Foundations, Excavation & Shoring Specialists

January 11, 2017

Reference: 16-6985

Via email: casre@accesspd.ca

Access Property Development
100 Canadian Road
Toronto, Ontario
M1R 4Z5

Attn: Chris Asre

Re: Geotechnical Exploration Report
Proposed Storage for Your Life Facility – Phase II
33433 North Railway Avenue, Mission, BC

Braun Geotechnical
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Foundations

Excavation & Shoring

Slope Stability

Natural Hazards

Pavement Design and Management

Reinforced Soil Walls and Slopes

Rev. Sept 15, 2006

Professional Engineers and Geoscientists of BC MEMBER

1.0 INTRODUCTION

As requested, Braun Geotechnical Ltd. has completed a geotechnical exploration at the above-referenced project. The geotechnical work has been performed in general accordance with the Braun proposal dated June 23, 2016 (reference no. P16-5031).

The scope of work included a review of soil conditions based on published and in-house geological and geotechnical information, a review of historical government air photos, an intrusive subsurface exploration program, and provision of comments and recommendations for the proposed Phase II expansion.

Prior geotechnical exploration was carried out for Phase I of the above referenced project and as such the subsurface program was limited to confirmatory test pits advanced in the vicinity of the proposed building expansion footprint.

No consideration has been given to any environmental issues. Offsite development issues such as roadways and service improvements are also considered outside the current work scope.

Braun Geotechnical should be forwarded the architectural and structural drawings when they become available and be provided the opportunity to comment on potential geotechnical aspects of proposed foundation designs and excavation.

2.0 SITE DESCRIPTION AND PROPOSED DEVELOPMENT

The subject site is located between Lougheed Highway and North Railway Avenue, immediately east of Murray Street in Mission, BC. The site is approximately rectangular in shape with overall dimensions of approximately 235m x 44m. The site slopes down approximately 10m from north to south. The site slopes steeply on the north side, and has a gentle slope to no slope on the south side. Trees and other vegetation currently cover the undeveloped portion of the site to the east of the existing building.

It is understood that an expansion to the existing mini storage facility is proposed with nearly identical features as the Phase I construction.

3.0 DESK STUDY INFORMATION

The Desk Study phase of geotechnical services was non-intrusive in nature, and involved update and review of available geological and geotechnical information, and update and review of available aerial photographs. In addition, a field review of the site area was carried out, and included a reconnaissance-level walkover of the site and vicinity.

Previous review of historical government air photos for the Phase I construction noted a substantial drainage channel at the eastern portion of the site that was subsequently filled in by development. The drainage channel was located at the approximate location of Catherwood Street to the north of the study site (see Plate 1 below).

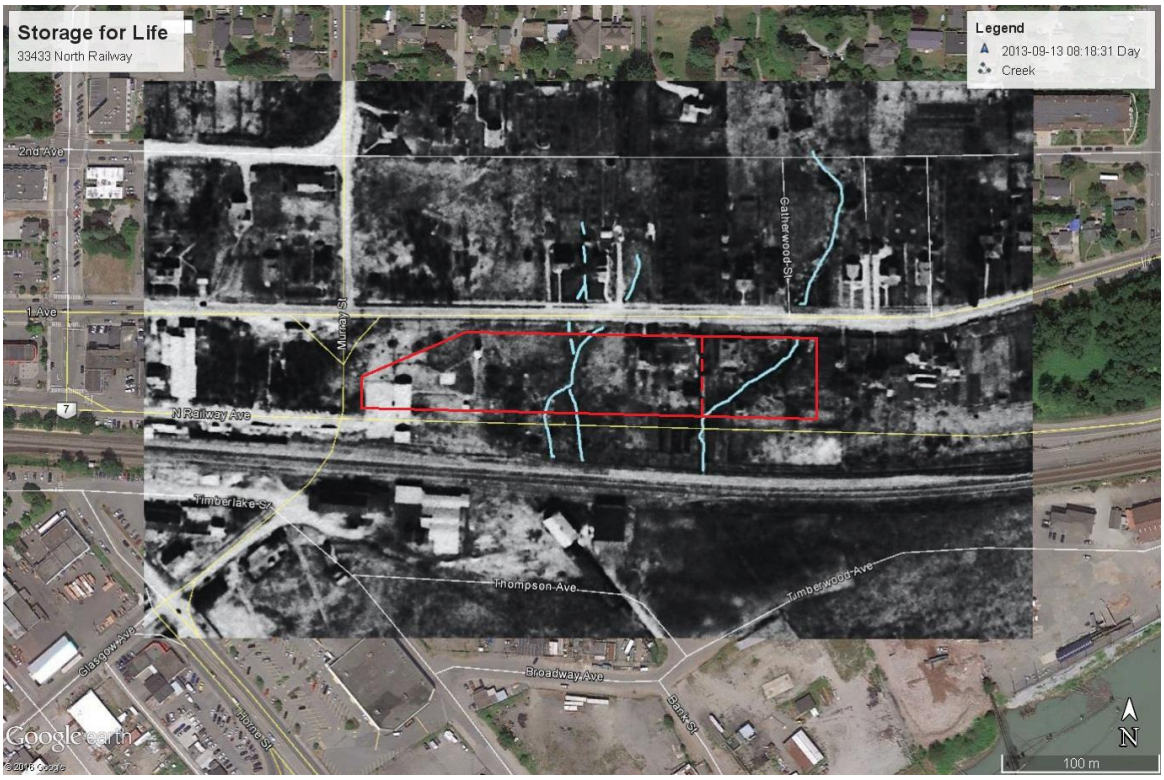

Plate 1 - 1938 Air Photo overlay on Google Earth Imagery of the study site (historical west and east creeks)

A review of subsequent air photos available for each decade was carried out, and the following was noted on or in the immediate vicinity of the site:

- The 1963 air photo shows visible evidence of onsite dwellings on the north east corner of the subject site (see Plate 2). These dwellings appear to be accessed from Lougheed Highway and it is inferred that the original properties slope down to the south to meet CP Rail track grades. The North Railway Avenue roadway is not visible. The 1963 air photo also shows evidence of the historical east creek channel to the south of Lougheed Highway.

