit.

Signature of Permittee

SEWAGE CONTROL MANAGER

Date Issued:

October 23, 2009

Date Amended:

#### APPENDIX A

#### to WASTE DISCHARGE PERMIT No. SC 090401

This Appendix sets out the standard conditions, engineering units, and the requirement for emergency procedures.

#### A. STANDARD CONDITIONS

- 1. Except where otherwise indicated in this Permit, all terms and conditions stipulated in Greater Vancouver Sewerage & Drainage District Sewer Use By-law No. 299, 2007 shall apply to this Permit.
- 2. The terms and conditions of this Permit may be amended as deemed necessary by the Sewage Control Manager.
- 3. Definitions contained within Greater Vancouver Sewerage & Drainage District Sewer Use By-law No. 299, 2007 apply to the terminology in this Permit.
- 4. The Permittee shall inspect the pollution control works regularly and maintain them in good working order. The Sewage Control Manager shall be notified of any malfunctions of these works.
- The discharge of non-domestic waste which has bypassed the authorized works is 5. prohibited.
- 6. The Permittee shall notify the Sewage Control Manager prior to implementing changes to any process, authorized works, or any other condition that may affect the quality and/or quantity of the discharge.

SEWAGE CONTROL MANAGER

Date Issued:

October 23, 2009

Date Amended:

-2-

#### APPENDIX A

#### to WASTE DISCHARGE PERMIT No. SC 090401

### B. ENGINEERING UNITS

The engineering units specified in this Permit are in accordance with the Metric System of measure. Approximate equivalent values for the British Imperial System can be calculated using the following conversion factors.

IGPD	+	220	= m <sup>3</sup> /day
IGPM	+	0.22	= U/min
cfs	+	35.3	$= m^3/s$
ppm	+	1	= mg/l
lb	+	2.205	= kg

where:

m³	=	cubic metres	IGPD	=	Imperial gallons per day
l	=	litres	IGPM	=	Imperial gallons per min
mg	=	milligrams	cfs	=	cubic feet per second
kg	=	kilograms	ppm	=	parts per million
S	=	seconds	lb	=	pounds

# C. EMERGENCY PROCEDURES

In the event of an emergency or condition which prevents the continuing operation of any pollution control works or procedures designated by this Permit or results in a violation of any discharge criteria specified in this Permit, the Permittee shall notify the City of Vancouver Environmental Protection Branch at (604) 667-7285 (24 hours) immediately and shall undertake appropriate remedial action.

SEWAGE CONTROL MANAGER

Date Issued:

October 23, 2009

Date Amended:

- 3 -

#### to WASTE DISCHARGE PERMIT No. SC 090401

This Appendix sets out the requirements for the authorized works.

## A. AUTHORIZED WORKS

- 1. The works authorized are as follows:
  - (a) Collection Sump
  - (b) Charcoal Filter and pH Treatment System
  - (c) Flocculant System
  - (d) Settling Tanks
  - (e) Sampling Point
  - (f) Flow Meter

# B. AUTHORIZED RATE OF DISCHARGE AND VOLUME

- (a) Maximum rate of treated groundwater discharged to the sanitary sewer is 0.10 L/second.
- (b) Maximum daily volume discharge of treated groundwater is 2.3 cubic metres per day.
- (c) Authorized volume of treated groundwater discharged to the sanitary sewer from 1338 Seymour Street during the validity of the permit is 125 cubic metres.
- (d) The authorized discharge point is the onsite sanitary sewer connection located at southeast of the site.

# C. AUTHORIZED DISCHARGE CHARACTERISTICS

- (a) The PERMITTEE shall not discharge Prohibited Waste as defined in Schedule "A" of the By-law (Greater Vancouver Sewerage and Drainage District Sewer Use Bylaw No. 299, 2007).
- (b) The PERMITTEE shall not discharge Hazardous Waste as defined in the Environmental Management Act with the exception of Hazardous Waste in compliance with the effluent standards contained in Schedule 1.2, Column 3 of the Hazardous Waste Regulation.

SEWAGE CONTROL MANAGER

Date Issued:

October 23, 2009

Date Amended:

# to WASTE DISCHARGE PERMIT No. SC 090401

- (c) The PERMITTEE shall not discharge or allow or cause the discharge into the sewer any of the following:
  - Storm Water
  - Uncontaminated Water
  - Groundwater (exception: providing it is in compliance with an applicable Waste Discharge Permit)
- (d) The PERMITTEE shall not discharge Restricted Waste as defined in Schedule "B" of the Bylaw.

SEWAGE CONTROL MANAGER

Date Issued:

October 23, 2009

Date Amended:

- 5 -

#### to WASTE DISCHARGE PERMIT No. SC 090401

#### D. SAMPLING AND REPORTING REQUIREMENTS

- (a) A grab sample shall be taken within the first four hours of the initial discharge and monthly sampling thereafter during the discharge period from the permit date.
- (b) Samples shall be collected in accordance with procedures in Standard Methods or other approved methods. The sample shall be analyzed within 48 hours by an approved laboratory using procedures from Standard Methods or other approved methods for the following parameters:
  - (i) Total Suspended Solids (TSS)
  - (ii) pH
- (c) The analysis of the sample taken in (a) above shall be reported to the Sewage Control Manager within two weeks after the date of sampling.
- (d) Further to (c), a closure report shall be sent to the Sewage Control Manager and shall include the volume discharged during the discharge period as well as the analytical data summary and discussion.

#### E. AUTHORIZED PERIOD OF DISCHARGE

The discharge is authorized for 180 days from October 23,2009 to April 20, 2010.

#### F. PERMIT AMENDMENT/CONDITIONS

We reserve the right to change the conditions of, or revoke, this Permit, at any time.

SEWAGE CONTROL MANAGER

Date Issued:

October 23, 2009

Date Amended:

# to WASTE DISCHARGE PERMIT No. SC 090401

G. SITE PLAN



Date Issued:

October 23, 2009



Date Amended:

GeoPacific Consultants Ltd.

23 July 2001

Our File: 3693

#410 -1200 West 73rd Avenue, Vancouver, BC, V6P 6G5 Phone (604) 439-0922 / Fax (604) 439-9189

MCC Housing c/o BC Housing c/o Neale Staniszkis Doll Adams Architects

Attention: Larry Adams, MAIBC, Principal

201 - 134 Abbott Street VANCOUVER, B.C. V6B 2K4

> Re: Proposed Mid-Rise Development at 1321 Richards Street, Vancouver

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411615

**Geotechnical Report** 

# **1.0 INTRODUCTION**

We understand that this development will consist essentially of an eleven-storey tower with one level of partial underground storage basement.

We have participated in an investigation of the ground conditions beneath this site and this report describes that investigation and discusses the results as they pertain to this proposed development.

## 2.0 SITE DESCRIPTION and PROPOSED DEVELOPMENT

2.1 SITE DESCRIPTION

The site is located on the west side of the 1300 Block on Richards Street in Vancouver and consists of two Lots. The site is approximately 33 metres wide (northeast to southwest) by 36 metres (northwest to southeast). The southwest Lot is a gravel-surfaced parking lot and the northeast lot is occupied by a two-storey building.

The site is bounded by Richards Street to the southeast, a City Lane to the northwest and existing developments to both the northeast and southwest.

The site slopes downwards from northwest to southeast from an elevation of about 16 metres at the west corner to an elevation of about 14 metres along the southeast side.

It should be noted that the existing development to the southwest has 3<sup>1</sup>/<sub>2</sub> levels of underground parking basement close to the common property line as shown on the attached shoring drawing from our records.

File: 3693; Proposed Mid-Rise Residential Development at 1321 Richards Street, Vancouver Page 1
CONSULTING GEOTECHNICAL ENGINEERS of Vancouver FOI #2018-010, page 0106
### 2.2 PROPOSED DEVELOPMENT

As indicated, we understand that this development will consist essentially of an eleven-storey tower with one level of partial underground storage basement.

We understand that the ground floor level will be at elevation 13 metres. Thus, minimum excavation for the basement will vary from about 1 metre on Richards Street to 3 metres on the Lane side.

We have no details of the structural loads at this time but we note that the building will be constructed close to the southwest property line.

### 3.0 GROUND INVESTIGATION

We were present from time to time on 25 June 2001 when Kelly Environmental staff investigated the ground for environmental purposes. Their testhole logs and testhole locations are attached in Appendix A for easy reference. In addition, we carried out a Dynamic Cone Penetration Test (DCPT) in the vicinity of testhole BH-3 after the environmental investigation was complete.

### 3 1 SOIL PROFILE

Reference to the detailed testhole logs indicates that, at the testhole locations, the site surface is underlain by about:

2 to 4 feet of fill over a black sand. The fill contains some building debris such as brick rubble. This layer is thicker to the east and thinner towards the Lane.

then stiff brown mottled silt with low plasticity and a trace of fine gravel to depths of between 5 and 6 feet.

then a weathered brown glacial till which becomes grey and dense at depths between about  $7\frac{1}{2}$  and 10 feet.

No "free" groundwater was encountered although the soils below the black sand were moist. We suspect that the long-term ambient groundwater level would be about 6 feet below grades.

The penetration test indicates that the soils to a depth of about 7 feet are firm/compact (with penetration resistances between 7 and 15 blows per foot) but become dense below about 7 feet (with penetration resistances between 30 and 70 blows per foot).

### 4.0 DISCUSSION and RECOMMENDATIONS

# 4.1 GENERAL COMMENTS

As indicated, the site for this development is underlain by thin fill and sand then weathered glacial till which becomes dense at about 71/2 to 10 feet below existing grades.

The ambient groundwater level groundwater was not proven during the short drilling period but

Page 2

we suspect that it is about 10 feet below grades.

As noted, this project will consist essentially of an eleven-storey tower with one level of partial underground storage basement. Also as noted, this building will be constructed close to property lines and we envisage that excavation adjacent to the Lane will be temporarily shored and the adjacent building to the north will likely require underpinning. In addition, we envisage that some special design measures will be required to ensure that this building does not impact the basement wall to the south.

Although the deeper soils have high bearing capacity, we envisage some over-excavation may be required for the shallow footings at the east end of the building to found on the better quality soil.

## 4.2 FOUNDATIONS and BEARING CAPACITY

As indicated, we envisage that this building will be supported by normal strip and pad spread footings founded on the weathered brown glacial till between 1.2 and 2.1 metres below local grades and we recommend that these footings be designed based on maximum allowable static bearing capacities of 6 ksf for strips and 8 ksf for pads.

However, regardless of actual bearing pressure, we recommend that the minimum width of strip footings should be 18 inches and the minimum width of pads should be 2 feet.

All footing subgrades should be inspected by the Geotechnical Engineer of Record (GER) to confirm the recommended bearing capacity throughout the site.

The underside of footings should be a minimum of 18 inches below final grades for frost protection.

#### 4.2.1 Foundation Factor, F

The foundation factor, F, can be assumed to be 1.0 for this site and the maximum allowable static bearing capacities can be increased by up to 50% for short-term transient loadings such as are generated by winds and earthquakes.

### 4.3 EXCAVATION and SHORING/UNDERPINNING

At this stage we assume that the west side of the excavation will be shored since, as noted, we expect that the excavation will be about 3 metres deep adjacent to the Lane and the building to the north must be underpinned.

### 4.4 EARTH PRESSURES ON BASEMENT WALLS

Although at this stage, we do not know how the basement wall will be constructed (conventional two-sided forms, "blind-form" or single-sided form), we recommend that basement walls be designed for a uniform compaction pressure of 400 psf.

It is our opinion that this compaction pressure is also sufficient for seismic earth pressure and for the surcharge from the adjacent building to the north. This earth pressure however, makes no allowance for groundwater pressures and basement walls should be constructed with fully efficient back-of-wall and perimeter drain systems.

# 4.5 SITE AND FOUNDATION DRAINAGE SYSTEMS

Although the long-term, ambient groundwater level was not determined during the short drilling period, we suspect that the groundwater level is about 6 feet below grades.

We have recommended that basement walls be constructed with a fully efficient back-of-wall and heel drain ensure that groundwater pressures do not act on the wall

We expect that groundwater flow is generally from west to east and at this stage, we recommend that the groundwater control system be preliminarily designed for a groundwater inflow of 0.02 gals/minute/ft of perimeter. Thus, if the perimeter is 400 feet, the groundwater inflow should be assumed to be 8 gals/minute. This groundwater inflow should be confirmed at the end of excavation for the basement.

## 4.6 SOUTHWEST SIDE FOOTINGS

As noted, of special concern on this site is the adjacent building basement to the southwest which is between 34 and 36 feet deep on the common property line whereas the minimum depth of footings for this building are between 3 and 10 feet below grades. (The relevant shoring drawings are attached).

It has been our experience in similar circumstances that the new footings would transfer their loads so that they do not impose significant stress on the adjacent basement wall either by lowering the footing or by piles.