- A subsequent air photo from 1979 no longer contained evidence of the onsite dwellings. The site was cleared and some re-grading activity is evident on the photo (See Plate 3). It is inferred from the air photo that some re-grading of the Lougheed Highway roadway embankment (ie. Grade steepening) and modification of the historical creek channels was

completed. A ditch appeared to be excavated onsite as a drainage capture for upslope seepage flows. The current alignment of North Railway Avenue is visible.

Plate 2 - 1963 Air Photo of the Subject Site

Plate 3 - 1979 Air Photo of the Subject Site

- Subsequent historical air photos do not reveal substantial study site changes.

In summary, the air photo review noted evidence of historical onsite dwellings, re-grading and clearing activities and modifications to historical drainage channels. The air photo review indicated that the historical east creek channel does not intercept the proposed Phase II expansion building footprint. However, excavation in this area may encounter deep stream channel fill and channel seepage similar to conditions that were encountered at the western historical channel alignment during the excavation for the Phase I building.

4.0 SUBSURFACE EXPLORATION

Levelton Consulting Ltd. completed a preliminary geotechnical investigation and report for the site in 2002. That investigation indicated that the east half of the site was underlain by relatively competent soils near surface at the northeast corner and at a depth of approximately 7' near the middle of the south side of the site. Six confirmatory test pits (TP06-01 to -06) were excavated by Braun on October 11, 2006 and were in general agreement with the findings of Levelton.

Four test pits, TP16-01 and TP16-04, were excavated on December 9, 2016 using a tracked mini excavator under subcontract to Braun to a maximum depth of 2.0m. The soil conditions were logged in the field by an Engineer from Braun Geotechnical.

Test pit locations from the three site investigations are shown on the attached Location Plan (Dwg. 16-6985-01).

5.0 SOIL AND GROUNDWATER CONDITIONS

Based on previous experience at the Phase I building footprint, it is expected that the site area to the east of the existing building will comprise similar Sumas Drift advance glaciofluvial sediments comprising very stiff sandy Silt and dense to very dense Sand & Gravel with some silt. The southern portion of the Phase II area along North Railway may be underlain by recent Fraser River sediments comprising loose Sand/ soft sandy Silt and organic soil deposits (including Peat).

It is understood from interview information that natural gravelly soils were excavated to construct North Railway Avenue in the 1970's (as noted previously - see Plate 3)

A generalized subsoil profile based on the test pits is provided below. Please refer to the test pit logs for detailed subsurface conditions encountered. Relevant logs from the 2002 investigation by Levelton and the 2006 investigation by Braun are also attached for reference. The summary below only describes the test pits advanced in the vicinity of the proposed building expansion footprint.

FILL/ORGANICS:

0.5 - 0.9m of brown to grey-brown, moist, loose to compact, mixed FILL was encountered in all 2016 Test Pits.

Compact/Firm SAND/SILT:

Brown, occasionally rust-mottled, compact SAND/SILT was encountered below in TP16-01 and TP06-05 to a maximum depth of 1.0m.

Dark-grey, moist, firm sandy SILT with some clay (FILL) was encountered beneath the Fill/Organics in TP16-03 to a depth of 1.7m. This soil appeared to have been disturbed during historical construction activity onsite.

Very Dense Silty Fine SAND:

Dark-grey, moist, very dense, Silty Fine SAND with trace to some clay, trace gravel and occasional cobbles/boulders (TILL-LIKE) was encountered at depths ranging from 0.5 to 1.7m below grade in the 2016 Test Pits. This material was encountered at shallower depths in the earlier test pits advanced in this area.

Groundwater:

At the time of exploration, groundwater seepage was encountered at depths ranging from 0.3 to 1.2m below grade. The seepage was inferred to be near surface drainage from the higher property to the north. Significant seepage flows anticipated towards the east due to the historical creek channel infilling was not encountered during the subsurface exploration program. In general, near-surface groundwater seepage flows are expected to fluctuate seasonally, and with drainage conditions.

The findings of the test pit exploration were generally consistent with the regional published geological information and with prior investigations completed at the subject site. The subsurface conditions described above were encountered at the test pit locations only. Subsurface conditions at other locations could vary.

6.0 DISCUSSION AND RECOMMENDATIONS

6.1 General

Based on test pit information, subsurface conditions in the vicinity of the proposed building expansion footprint are considered favorable for support of conventional shallow strip and spread footings. These footings should be founded upon the Very Dense Silty Fine SAND, encountered at depths ranging from 0.5 – 1.7m at the 2016 test pit locations. To optimize the allowable bearing pressure, the near surface FILL/ORGANICS and Compact/Firm SAND/SILT should be removed and replaced with structural fill as required.

Foundation construction adjacent to Lougheed Highway for Phase I was achieved using temporary slopes cut at 1H:1V (horizontal to vertical) with Lock Block type shoring at selected slope areas (i.e. historical west stream channel). Note that requirement for additional temporary shoring measures will depend on finalized building and development designs, including the pine tree preservation radius. Temporary shoring requires that the building foundation be designed to resist full horizontal earth pressures. Permanent shoring designs could be adopted to substantially reduce lateral earth pressures. However, previous experience with permanent shoring for property development has found that for this project scale permanent shoring may prove cost-prohibitive due to the requirement for corrosion protection for tie-back anchors and design safety factor constraints. Excavation shoring tie-back anchors would require permission to encroach in those areas where anchors are required to extend offsite.