Lowering the southwest side footing would imply excavating about 30 feet. Lowering the southwest-side footings would require shoring Piling would require drilled piles since piles cannot be driven into the glacial till. The drilled piles would encounter ground anchors installed to shore the adjacent excavation.

At this stage, we do not know the structural system that will be used in this area.

#### 4.7 SLAB-ON-GRADE

We envisage that the lowest floor will be a slab-on-grade and we recommend that the slab-ongrade be underlain directly by a polyethylene vapour barrier to prevent moisture movement up through the slab which is, in turn, underlain by a minimum of 6 inches of a coarse, freedraining granular material to inhibit capillary rise of groundwater. This free-draining layer should have hydraulic connection to the perimeter drain system.

Any material required to raise grade (to correct over-excavation, for example) should "engineered fill".

In the context of this report, engineered fill to support slabs-on-grade should be well-graded granular materials with a maximum size of 3 inches and with not more that 5% passing the No. 200 sieve which is systematically compacted in maximum 12 inch thick loose lifts to achieve a

minimum density equivalent to 98% of its so-called "Standard Proctor" maximum dry density at water contents within 2% of its "optimum" moisture content for compaction as determined by ASTM D698.

#### 4.8 BACKFILL and REINSTATEMENT OF CITY PROPERTY

Any backfill placed on City property (within the Lane, for example) must comply with the City's latest edition of their Manual on Backfilling.

If the northwest side basement wall is constructed conventionally within a 2 feet wide working space, backfill will usually be "bird's-eye" gravel to within about 4 feet from the final grade then a separator fabric overlain by compacted silty sand and then "road-mulch" to support the asphalt surfacing.

Assuming that the Lane is to be supported with anchored-shotcrete shoring, all anchors within 5 feet of final grade must be removed, all other anchors must be either detensioned or fully grouted and the upper 4 feet of shotcrete on City property must be removed.

#### 5.0 FIELD REVIEWS

We would expect to carry out field reviews of the geotechnical aspects of the project during construction. These include, excavation, shoring and underpinning, footing and slab-on-grade subgrades, backfill and compaction of engineered fills and reinstatement of City property including detensioning or removal of anchors as appropriate and removal of shotcrete.

It should be noted that these field reviews are not for the benefit of Contractors who must construct the project as designed and specified.

This work has been carried out within the range of local practices of geotechnical engineers for this type of project and no other warranty is expressed or implied.

This work has been carried out for our Client and the Design Team for this project as described and GeoPacific accepts no responsibility for any other use.

We are pleased to assist you with this assignment and we trust our comments and recommendations are sufficient for your purposes at this time. However please do not hesitate to call the undersigned if you should require any additional details or clarification.

FEB 2 0 200/

5510 For: GeoPacific Consultants Ltd. KOKAN GINE

Ed Harrington, P.Eng. Principal

our reference, diskette 108; our file. 3693, geotechnical report

Page 5

City of Vancouver FOI #2018-010, page 0110

	Geo Con	Pac sul	lta 1.	ic nts			Proposed Residen at 1321 Richards S for MCC Housing/BC Hous	tructure Vancouver ty of Vancouver		
FILE: 3	3693	1					TEST HOLE LOG	TES	TI	HOLE: DCPT-1
Lgd/Drn: E	JH/ BJ	H	DAT	rE: 2	5 June	2001	DATUM: GROUND SURFACE ELEVATION: 0		RQUI	IPMENT: Downrite Tracked
Penet (DCPT	ration blows	Res	foot	t)	H.	FEET	INFERRED PROFILE	HNSH	TYPE	OTHER TESTS
10 20 単11 単11 単15 単15 単15 単11	30 #30	<b>\$</b> 40			65.	1 2 3 4 5 6 7 8 9	DCPT penetration sounding only.			
1 1		:	3	:	72	11	11	_		

NOTES:

Disturbed Undisturbed No Recovery	A A B B C C	luger block Core	DGA	Drive Grab Pitcher	0%0	Shelby Wash Other, see text	PAGE 1 OF 1 FIGURE NUMBER: 3693.1
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# APPENDIX A

Testhole Logs and Testhole Location Plan by David Kelly Environmental Ltd.

File: 3693; Proposed Mid-Rise Residential Development at 1321 Richards Street, Vancouver

City of Vancouver FOI #2018-010, page 0112



Borehole No.: BH-1 Project No.: PJ-791			Sheet 1 of 1				
Site Location: 1321 Richards Street, Vancouver, B.C. Driller: Downrite Drilling Date Drilled: 25 Drilling Method: Solid Stem Auger MONITORING WELL DATA Pipe: 50 mm Screen: # 10 Slot Other Monitors:	/06/01		Well Screen Bentonite Scol Filter Sand	SS - Split S WA - Wash AU - Auger CN - Contin RX - Rock ( GS - Grab )	mple Ty poon Sample Sample nuous Core Sample	<u>pe</u>	
		Denth		Samp	le	Soil	
SOIL DESCRIPTION	Strat Plot	Scale (m)	Monitoring Well Details	Number & Depth (m)	Type	Vapour Conc. (ppm)	
0 – 0.1 m Sand/Gravel 0.1 – 1.5 m Medium dense, dark to light brown, medium to coarse SAND 1.5 – 2.1 m Stiff, light brown, slightly clayey SILT with trace gravel, sandy from 2 m 2.1 – 3.8 m Dense to very dense, light brown to gray, slightly silty fine to coarse SAND with occasional cobbles				01 @ 0.7 02 @ 2.1	AU		
<ul> <li>Soil samples (01) &amp; (02) submitted for laboratory analysis</li> </ul>							

Borehole No.: BH-2 Project No.: P	J-791		She	ət 1 of	1	
Site Location: 1321 Richards Street, Vancouver, B.C. Driller: Downrite Drilling Date Drilled: 25 Drilling Method: Solid Stem Auger MONITORING WELL DATA Pipe: 50 mm Screen: # 10 Slot Other Monitors:	:. :/06/01		Well Screen Bentonite Seal Filter Sand	SS - Split S WA - Wash AU - Auger CN - Contin RX - Rock ( GS - Grab 3	mple Ty poon Sample Sample Jore Sample	<u>Pe</u>
		Denth		Samp	8	Soil
SOIL DESCRIPTION	Strat Plot	Scale (m)	Monitoring Well Details	Number å Dapth (m)	Type	Vapour Conc. (ppm)
0 – 0.6 m Mainly SAND with gravel				03 @ 0.3	AU	
0.6 – 1.2 m Stiff, brown, slightly sandy clayey SILT with trace of gravel 1.2 – 4.3 m Dense to very dense, brown to grey, slightly silty fine to coarse SAND with gravel				04 & 12 @ 1.2	AU	
<ul> <li>Soil samples (03), (04) &amp; (12) submitted for laboratory analysis</li> <li>(04) &amp; (12) were duplicates</li> </ul>	EULEGEE					

Borehole No.: BH-3 Project No.: P.	J-791		Shee	at 1 of	1	
Site Location: 1321 Richards Street, Vancouver, B.C. Driller: Downrite Drilling Date Drilled: 254 Drilling Method: Solid Stem Auger MONITORING WELL DATA Pipe: 50 mm Screen: # 10 Slot Other Monitors:	/06/01		Well Screen Bentonite Seal Filter Sand	SS - Split S WA - Wash AU - Auger CN - Contin RX - Rock ( GS - Grab S	mple Ty poon Sample Sample uous Sample Sample	20
		Danih		Sampl	e	Soil
SOIL DESCRIPTION	Strat Plot	Scale (m)	Monitoring Well Details	Number & Depth (m)	Type	Vapour Conc. (ppm)
0-0.75 m SAND with gravel 0.75 - 1.5 m Firm, brown, slightly sandy clayey SILT 1.5 - 3.4 m Dense to very dense, light greenish grey, slightly silty fine to coarse SAND with gravel Drilling refused at 3.4 m • Soil sample (05) submitted for laboratory analysis				05 @ 0.6	AU	

Borehole No.: BH-4 Project No.: I	PJ-791		Shee	et 1 of	1	
Site Location: 1321 Richards Street, Vancouver, B.( Driller: Downrite Drilling Date Drilled: 2 Drilling Method: Solid Stem Auger MONITORING WELL DATA Pipe: 50 mm Screen: # 10 Slot Other Monitors:	C. 5/06/01		Well Screen Bentonite Seal Filter Sand	SS - Split S WA - Wash AU - Auger CN - Contin RX - Rock ( GS - Grab S	poon Sample Sample uous Core Sample	pe e
		0		Samp	e	Soil
SOIL DESCRIPTION	Strat Plot	Scale (m)	Monitoring Well Details	Number & Depth (m)	Type	Vapour Conc. (ppm)
0-1.2 m SAND becoming Sand/Gravel 1.2-1.7 m Firm, brown, slightly sandy clayey SILT with trace of gravel 1.7-4.75 m Very dense, brown to grey, slightly silty fine to coarse SAND with gravel Drilling refused at 4.75 m Soil sample (06) submitted for laboratory analysis				06 @ 0.6	AU	

Borehole No.: BH-5 Project N	No.: PJ	-791		Shee	at 1 of	1	
Site Location: 1321 Richards Street, Vancouve Driller: Downrite Drilling Date Drill Drilling Method: Solid Stem Auger MONITORING WELL DATA Pipe: 50 mm Screen: # 10 Slot Other Monitors:	er, B.C. led: 25/0	96/01		Well Screen Bentonite Seal Filter Sand	SS - Split S WA - Wash AU - Auger CN - Contin RX - Rock ( GS - Grab S	poon Sample Sample uous Core Sample	<u>De</u>
			Denth		Samp	e	Soil
SOIL DESCRIPTION		Strat Plot	Scale (m)	Monitoring Well Details	Number & Depth (m)	Type	Vapour Conc. (ppm)
0 – 1.35 m Sand/Gravel to Sand 1.35 – 1.8 m Firm, brown, slightly sandy clayey S 1.8 – 3.15 m Dense to very dense, brown, fine coarse SAND, silty with trace of gra End of borehole at 3.15 m • Soil sample (07) submitted for laboratory analysis	SILT to avel				07 @ 0.8	AU	

Borehole No.: BH-6 Project No.: PJ-791			Sheet 1 of 1				
Site Location: 1321 Richards Street, Vancouver, B.         Driller: Downrite Drilling       Date Drilled: 2         Drilling Method: Solid Stem Auger         MONITORING WELL DATA         Pipe: 50 mm         Screen: # 10 Slot         Other Monitors:	c. 5/06/01		Well Screen Bentonite Seat Filter Sand	SS - Split S WA - Wash AU - Auger CN - Contin RX - Rock C GS - Grab S	mple Ty poon Sample Sample uous Sore Sample	28	
	1	Denth		Samp	e	Soil	
SOIL DESCRIPTION	Plot	Scale (m)	Well Details	Number & Depth (m)	Type	Vapour Conc. (ppm)	
0 – 1.1 m Sand/Gravel to Sand 1.1 – 1.5 m Slightly sandy clayey SILT 1.5 – 2.45 m Dense, brown medium to coarse SAND, slightly silty End of borehole at 2.45 m • Soil sample (08) submitted for laboratory analysis				08 @ 0.6	AU		

Borehole No.: BH-7 Project No.: PJ-		Sheet 1 of 1					
Site Location: 1321 Richards Street, Vancouver, B.C. Driller: Downrite Drilling Date Drilled: 24 Drilling Method: Solid Stem Auger MONITORING WELL DATA Pipe: 50 mm Screen: # 10 Slot Other Monitors:	2. 5/06/01	Well Screen Bentonite Seal Filter Sand		Sample Type SS - Split Spoon WA - Wash Sample AU - Auger Sample CN - Continuous RX - Rock Core GS - Grab Sample			
	1	Denth		Samp	le	Soll	
SOIL DESCRIPTION	Strat Plot	Scale (m)	Monitoring Well Details	Number & Depth (m)	Type	Vapour Conc. (ppm)	
0.9 – 1.5 m Slightly sandy clayey SILT End of borehole at 1.5 m • Soil samples (09) & (10) submitted for laboratory analysis				09 @ 0.6	AU		

		UNDITIONING	(Version 4.0
I. Contact Identif	ication	TV CHERT	
A. Name of Site O	wner		4
Last: Wall	First:	Bruno Middle	Initial(s): and/or, if applicable
Company: 1300 Rid	hards Street Deve	elopment Limited Partnersl	hip
Owner's Civic Addres	s: 3502-1088 E	Burrard Street	
City: Vancouv	ver	Province/State:	BC
Country: Canada		Postal Code/ZIF	P: V6Z 2R9
B. Person Compl	eting Site Profile		
Last:	First:	Middle	Initial(s): and/or, if applicable
Company: Potting	er Gaherty Enviror	nmental Consultants Ltd. (	PGL)
C. Person to Con Last: Gagné	tact Regarding th	ne Site Profile Keith	Middle Initial(s):
Company: Pottinge	r Gaherty Environ	mental Consultants Ltd.	
Mailing Address: S	uite 1200, 1185 V	Vest Georgia Street	
City: Vancouv	/er	Province/State:	BC
Country: Canada		Postal Code/ZIF	P: V6E 4E6
Telephone: (604)	895-7618	Fax: (604) 6	682-3497
II. Site Identificat	ion		
	Plea	se attach a site location	map
All Property Coordinates (using th Latitude:	e North American Degrees: 49	Datum 1983 convention) fo Minutes: 16	or the centre of the site: Seconds: 28.9
Longitude:	Degrees: 123	Minutes: 7	Seconds: 33.1
Please attach a map	of appropriate sca	le showing the boundaries	of the site.
Legally Titled, Regis	tered Property		
Site Street Address (if applicable):	1300 Richards	Street	
City/Province:	Vancouver, BC		Postal Code V6B 3G6