The Phase I building adopted stepped building foundations up from south to north and utilized lightweight aggregate backfill in order to excavate unsupported temporary cut slopes between benches and avoided the need for permanent shoring.

The following sections provide our recommendations for site preparation, foundation design, and our comments regarding building design along the north side of the site.

6.2 Site Preparation

General site stripping below the proposed Phase II building footprint should include removal of any existing surficial vegetation and organic rich material to expose existing natural mineral soils. Based on observed conditions, the depth of stripping for removal of unsuitable materials is

expected to be 0.5 to 1.7m. Final trimming should typically be carried out using an excavator equipped with a smooth bucket.

The exposed subgrade should be compacted using a heavy drum roller to at least 95% Modified Proctor Density (MPD), and re-compaction of the exposed subgrade should be reviewed by Braun Geotechnical. Soft spots that cannot be re-compacted should be sub-excavated and replaced with structural fill. Drainage measures should be implemented to reduce potential for water ponding on prepared subgrades.

6.3 Excavation

It is anticipated that Phase II excavation and shoring requirements will be very similar to those of Phase I.

In general, excavations up to 1.2 m deep can be cut near vertical in accordance with WorksafeBC requirements. The north side excavation cut slopes may be developed at approximately 3/4H:1V to 1H:1V.

Cut slopes should be reviewed by Braun Geotechnical during excavation and may require modification based on actual site conditions. Flatter slopes and/or shoring may be required if poor soil conditions and/or significant seepage are encountered.

It is expected that excavation areas may be dewatered during construction using pumping sumps or equivalent. A layer of polyethylene sheeting should be placed on the slope cuts and secured in place for erosion protection.

It is understood that a mature pine tree along Lougheed Highway is to be preserved with a 5m root radius indicated. Design of temporary or permanent excavation shoring for this excavation area could be provided under separate cover.

6.4 Foundation Design

Conventional shallow strip and spread footing foundation support is considered feasible on the natural Very Dense Silty Fine SAND or structural fill placed thereon.

The following soil resistance (bearing) values may be adopted for foundation design:

Foundation Subgrade	**Limit States Design**		**Working Stress Design**
	Factored Ultimate Bearing Resistance (ULS)	**Serviceability Limit State (SLS)**	**Allowable Bearing Pressure DL + LL**
Very Dense Silty Fine SAND or Structural Fill placed thereon	225 kPa (4700 psf)	150 kPa (3100 psf)	150 kPa (3100 psf)

These design bearing pressures assume the following:

- Strip and pad footings have minimum widths of 18” (460mm) and 24” (600mm), respectively.
- Site preparation is completed as indicated above and load-bearing surfaces are reviewed and approved by the Geotechnical Engineer.
- Foundation bearing surfaces are no higher than 1H:1V (Horizontal to Vertical) from the base or toe of adjacent walls, sumps, or buried structures such as utility lines, etc.
- Footings are placed below a 2H:1V line projected up from lower footings.

- Perimeter footings are founded at least 18" (460mm) below final finished adjacent grade for frost protection and confinement.
- Interior footings should be founded at least 12" (300mm) below finished adjacent grade for confinement.

Settlements are expected to be less than 1 inch (25mm) subject to satisfactory removal of compressible soils below the building footprint, and site preparation being carried out as recommended.

6.5 Seismic Considerations

The current BC Building Code (2012) classifies a site as Site Class C where the subgrade soils in the upper 30m consist of "very dense soil and soft rock" with average SPT N values greater than 50 and average undrained shear strength (s_u) greater than 100 kPa. A review of available subsurface information indicated that very dense/stiff soil layers were encountered near surface and extend to a depth of 30m. A Site Class C classification will require that all near surface soft/unsuitable materials including peat, soft soils and other loose fill below proposed building(s) be removed and replaced with well compacted structural fill.

The 2015 National Building Code of Canada (NBCC2015) has adopted current 5th generation seismic hazard model (GSC Open File 7576). The previous deterministic inclusion of the Cascadia fault source has been included in 2015 as a probabilistic model, shaking relations have been updated, andadditional short periods and peak ground velocity (PGV) calculations for Site Class C conditions have been included at the 2% in 50-year probability level. For the Lower Mainland area, the 2015NBCC calculations generally result in decreased PGA and short period seismic hazard calculations (i.e. less than 1.0 seconds) and increased long period seismic hazard calculations. The 2015NBCC seismic hazard calculations have been adopted in design.

The subgrade soil conditions are not considered susceptible to seismically induced liquefaction.

6.6 Slab on Grade

The slab on grade should be underlain by a drainage layer comprising a minimum 6" (150mm) thick layer of well-compacted ¾" (19mm) clear, crushed gravel. This drainage layer should have a suitable discharge to the permanent storm system and be independent from the perimeter drainage system. Polyethylene sheeting should be provided beneath the floor slab to reduce potential slab dampness.

Compaction testing should be completed on all underslab fills to confirm that all fill placed below the building has been compacted to at least 95% MPD. Prior to placement of any grade restoration fills, the subgrade should be reviewed by the geotechnical consultant.

6.7 Foundation Wall Design

6.7.1 Static Conditions

Under static loading conditions, walls may be designed using the loads provided on the attached Horizontal Wall Loading Diagram (Dwg. 16-6985-02). The lateral wall pressures assume horizontal backfill that consists of an approved, free draining, granular material with no hydrostatic water pressure against the basement walls.

Actual earth pressures on foundation walls will be a function of backfill material, compaction procedure and equipment, surcharge loads, wall rigidity, backfill slope, drainage conditions, and allowable wall movements. It is assumed foundation walls are expected to be rigid (i.e. insufficient movement to achieve active earth pressure condition in backfill) at intervening floor levels and somewhat flexible (capable of some movement) between floors. These assumptions

should be confirmed by the structural consultant prior to adoption of active lateral earth pressures in structural design.