(Version 4.0)

PID	Legal Description
011-207-931	Lot A, Block 115, District Lot 541, Plan 5210
Total Number o	f Titled Parcels represented by this Site Profile: 1
IF Untitled Cro 1) PIN numbers	wnLand and associated Land Description. Attach additional sheet if necessary.
PIN	Land Description
Total number o (and, if availab	f untitled crown land parcels represented by this site profile is:
Crown land file	numbers. Attach additional sheet if necessary.
III. Commer	cial and Industrial Purposes or Activities
Please indicate purposes and a	below, in the format of the example provided, which of the industrial and commercial ctivities from Schedule 2 have occurred or are occurring on this site.
Schedule 2 Reference	Description
E1	Appliance, equipment or engine repair, reconditioning, cleaning or salvage
F10	Solvent manufacturing or wholesale bulk storage
Please Print Le	gibly. Attach additional sheet if necessary.
Schedule 2 Reference	Description

		(Vers	ion 4.0
	No Schedule 2 Use. No Site Profile Required - see below.		
	Environmental Management Act, Contaminated Sites Regulation		
	[includes amendments up to B.C. Reg. 97/2011, May 31, 2011]		
	<ul> <li>2 (1) A person is exempt from the duty to provide a site profile under set</li> <li>(2), (3), (6) and (7) of the Act with respect to industrial or commercial pur industrial or commercial activities which are not described in Schedule 2</li> </ul>	ction 40 poses a	(1), nd
	· · · · · · · · · · · · · · · · · · ·		_
IV.	Areas of Potential Concern		
Is the s	ere currently or to the best of your knowledge has there previously been on ite any (please mark the appropriate column opposite the question):	Yes	No
Α.	Petroleum, solvent or other polluting substance spills to the environment greater than 100 litres?		
В.	Residue left after removal of piled materials such as chemicals, coal, ore, smelter slag, air quality control system baghouse dust?		
C.	Discarded barrels, drums or tanks?		
D.	Contamination resulting from migration of substances from other properties?		
٧.	Fill Materials		
Is the s	ere currently or to the best of your knowledge has there previously been on site any deposit of (please mark the appropriate column opposite the question):	Yes	No
A.,	Fill dirt, soil, gravel, sand or like materials from a contaminated site or from a source used for any of the activities listed under Schedule 2?		
в.	Discarded or waste granular materials such as sand blasting grit, asphalt paving or roofing material, spent foundry casting sands, mine ore, waste rock, or float?		
C.	Dredged sediments, or sediments and debris materials originating from locations adjacent to foreshore industrial activities, or municipal sanitary or stormwater discharges?		
VI.	Waste Disposal		
Is the smate	ere currently or to the best of your knowledge has there previously been on site any landfilling, deposit, spillage or dumping of the following erials(please mark the appropriate column opposite the question):	Yes	No
Α.	Materials such as household garbage, mixed municipal refuse, or demolition debris?		
В.	Waste or byproducts such as tank bottoms, residues, sludge, or flocculation precipitates from industrial processes or wastewater treatment?		
C.	Waste products from smelting or mining activities, such as smelter slag, mine tailings, or cull materials from coal processing?		

-		(Vers	sion 4.
D.	Waste products from natural gas and oil well drilling activities, such as drilling fluids and muds?		
E.	Waste products from photographic developing or finishing laboratories; asphalt tar manufacturing; boilers, incinerators or other thermal facilities (e.g., ash); appliance, small equipment or engine repair or salvage; dry cleaning operations (e.g., solvents); or from the cleaning or repair of parts of boats, ships, barges, automobiles or trucks, including sandblasting grit or paint scrapings?		
VII.	Tanks or Containers Used or Stored, Other Than Tanks Used for Residential He	eating F	uel
Are the s	there currently or to the best of your knowledge have there previously been on site any (please mark the appropriate column opposite the question):	Yes	No
Α.	Underground fuel or chemical storage tanks other than storage tanks for compressed gases?		
В.	Above ground fuel or chemical storage tanks other than storage tanks for compressed gases?		
VIII.	Hazardous Wastes or Hazardous Substances		
Are the s	there currently or to the best of your knowledge have there previously been on site any (please mark the appropriate column opposite the question):	Yes	No
Α.	PCB-containing electrical transformers or capacitors either at grade, attached above ground to poles, located within buildings, or stored?		
В.	Waste asbestos or asbestos-containing materials such as pipe wrapping, blown-in insulation or panelling buried?		
C.	Paints, solvents, mineral spirits or waste pest control products or pest control product containers stored in volumes greater than 205 litres?		
IX.	Legal or Regulatory Actions or Constraints		
To ti (plea	he best of your knowledge are there any of the following pertaining to the site use mark the appropriate column opposite the question):	Yes	No
٨	Government orders or other notifications pertaining to environmental conditions or		
А.	quality of soil, water, groundwater of other environmental media?	-	
В.	Liens to recover costs, restrictive covenants on land use, or other charges or encumbrances, stemming from contaminants or wastes remaining onsite or from other environmental conditions?		
А. В. С.	Liens to recover costs, restrictive covenants on land use, or other charges or encumbrances, stemming from contaminants or wastes remaining onsite or from other environmental conditions? Government notifications relating to past or recurring environmental violations at the site or any facility located on the site?		