6.7.2 Seismic Conditions

For preliminary design purposes, foundation walls may be designed for the seismic load indicated on the Horizontal Wall Loading Diagram. The seismic wall loading estimated using the pseudo-static approach is significant. The reason is that foundation walls are anticipated to be relatively unyielding due to the presence of floor diaphragms. Considerably lower wall loading may be achieved if the structural designs can accommodate some relative movement of the foundation walls away from backfill.

If required, Braun Geotechnical can review wall loading under seismic conditions with the structural consultant during design advancement.

Note that dynamic analysis of foundation wall concepts may be required in order to estimate reasonable seismic earth pressure loads on walls retaining backfill more than approximately 26' (~8m) in depth, where ground shaking at foundation level may be out of phase with backfill surface motion.

Rigid Wall Discussion

For non-yielding walls, pressures that may be generated during earthquake shaking were estimated using methods presented in the ATC document, "Seismic Design Guidelines for Highway Bridges, ATC-6, 1981". These seismic design guidelines recognized that inertial forces in backfill soils against non-yielding walls are not considered in the Mononobe-Okabe (M-O) method which relies on movement sufficient to mobilize soil shear strength. To address this concern at the time of publication, the ATC guidelines suggested a factor of 1.5 be applied to peak ground accelerations (PGA) for preliminary determination of seismic lateral earth pressure. The 'firm ground' site seismic hazard calculation determined a PGA of 0.284 at the site for 1 in 2,475 year ground motions. Using the simplified ATC approach, a dynamic earth pressure coefficient (Kae) of 0.87 is established for a 30% backslope.

A method developed by Wood (1973) provides an estimate of dynamic earth pressures for rigid walls with non-yielding backfill. Wood's method is considered an appropriate solution for the condition where the predominant frequency of shaking is significantly less than the fundamental frequency of the backfill. Using Wood's method and assuming a maximum backfill width for an 8m wall, a dynamic normal load of approximately 137kN/m applied at an approximate height of 5m above the base of the structure was estimated for a PGA of 0.284g. Note that the preliminary estimate neglected the potential effect of a vertical acceleration component in the analysis, and does not account for additional load due to sloping backfill.

6.7.3 Lateral Earth Pressure Reduction

In order to reduce the design wall loads, consideration should be given to the use of light weight fill such as pumice, and to alternative compaction methods to reduce compaction-induced pressures. Design wall pressures under seismic conditions can be further reduced if it is assumed that the wall can move away slightly from the backfill during a seismic event. The wall pressures provided below are for the design 1 in 2475 year return period earthquake (2% chance of exceedance in 50 years).

It should be noted that compaction induced lateral earth pressures are provided for use in structural design of the wall, and should not be applied in external stability analysis (sliding, overturning, etc.).

Lightweight Aggregate (LWA) Fill

Vesicular Basalt aggregate (known locally as red to black 'pumice') is a lightweight volcanic rock material with a unit weight approximately 50 percent that of conventional granular fill. Vesicular basalt is commonly used locally for light weight fill for reducing settlements in areas with compressible soils. The material also has a higher internal friction angle than conventional sand and gravel soils. The lightweight and high internal friction angle properties of vesicular basalt aggregate mean that the material can be used as foundation backfill in order to reduce lateral wall pressures.

As an alternative to vesicular basalt, light grey pumice (Mt Meagher airfall pumice) is a locally available lightweight aggregate. The pumice fragments are generally weaker than vesicular basalt fragments and have an open framework fibrous structure that is both permeable and porous.

Lightweight aggregate material (and in particular light grey pumice) should be compacted using lightweight walk-behind vibrating-plate compaction equipment to reduce potential for particle damage. This material should not be overly compacted. Braun Geotechnical should review the compaction procedure and equipment when this work commences.

In order to reduce wall pressures, pumice fill should be placed a horizontal distance from foundation walls at least equal to half of the wall height. Temporary excavation cut slopes (expected to be approximately 3/4H:1V to 1H:1V or flatter) may be located such that the toe of the slope is established close to the proposed footing perimeter. At these locations, over-excavation of native undisturbed subgrade is not required and pumice backfill may be placed up the slope cut and up to the elevation at which the width of pumice backfill is equal to half the wall height. Above this elevation, conventional fill may be used where the slope cut extends beyond a distance equal to half the wall height.

Typically, pumice fill should be separated from adjacent fill using an approved geotextile separator. A non-woven geotextile with Class 2 Survivability is recommended (AASHTO M-288). However, if the adjacent fill is comprised of a compatible material such as well graded sand and gravel reviewed and approved by Braun Geotechnical, the geotextile may be omitted.

A typical sketch with the pumice fill configuration is attached.

Following are estimates of unfactored wall pressures with pumice backfill and 30% backfill slope:

Static – 3.1H kPa

Seismic – Minimum yielding wall (8mm): 3H kPa

Seismic – Wall can yield 25mm away from retained fill: 1.9H kPa

Seismic - Wall can yield 50mm away from retained fill: 1.5H kPa

Seismic - Wall can yield 75mm away from retained fill: 1.4H kPa

Surcharge loading above the fill zone, adjacent to foundation walls should be assessed as per the Horizontal Wall Loading diagram attached to this geotechnical report.

6.8 Drainage and Backfill

Perimeter drainage should consist of perforated 6" (150mm) PVC pipe, placed around the building perimeter, with the invert elevation at footing level. The perimeter drain should be surrounded by at least 6" (150mm) of ¾" (19mm) clear crushed gravel. A 6" (150mm) thick

layer of birdseye gravel should be placed over the clear crushed gravel to act as a filter layer. Perimeter drains should also be provided adjacent to any steps in the foundation walls.