Note 2: if completed by a consultant, receiver or trustee, please indicate the type and degree of access to information used to complete this site profile. Attach extra pages if necessary):

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The perso person's c	rent knowledgeras of the date completed. F. K. H. GAGNE # 12579 12-1	ve information is tr 0-25	ue based on the				
Signature	of person completing site profile of Date	completed: (YY-MM-DD)					
XII. Official Use							
	Local Authority						
Reason fo	r Submission (Please check one or more of the fo	llowing)					
Soil Rei	moval Subdivision Application	Zoning Application					
Develop	oment Permit UVariance Permit	Demolition Pe	ermit				
Date received:	Local Government contact: Name Agency Address	Date submitted to Site Registrar: Date forwar Manageme					
	Telephone Fax						
Let	Director of Waste Management						
Reason fo	r Submission (Please check one or more of the fo	llowing)					
Under (	Order Site Decommissioning	Foreclosure					
Date received:	Assessed by:          Name         Region         Telephone       Fax         If site profile entered, SITE ID #	Investigation required? Ves	Decision date:				
	Site Registrar		June				
Date received:	Entered into site registry by:	SITE ID#	Entry date:				



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1320 Richards St. Vancouver, BC

and a state

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# 1.0 EXECUTIVE SUMMARY

A.C.M. Environmental Corporation was retained by Mr. Ali Alibhai on behalf of Granville Hotel to conduct a Phase II Environmental Assessment of the property located at 1320 Richards Street in Vancouver, BC. An original Phase I Environmental Assessment completed by PHH, in January 2001, was reviewed to provide information regarding the property's historical uses. The Phase I Assessment raised areas of environmental concern.

Suspected contaminants in the soils and groundwater on the subject site were limited to heating oils, (LEPH / HEPH) and ICP metals. Contamination on the subject site is possible due to the historical land use activities on the adjacent property, and past activities that have occured on the site.

A.C.M. Environmental drilled three boreholes and obtained representative soil samples in order to assess the site. Two boreholes were completed to monitoring wells to obtain groundwater samples. Three soil samples were collected from the site and analyzed at an independent 3<sup>rd</sup> party accredited laboratory for LEPH / HEPH and ICP metals. The samples were below the applicable commercial guidelines. A total of one groundwater sample was collected. Groundwater was analyzed for LEPH / EPH and ICP metals. The groundwater sample was below the applicable aguatic life standards.

No sought after environmental contamination was discovered. No further environmental investigation is recommended for the subject site.



BU442265



Unit 114 2433 Dollarton Highway North Vancouver, BC

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Fax

# **REVISED GEOTECHNICAL REPORT**

for a

# PROPOSED SOCIAL HOUSING DEVELOPMENT

at

1338 Seymour Street, Vancouver, BC



Our File: 107-2064

September 25, 2008



Consulting Geotechnical Engineers of Vancouver FOI #2018-010, page 0128

HORIZON BC Housing and NSDA Architects 1338 Seymour Street, Vancouver, BC ENGINEERING INC Geotechnical Report - Revised Address

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## PART A - BACKGROUND INFORMATION AND TECHNICAL DATA

### 1.0 INTRODUCTION

This document reports on the results of the field investigation carried out on December 12, 2007, our subsequent engineering analyses, and provides geotechnical design and construction recommendations for the proposed development. This report was originally issued on February 22, 2008 with the address 1308 Seymour Street and is currently reissued with the address 1338 Seymour Street. No changes other than the address revision have been made since the original report was submitted.

# 2.0 SITE DESCRIPTION and PROPOSED DEVELOPMENT

The subject site is located at 1338 Seymour Street within the City of Vancouver and is bounded by Seymour Street to the west, a lane to the east and two private properties to the north and south. The site location is shown on Figure 1 in Appendix A.

Topography in the general vicinity of the site slopes gently down to the east and at the time of our site visit, the southern portion of the proposed area of study was used as temporary office and parking area for a construction site at 1321 Richards Street, Vancouver, BC and the northern part was occupied by an existing commercial building. The existing and neighbouring buildings appear to have been constructed at existing grades, without basements.

Based on the preliminary Architectural drawings prepared by NSDA Architects, we understand that the proposed development will be a thirteen-storey residential building with an underground parkade; therefore, we envisage that the lowest floor slab elevation will be about 2.7 metres (about 9.0 feet) below the existing ground level. Allowing about 0.6 metres (about two feet) from the floor slab to the underside of the footings, the depth of the excavation is expected to be about 3.30 metres (11.0 feet) below the existing ground level.

# 3.0 SUBSURFACE INVESTIGATION

In order to obtain engineering understanding about the geotechnical conditions in the subject site, a subsurface investigation program was carried out on December 12, 2007 and involved drilling one auger test hole. The drilling was directed and supervised by an engineer with our office and was carried out by Uniwide Drilling Co. Ltd of Burnaby BC. The information obtained during drilling was augmented with our observations of the subsurface soil conditions made at the adjacent construction site at 1321 Richards Street.

The auger test hole, AH07-1, was drilled to a depth of about 4.5 metres (15.0 feet). The test hole was advanced through the surficial asphalt pavement and was terminated within the underlying natural material. The soil stratigraphy encountered at the test hole was logged at the time of drilling and select soil samples were retrieved from the auger flights and returned to our office for further examination. The approximate location of the test hole is shown on Figure 2 in Appendix A.

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#### 4.0 SUBSURFACE CONDITIONS

Based on information from the Geologic Survey of Canada (Map 1468A, Surficial Geology Vancouver) and as indicated on Figure 3 in Appendix A, surficial geology is expected to comprise Vashon Drift and Capilano Sediments, which comprise glacial drift including lodgement and minor flow till, lenses and interbeds of substratified glaciofluvial sand to gravel and interbeds of glaciolacustrine laminated stony silt, which is underlain by Tertiary Bedrock comprised of sandstone, siltstone, shale, conglomerate, and minor volcanic rocks at a depth of more than 10 metres below surface. Based on published literature from the Geological Survey of Canada (Mustard and Rouse, "Stratigraphy and evolution of Tertiary Georgia Basin and subjacent Upper Cretaceious sedimentary rocks, southwestern British Columbia and northwestern Washington State" IN "Geology and Geological Survey of Canada, 1994), Tertiary bedrock in the Vancouver area consists of the Huntingdon Formation which unconformably overlie the lower Nanaimo Group of rocks from the Cretaceous Period that in turn overlie Gambier Group to Coast Belt rock types as shown on Figure 4 in Appendix A.

The Huntingdon Formation consists of sedimentary rocks that were identified as Kitsilano and upper Burrard Formations in previous published literature. These sedimentary rocks generally consist of mudstones and sandstones coarsening upwards to sandstones and conglomerates; but may include shale, chert, lignite, and siltstone. In the Vancouver area, these sedimentary rocks are estimated to have a minimum thickness of more than 1000 metres and possibly up to about 1200 metres to 1300 metres thick. Local outcrops and drill hole data indicate this formation dips 10 to 15 degrees to the south and there are also intrusive igneous bodies of andesitic to basaltic sills, dykes, or small laccoliths. The Huntingdon Formation was formed in a sand dominated flood plain environment with possible minor lacustrine facies and no evidence of marine environment or deposits.

The Nanaimo Group consists of sedimentary rocks up to four kilometres thick and formed mainly in a marine environment. These sedimentary rocks generally comprise sandstone-conglomerate units separated by mudstone and fine grained sandstone formations.

The Gambier Group may consist of meta-volcanic to meta-sedimentary rocks including tuff, breccia, agglomerate, andesite, argillite, greywacke, quartzite, and conglomerate.

Coast Belt plutonic bedrock generally consist of granitic rocks that include quartz diorite, granodiorite, diorite, and granite.

#### 4.1 Soil Conditions

The soil stratigraphy encountered during the geotechnical investigation are described following. These conditions are consistent with those encountered during excavation for the basement at 1321 Richards Street. The Test Hole Log is presented in Appendix B. HORIZON BC Housing and NSDA Architects 1338 Seymour Street, Vancouver, BC ENGINEERING INC Geotechnical Report - Revised Address Our File: 107-2064 September 25, 2008 Page 3

# 4.1.1 Fill

At the test hole location, dark grey, moist to dry, medium to coarse grained sand with trace gravel was encountered below the asphalt pavement. The material was inferred to be fill and found to be about 0.6 metres (2.0 feet) thick. Based on the rate of drilling, this fill was inferred to be dense.

### 4.1.2 Stiff Silt

The fill was underlain by a layer of light brown to light grey, moist to dry silt with trace fine grained sand. This layer was inferred to be natural and measured to be 2.1 metres (7.0 feet) thick at the test hole location. Based on the rate of drilling, this stratum was inferred to be stiff to very stiff.

#### 4.1.3 Till-Like Silt

The stiff to very stiff silt was underlain by a grey, moist to dry, till-like silt which was inferred to be hard. This stratum continued to a depth of at least 4.5 metres (15.0 feet) where AH07-1 was terminated.

#### 4.2 Groundwater Conditions

At the time of the auger drilling, no groundwater was encountered. The materials encountered at the test hole were found to be moist to dry. It is possible that groundwater may become perched near the surface during periods of wet weather.

# PART B - DISCUSSION and RECOMMENDATIONS

#### 5.0 GENERAL

From a geotechnical viewpoint, the subject site is considered suitable for a development of the type proposed, provided the following recommendations are incorporated into the design and construction.

The hard silt encountered at a depth of about 2.7 metres (9.0 feet) below the existing grade is considered suitable for supporting the proposed development on conventional spread and strip foundations.

## 6.0 GEOTHERMAL FEASIBILITY

For the purpose of this report, 'geothermal' is taken to be a colloquialism for ground source heat pumps or 'geoexchange'. It is understood that most areas of metro Vancouver have sufficiently dense soil and high water table that the thermal conductivity of the underlying stratigraphy would support ground source heat pumps.

It is understood that typical drill hole depths for the closed system wells range from 75.0 to 100.0 metres (about 250.0 to 300.0 feet), with a minimum typical depth of 45.0 metres (150.0 feet). The cost of installing these drill holes is a function of drilling difficulty. It is expected that tertiary bedrock would be encountered for most of the depth of interest at the subject site and that drilling in this deposit would be fairly routine.

A challenge associated with installing the below grade infrastructure relates to scheduling the lengthy drilling program so that it does not unduly delay construction. It is surmised that this challenge could be overcome by scheduling drilling to occur between Building Permit Application and Issuance, but this may be subject to a successful, separate permitting program (similar to Demolition or Excavation and Foundation Permits).

It is understood that the feasibility of a geoexchange system is highly influenced by the cost of above-ground infrastructure within the building structure and that the cost of this infrastructure would be most difficult to overcome for small suites, but this is an issue best-addressed by others on the project team. It should be noted that heat recovery from grey water, which does <u>not</u> require ground source infrastructure, may be cost effective for small units.

# 7.0 TEMPORARY EXCAVATION SUPPORT

It is estimated that the materials encountered in the test hole could be readily excavated using conventional hydraulic excavation equipment in good repair suitably equipped with ripping attachments. It is possible that large boulders may be encountered which may require splitting for removal.

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In general, it is recommended that unshored excavation slopes be no steeper than 4.0 vertical to 3.0 horizontal in the silt. However, if there is insufficient room to slope the excavation, temporary excavation support will be required. We envisage that tied-back shotcrete and anchors would prove to be the most practical shoring methodology for the eastern and western sides. We also envisage that the existing buildings along the northern and southern property lines should be supported by underpinning, also comprised of tied-back shotcrete installed as the excavation advances.

Any unshored excavation slope should be protected by a layer of 6 mil polyethylene sheeting securely tied to resist wind action.

## 8.0 FOUNDATIONS

#### 8.1 Recommended Static Design Bearing Pressure

The grey hard till-like silt expected at design subgrade elevation is considered suitable for support of strip and pad foundations. We recommend that a maximum allowable static design bearing pressure of about 400 kPa (8,000 psf) be used for sizing the footings where founded on the hard, grey, till-like silt.

The subgrade should be prepared such that only natural, undisturbed materials are present at subgrade elevation. Any loosened, softened, disturbed or otherwise deleterious material should be removed prior to footing construction. The silt expected at subgrade elevation is considered sensitive to disturbance and water softening. As a precaution against delays, it is suggested that the footing areas be protected with an approximately 2 inch thick layer of a 3/4 inch minus clear crushed gravel, placed immediately after the detailed footing excavation is complete.

Foundation subgrades should be protected from freezing. In addition, groundwater and rainwater runoff should be directed to temporary sumps and footing subgrades should be kept free of standing water.

The Geotechnical Engineer should be provided with an opportunity to review the exposed subgrade prior to footing construction or concrete pouring.

# 8.2 Recommended Footing Characteristics - Typical

Minimum pad footing dimensions of 0.6 metres (2.0 feet) and minimum strip footing widths of 0.45 metres (1.5 feet) are recommended.

It is recommended that foundations be placed at least 0.45 metres (18 inches) below slab-on-grade and exterior grades for confinement and frost protection, respectively.

Foundations should step at no more than 1.0 vertical to 2.0 horizontal.

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#### 8.3 Seismic Considerations

An ultimate bearing capacity of 800 kPa (16,000 psf) can be used for Ultimate Limit State design requirements for footings to be placed on the hard till-like SILT subgrade.