As discussed previously in Section 6.6, it is considered preferable to have independent systems for perimeter drains and underslab drains. However, if a non-independent system is contemplated, the perimeter drain and underslab gravel layer should be hydraulically connected only through downslope (south) footing areas in order to avoid potential for ingress of upslope seepage. All drain pipes should be directed to the permanent storm system.

Perimeter drainage should be included at foundation step locations.

Backfill placed around perimeter foundation walls should consist of free-draining granular material such as sand or sand and gravel with less than 5% fines. The material should be compacted to at least 95% of MPD for its full depth. Where space is limited adjacent to the foundation wall, birdseye gravel placed in maximum 3' (900 mm) thick lifts, with each lift compacted using a concrete vibrator while flushing with water may be used as backfill material.

6.9 Onsite Asphalt Pavements

With subgrade preparation completed in the manner recommended above, the minimum recommended pavement structure for the proposed onsite pavements is outlined below.

Parking Areas	*Travel + Fire Access Pavements (Areas subjected to Truck traffic)*	*Material*
65mm	75mm[1]	Hot Mix Asphalt Surface (MMCD Hot Mix Asphalt, HMA)
100mm	100mm	19mm minus Granular Base (MMCD Sec. 2226 & 2223)
200mm	200mm	Granular Subbase (SGSB) (MMCD Sec. 2226 & 2234)

Note 1: The pavements should be placed in two lifts comprising a base course of 45mm and an upper course of 30mm.

The gradation of the above materials should comply with the appropriate Master Municipal Specifications outlined above. The road construction materials should be placed and compacted in compliance with the current MMCD specifications. Adequate drainage and/or cross falls should be provided to ensure that the base and subbase materials will not become saturated.

7.0 GEOTECHNICAL FIELD REVIEWS

Geotechnical field reviews are required by the Geotechnical Engineer of Record and to satisfy the requirements of the Letters of Professional Assurance required for the Building Permit. Field reviews are essential to confirm that the recommendations of the geotechnical report are understood and followed. Geotechnical field reviews should be arranged by the Contractor to address the following:

- Review removal of unsuitable materials below the building footprint;
- Review of excavation cut slopes;
- Review and density testing of structural fill placed below the building;
- Confirm suitability of exposed footing subgrade;
- Review of perimeter drain installation (for geotechnical considerations);
- Review and density testing of perimeter fill.

8.0 CLOSURE

This report is prepared for the exclusive use of Access Property Development and their designated representatives and may not be used by other parties without the written permission of Braun Geotechnical. The District of Mission may also rely on the findings of the Geotechnical Report.

If the development plans change, or if during construction soil conditions are noted to be different from those described in this report, Braun Geotechnical should be notified immediately in order that the geotechnical recommendations can be confirmed or modified, if required.

Further, this report assumes that field reviews will be completed by Braun Geotechnical during construction.

The site contractor should make their own assessment of subsurface conditions and select the construction means and methods most appropriate to the site conditions.

This report should not be included in the specifications without suitable qualifications approved by the geotechnical engineer. The report should be considered preliminary and subject to review and revision as required for final project design and construction.

The use of this report is subject to the conditions on the Report Interpretation and Limitations, sheet which is included with the report. The reader's attention is drawn specifically to those conditions, as it is considered essential that they be followed for proper use and interpretation of this report.

We hope the above meets with your requirements. Should any questions arise, please do not hesitate to contact the undersigned.

Yours truly,

Braun Geotechnical Ltd.

Jan.11, 2017

Alex Janzen, EIT
Geotechnical Engineer

Braun Geotechnical Ltd.

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Encls: Report Interpretations and Limitations
Test Pit Location Plan
2016 Test Pit Logs by Braun Geotechnical (4)
2006 Test Pit Logs by Braun Geotechnical (2)
2002 Test Pit Logs by Others (3)
Horizontal Wall Loading Diagram
LWA Section Sketch

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BRAUN GEOTECHNICAL LTD.

REPORT INTERPRETATION AND LIMITATIONS

1. STANDARD OF CARE

Braun Geotechnical Ltd. (Braun) has prepared this report in a manner consistent with generally accepted engineering consulting practices in this area, subject to the time and physical constraints applicable. No other warranty, expressed or implied, is made.

2. COMPLETENESS OF THIS REPORT

This Report represents a summary of paper, electronic and other documents, records, data and files and is not intended to stand alone without reference to the instructions given to Braun by the Client, communications between Braun and the Client, and/or to any other reports, writings, proposals or documents prepared by Braun for the Client relating to the specific site described herein.

This report is intended to be used and quoted in its entirety. Any references to this report must include the whole of the report and any appendices or supporting material. Braun cannot be responsible for use by any party of portions of this report without reference to the entire report.

3. BASIS OF THIS REPORT

This report has been prepared for the specific site, development, design objective, and purpose described to Braun by the Client or the Client's Representatives or Consultants. The applicability and reliability of any of the factual data, findings, recommendations or opinions expressed in this document pertain to a specific project at described in this report and are not applicable to any other project or site, and are valid only to the extent that there has been no material alteration to or variation from any of the descriptions provided to Braun. Braun cannot be responsible for use of this report, or portions thereof, unless we were specifically requested by the Client to review and revise the Report in light of any alterations or variations to the project description provided by the Client.

If the project does not commence within 18 months of the report date, the report may become invalid and further review may be required.

The recommendations of this report should only be used for design. The extent of exploration including number of test pits or test holes necessary to thoroughly investigate the site for conditions that may affect construction costs will generally be greater than that required for design purposes. Contractors should rely upon their own explorations and interpretation of the factual data provided for costing purposes, equipment requirements, construction techniques, or to establish project schedule.

The information provided in this report is based on limited exploration, for a specific project scope. Braun cannot accept responsibility for independent conclusions, interpretations, interpolations or decisions by the Client or others based on information contained in this Report. This restriction of liability includes decisions made to purchase or sell land.

4. USE OF THIS REPORT

The contents of this report, including plans, data, drawings and all other documents including electronic and hard copies remain the copyright property of Braun Geotechnical Ltd. However, we will consider any reasonable request by the Client to approve the use of this report by other parties as "Approved Users." With regard to the duplication and distribution of this Report or its contents, we authorize only the Client and Approved Users to make copies of the Report only in such quantities as are reasonably necessary for the use of this Report by those parties. The Client and "Approved Users" may not give, lend, sell or otherwise make this Report or any portion thereof available to any other party without express written permission from Braun. Any use which a third party makes of this Report – in its entirety or portions thereof – is the sole responsibility of such third parties. BRAUN GEOTECHNICAL LTD. ACCEPTS NO RESPONSIBILITY FOR DAMAGES SUFFERED BY ANY PARTY RESULTING FROM THE UNAUTHORIZED USE OF THIS REPORT.

Electronic media is susceptible to unauthorized modification or unintended alteration, and the Client should not rely on electronic versions of reports or other documents. All documents should be obtained directly from Braun.

5. INTERPRETATION OF THIS REPORT

Classification and identification of soils and rock and other geological units, including groundwater conditions have been based on exploration(s) performed in accordance with the standards set out in Paragraph 1. These tasks are judgemental in nature; despite comprehensive sampling and testing programs properly performed by experienced personnel with the appropriate equipment, some conditions may elude detection. As such, all explorations involve an inherent risk that some conditions will not be detected.

Further, all documents or records summarizing such exploration will be based on assumptions of what exists between the actual points sampled at the time of the site exploration. Actual conditions may vary

significantly between the points investigated and all persons making use of such documents or records should be aware of and accept this risk.
The Client and "Approved Users" accept that subsurface conditions may change with time and this report only represents the soil conditions encountered at the time of exploration and/or review. Soil and ground water conditions may change due to construction activity on the site or on adjacent sites, and also from other causes, including climactic conditions.
The exploration and review provided in this report were for geotechnical purposes only. Environmental aspects of soil and groundwater have not been included in the exploration or review, or addressed in any other way.
The exploration and Report is based on information provided by the Client or the Client's Consultants, and conditions observed at the time of our site reconnaissance or exploration. Braun has relied in good faith upon all information provided. Accordingly, Braun cannot accept responsibility for inaccuracies, misstatements, omissions, or deficiencies in this Report resulting from misstatements, omissions, misrepresentations or fraudulent acts of persons or sources providing this information.

6. DESIGN AND CONSTRUCTION REVIEW

This report assumes that Braun will be retained to work and coordinate design and construction with other Design Professionals and the Contractor. Further, it is assumed that Braun will be retained to provide field reviews during construction to confirm adherence to building code guidelines and generally accepted engineering practices, and the recommendations provided in this report. Field services recommended for the project represent the minimum necessary to confirm that the work is being carried out in general conformance with Braun's recommendations and generally accepted engineering standards. It is the Client's or the Client's Contractor's responsibility to provide timely notice to Braun to carry out site reviews. The Client acknowledges that unsatisfactory or unsafe conditions may be missed by intermittent site reviews by Braun. Accordingly, it is the Client's or Client's Contractor's responsibility to inform Braun of any such conditions.
Work that is covered prior to review by Braun may have to be re-exposed at considerable cost to the Client. Review of all Geotechnical aspects of the project are required for submittal of unconditional Letters of Assurance to regulatory authorities. The site reviews are not carried out for the benefit of the Contractor(s) and therefore do not in any way effect the Contractor(s) obligations to perform under the terms of his/her Contract.

7. SAMPLE DISPOSAL

Braun will dispose of all samples 3 months after issuance of this report, or after a longer period of time at the Client's expense if requested by the Client. All contaminated samples remain the property of the Client and it will be the Client's responsibility to dispose of them properly.

8. SUBCONSULTANTS AND CONTRACTORS

Engineering studies frequently requires hiring the services of individuals and companies with special expertise and/or services which Braun Geotechnical Ltd. does not provide. These services are arranged as a convenience to our Clients, for the Client's benefit. Accordingly, the Client agrees to hold the Company harmless and to indemnify and defend Braun Geotechnical Ltd. from and against all claims arising through such Subconsultants or Contractors as though the Client had retained those services directly. This includes responsibility for payment of services rendered and the pursuit of damages for errors, omissions or negligence by those parties in carrying out their work. These conditions apply to specialized subconsultants and the use of drilling, excavation and laboratory testing services, and any other Subconsultant or Contractor.

9. SITE SAFETY

Braun Geotechnical Ltd. assumes responsibility for site safety solely for the activities of our employees on the jobsite. The Client or any Contractors on the site will be responsible for their own personnel. The Client or his representatives, Contractors or others retain control of the site. It is the Client's or the Client's Contractors responsibility to inform Braun of conditions pertaining to the safety and security of the site – hazardous or otherwise – of which the Client or Contractor is aware.
Exploration or construction activities could uncover previously unknown hazardous conditions, materials, or substances that may result in the necessity to undertake emergency procedures to protect workers, the public or the environment. Additional work may be required that is outside of any previously established budget(s). The Client agrees to reimburse Braun for fees and expenses resulting from such discoveries. The Client acknowledges that some discoveries require that certain regulatory bodies be informed. The Client agrees that notification to such bodies by Braun Geotechnical Ltd. will not be a cause for either action or dispute.

Image obtained from District of Mission WebMap Dec. 2, 2016

BRAUN GEOTECHNICAL LTD.