Based on the City of Vancouver Building By-Law 2007, the subject site would be categorized as Site Class C. The site-specific, peak horizontal ground acceleration for the design magnitude seismic event with a 2% probability of exceedance in 50 years is 0.455g. The recommended spectral accelerations are presented following:

Sa(0.2) (g)	Sa(0.5) (g)	Sa(1.0) (g)	Sa(2.0) (g)	PGA (g)
0.918	0.638	0.333	0.173	0.455

#### Table 1: Design Ground Motions for 2% Probability of Exceedance in 50 Years

Based on the above design spectral response accelerations and Tables 4.1.8.4.B and 4.1.8.4.C on Division B - Part 4 of the City of Vancouver Building By-Law 2007, values of the acceleration and velocity based site coefficients (Fa and Fv) would be 1.0 and 1.0, respectively.

# 8.4 Expected Settlement

The total settlement of footings, under static loading, designed in accordance with the above recommendations should be less than 25 mm (1 inch). Differential settlement would be expected to be less than 19 mm over 9.0 metres (3/4 of an inch over a span of 30 feet) or 0.002 radians angular distortion.

# 9.0 RECOMMENDED LATERAL EARTH PRESSURES

In general, backfill against foundation walls and beneath settlement-sensitive structures should be comprised of compacted, select, free-draining granular material free from deleterious material. The City of Vancouver Street Restoration Manuel should be referred to for acceptable material specifications and compaction criteria. Assuming backfill is compacted to between 95% and 100% of its density when tested in accordance with ASTM D698, and the foundation walls can move 0.2% of the wall height, they should be designed to resist the following:

- a) For static loading conditions, the greater of a 20 kPa (400 psf) uniform pressure or 5.0 x h (kPa) triangular earth pressure distribution, where h is the distance from the top of the wall measured in metres.
- b) For seismic loading conditions, the effect of earthquake shaking can be assumed to add an additional triangular pressure to the top of the wall which decreases to zero at the base of the wall. The seismic surcharge pressure is estimated to be 10.0 (H-h) (kPa) where h is the distance from the top of the wall and H is the total wall height. Seismic earth pressures are not added to the 20 kPa compaction pressure, so the earth pressure distribution for seismic conditions would be the greater of either 10.0 x (H-h) or 20 kPa between the top of the wall and the full depth of excavation.

Surcharge loads from the adjacent lane can be assumed to be equivalent to an additional 0.6 metres (2.0 feet) of soil against the wall.

# 10.0 FOUNDATION AND UNDERSLAB DRAINAGE

The excavation is expected to intercept zones of perched groundwater. The volumetric flowrate expected is difficult to accurately determine at this time. We recommend that the actual discharge rate encountered during construction be measured and a suitable drainage system be adopted by the professional having the responsibility for the site and foundation drainage.

The underslab drainage layer should be hydraulically connected to the foundation drainage. After preparing the subgrade as described above, we recommend that a 150 mm (6 inch) thick drainage layer of compacted 19 mm (3/4 inch) clear crushed gravel be placed beneath the slab-on-grade. This drainage layer may be separated from the slab-on-grade by a layer of 6 mil polyethylene sheeting.

# 11.0 REVIEWS

It is recommended that we be provided with the opportunity to review Building Permit Application drawings from the architect, structural engineer and landscape architect prior to tender in order that the recommendations in this report can be confirmed or augmented, as required.

In accordance with the City of Vancouver Building By-Laws and the associated Letters of Assurance program, the Geotechnical Engineer of Record will be required to perform Field Reviews and consulting services regarding the following items;

Geotechnical - Temporary 7.1 Excavation 7.2 Shoring

7.3 Temporary Underpinning

Geotechnical - Permanent

8.1 Bearing capacity of the soil

8.3 Compaction of engineered fill

8.4 Structural considerations of soil, including slope stability and seismic loading

8.5 Backfill

8.7 Permanent Underpinning

8.8 Removal of shoring works from adjoining streets and properties

Thus, we should be given the opportunity to witness installation of the excavation and shoring work, confirm foundation and slab-on-grade subgrades, verify the material type and degree of compaction of Engineered Fill and backfill, and confirm decommissioning of the excavation shoring.

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# 12.0 CLOSURE

This report has been prepared for the sole use of BC Housing and other consultants for this project, as described. Any use or reproduction of this report for other than the stated intended purpose is prohibited without the written permission of Horizon Engineering Inc.

We are pleased to be of assistance to you on this project and we trust that our comments and recommendations are both helpful and sufficient for your current purposes. If you would like further details or require clarification of the above, please do not hesitate to call.

For HORIZON ENGINEERING INC

Masoud Mohajeri, Ph.D. Project Engineer For HORIZON ENGINEERING INC E. SAVAGE Karen Savage, P.Eng. Principal

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HORIZON BC Housing 1338 Seymour Street, Vancouver, BC ENGINEERING INC Geotechnical Report

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# APPENDIX A

Figures

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## APPENDIX B

**Test Hole Logs** 

**Consulting Geotechnical Engineers** 

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LOG	GED BY: ON: <u>12 Dec 2007</u> RE		ge BY	е <mark>r Hole LO</mark> C	G	ELEVA	A	uger	Hole No.: AH07-1 Truck Mounted METHOD: Drill Rig
0.48>~	Type of Test Dynamic Cone Penetrometer Test (DCPT) Becker Denseness Test (BDT) Number of blows - Standard Penetration (SPT) Moisture Content (% of dry weight) Plastic limit Liquid limit	TY SF S G O	(PE PT	<ul> <li>Type of sample</li> <li>Split spoon</li> <li>Shelby tube</li> <li>Grab</li> <li>Other (specify)</li> </ul>		Not	es:		
Depth	DESCRIPTION	pog 4	EL	SAMPLE	1	10	1	1	Piezometer / Comme
m   ft 0 0	ASPHALT SAND (dark grey)	S S	.2	TYPE		Ť			/ Additional Testing
-	inferred to be fill, medium to coarse grained, trace gravel, dry to moist		2	G AH07-1-1		-			
+ +	SILI (light brown) trace fine sand, dry to moist -inferred to be stiff to very stiff			G					
5	<b>SILT</b> (light grey) trace fine sand, dry to moist -inferred to be stiff to very stiff	4	.5	AH07-1-2					
				G AH07-1-3					
3 10	SILT (grey) Till-like, dry to moist -inferred to be hard		9						$\square$
				G AH07-1-4					
4									+-
15	Terminated at 15.0 feet	1	15						
5									-
6	HORIZON	PROJEC	т. 13	338 Seymour St	reet.	Vanco	uver	BC	јов но.: 107-2064

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