Rev.	Description	Date

Client: Access Property Development

Project: Storage for Your Life Facility - Phase 2
33433 North Railway Avenue, Mission, BC

Project no.	Drawn	Design	Checked
16-6985	AJ	JW	SS

Title: LOCATION PLAN

Date	Scale	Drawing no.
December 12, 2016	1:750	16-6985-01

Test Pit Log: TP16-01

File: 16–6985
Project: Storage For Your Life Facility – Phase 2
Client: Access Property Development
Location: 33433 North Railway Avenue, Mission, BC

BRAUN GEOTECHNICAL LTD.

Depth (ft)	Depth (m)	Thickness (mm)	Sample	Soil Description	Sample #	Water Cont.	Remarks
0	0			grey-brown, moist, loose to compact, SAND & GRAVEL, some silt, trace organics (FILL/ORGANICS)			
				brown, rust-mottled, moist, compact SAND, some silt, occasional cobbles			
	1			dark-grey, moist, very dense, silty fine SAND, trace to some clay, trace gravel (TILL-LIKE)			
4			○		S1	12%	
5							
6			○		S2	15%	
				End of Test Pit @ 1.8m			
	2						
7							
8							
9							
	3						
10							

Equipment: Tracked Mini Excavator
Sampling Method: Lump Sample

Datum: Ground Surface
Water Depth: Not Encountered

Logged By: AJ
Exploration Date: December 9, 2016
Dwg No.: 16-6985-TP01
Page: 1 of 1

Test Pit Log: TP16-02

File: 16–6985
Project: Storage For Your Life Facility – Phase 2
Client: Access Property Development
Location: 33433 North Railway Avenue, Mission, BC

BRAUN GEOTECHNICAL LTD.

Depth (ft)	Depth (m)	Thickness (mm)	Sample	Soil Description	Sample #	Water Cont.	Remarks
0	0			grey-brown, moist to wet, loose, SILT & SAND, some gravel, occasional concrete slab sections, occasional roots/rootlets (FILL/ORGANICS)			- Seepage between 0.6 and 1.2m
3	1			dark-grey, moist, very dense, silty fine SAND, trace to some clay, trace gravel (TILL-LIKE)			
4			○		S1	16%	
5				End of Test Pit @ 1.5m			
6	2						
7							
8							
9							
10	3						

Equipment: Tracked Mini Excavator
Sampling Method: Lump Sample

Datum: Ground Surface
Water Depth: Seepage From 0.6 - 1.2m

Logged By: AJ
Exploration Date: December 9, 2016
Dwg No.: 16-6985-TP02
Page: 1 of 1

Test Pit Log: TP16-03

File: 16–6985
Project: Storage For Your Life Facility – Phase 2
Client: Access Property Development
Location: 33433 North Railway Avenue, Mission, BC

BRAUN GEOTECHNICAL LTD.

Depth (ft)	Depth (m)	Thickness (mm)	Sample	Soil Description	Sample #	Water Cont.	Remarks
0	0			dark-brown, moist, loose, silty SAND, some organics, occasional roots/rootlets (FILL/ORGANICS)			
1				brown, moist, loose to compact, silty SAND, trace to some gravel (FILL)			- Seepage @ 0.3m
3	1			dark-grey, moist, firm, sandy SILT, some clay, trace gravel			
4			○		S1	19%	
6			○	dark-grey, moist, very dense, silty fine SAND, trace to some clay, trace gravel, occasional cobbles (TILL-LIKE)	S2	10%	
	2			End of Test Pit @ 2.0m			
10	3						

Equipment: Tracked Mini Excavator
Sampling Method: Lump Sample

Datum: Ground Surface
Water Depth: Seepage @ 0.3m

Logged By: AJ
Exploration Date: December 9, 2016
Dwg No.: 16-6985-TP03
Page: 1 of 1

Test Pit Log: TP16-04

File: 16–6985
Project: Storage For Your Life Facility – Phase 2
Client: Access Property Development
Location: 33433 North Railway Avenue, Mission, BC

BRAUN GEOTECHNICAL LTD.

Depth (ft)	Depth (m)	Thickness (mm)	Sample	Soil Description	Sample #	Water Cont.	Remarks
0	0			dark-brown, moist, loose, silty SAND, some organics, occasional roots/rootlets (FILL/ORGANICS)			
1				grey-brown, rust-mottled, moist, compact, silty SAND, some gravel (FILL)			- Seepage @ 0.3m
2				dark-grey, moist, very dense, silty fine SAND, trace to some clay, trace gravel (TILL-LIKE)			
3	1		○		S1	9%	
4							
5				End of Test Pit @ 1.5m			
6	2						
7							
8							
9							
10	3						

Equipment: Tracked Mini Excavator
Sampling Method: Lump Sample

Datum: Ground Surface
Water Depth: Seepage @ 0.3m

Logged By: AJ
Exploration Date: December 9, 2016
Dwg No.: 16-6985-TP04
Page: 1 of 1

Test Hole Log: TP 06-5

File: 06-5044
Project: Proposed Self Storage Facility
Client: Carousel Ventures
Location: 33433 North Railway Avenue, Mission

BRAUN GEOTECHNICAL LTD.

Depth	Well Info	Symbol	Soil Description	Sample #	Water (%)	DCPT (blows per ft.) 0 10 20 30 40 50	Remarks
0 ft / 0 m			dk. br. SILT & SAND with organics and roots				
			dense, grey-brown SAND & SILT, damp	S1			
1			dense / very stiff, grey silty fine SAND to SILT with fine sand, with some gravel, damp	S2	15		
5			End of hole @ 5'-0"				
2							
10							
3							
4							
15							
5							

Equipment: Rubber Tire Backhoe
Sampling Method: Lump Sample
Hammer Type:

Datum: Ground Surface
Surface Elevation:
Water El.: N/A
(at time of drilling)

Logged By: SS
Drilling Date: October 11, 2006
Dwg No.: 06-5044-TP5
Page: 1 of 1

Test Hole Log: TP 06-6

File: 06-5044
Project: Proposed Self Storage Facility
Client: Carousel Ventures
Location: 33433 North Railway Avenue, Mission

BRAUN GEOTECHNICAL LTD.

Depth	Well Info	Symbol	Soil Description	Sample #	Water (%)	DCPT (blows per ft.) 0 10 20 30 40 50	Remarks
0 ft / 0 m			dk. br. SILT & SAND with organics and roots				
			dense / stiff, grey, silty fine SAND to SILT with fine sand, damp	S1	18		
			seepage from zone at 1'				
1			grey SAND & GRAVEL with cobbles				
			seepage below 4'	S2			
5			End of hole @ 5'-0"				
2							
10 / 3							
4							
15							
5							

Equipment: Rubber Tire Backhoe
Sampling Method: Lump Sample
Hammer Type:

Datum: Ground Surface
Surface Elevation:
Water El.: N/A
(at time of drilling)

Logged By: SS
Drilling Date: October 11, 2006
Dwg No.: 06-5044-TP6
Page: 1 of 1

SOIL LOG

LOGGED BY: KJB COLLAR ELEV.: PIT/HOLE No: TP-9

C : Sample condition - GOOD
DISTURBED
NO RECOVERY

N : Number of blows
UU : Unconfined Compressive Strength
(PP) : Pocket Penetrometer
(TV) : Torvane

Type : Type of Sample
SPT : Split Spoon
S : Shelby tube
G : Grab
O : Other (specify)

● : Moisture Content (% of dry weight)
: Plastic Limit
: Liquid Limit
: Ground Water Level

Depth Ft	DESCRIPTION	Symbol	Depth Ft	Sample C	Sample N	Sample Type
0	TOPSOIL (dark brown); rootmat, silty, soft, moist		0.5			
	Silty SAND (grey); trace gravels, dense, moist		3.0			
	SAND & GRAVEL (grey); coarse, dense - Light seepage observed at 6.0 feet.					
5						
10			12.0			
	Silty SAND (brownish grey); some gravel, occasional cobble, very dense, moist		13.0			
	End Test Pit TP-9 at 13.0 feet. Seepage observed at 6.0 feet Test Pit dug in slope.					
15						
20						

10 20 30 40 50 60 70 80

LEVELTON
Engineering Solutions

PROJECT: 33500 1st Ave. Mission, BC

CLIENT: ABBOTSFORD AUCTION & APPRAISAL

JOB No: 802-0283
SHEET No: 1 OF 1
DATE: Jul 22 02

A_SOIL_I 802-0283.GPJ LEVELTON.GDT 8/6/02

SOIL LOG

LOGGED BY: KJB COLLAR ELEV.: PIT/HOLE No: TP-10

C : Sample condition - GOOD
DISTURBED
NO RECOVERY
N : Number of blows
UU : Unconfined Compressive Strength
(PP) : Pocket Penetrometer
(TV) : Torvane

Type : Type of Sample
SPT : Split Spoon
S : Shelby tube
G : Grab
O : Other (specify)

● : Moisture Content (% of dry weight)
: Plastic Limit
: Liquid Limit
: Ground Water Level

Depth Ft	DESCRIPTION	Symbol	Depth Ft	Sample C	Sample N	Sample Type
0	TOPSOIL (dark brown); rootmat, silty, soft, moist		0.5			
	SAND (light brown); some gravel, very dense, moist - Till-like					
5			5.0			
	Silty SAND (grey); some gravel, occasional cobble, moist, very dense - Till-like - Light seepage observed at 10.0 feet					
10						
	End of Test Pit TP-10 at 12.0 feet. Seepage observed at 10.0 feet Test Pit dug in slope.		12.0			
15						
20						

10 20 30 40 50 60 70 80

LEVELTON
Engineering Solutions

PROJECT: 33500 1st Ave. Mission, BC

CLIENT: ABBOTSFORD AUCTION & APPRAISAL

JOB No: 802-0283

SHEET No: 1 OF 1

DATE: Jul 22 02

LA_SOIL_1 802-0283.GPJ LEVELTON.GDT 8/6/02

SOIL LOG

LOGGED BY: KJB COLLAR ELEV.: PIT/HOLE No: TP-11

C : Sample condition - GOOD
DISTURBED
NO RECOVERY
N : Number of blows
UU : Unconfined Compressive Strength
(PP) : Pocket Penetrometer
(TV) : Torvane

Type : Type of Sample
SPT : Split Spoon
S : Shelby tube
G : Grab
O : Other (specify)

● : Moisture Content (% of dry weight)
› : Plastic Limit
K : Liquid Limit
▼ : Ground Water Level

Depth Ft	DESCRIPTION	Symbol	Depth Ft	Sample C	Sample N	Sample Type
0	TOPSOIL (dark brown); silty, rootmat, soft, moist		0.5			
	SILT (light brown); some sand, firm, moist		2.5			
	SAND (grey); medium grain, dense, moist		3.5			
	- Light seepage at 3.0 feet.					
5	Silty SAND (grey); some gravel, occasional cobble, moist, very dense					
	- Till-like		6.0			
	End of Test Pit TP-11 at 6.0 feet Seepage observed at 3.0 feet					
10						
15						
20						

10 20 30 40 50 60 70 80

LEVELTON Engineering Solutions

PROJECT: 33500 1st Ave. Mission, BC

CLIENT: ABBOTSFORD AUCTION & APPRAISAL

JOB No: 802-0283

SHEET No: 1 OF 1

DATE: Jul 22 02

LA_SOIL_I 802-0283.GPJ LEVELTON.GDT 8/6/02

NOTES:

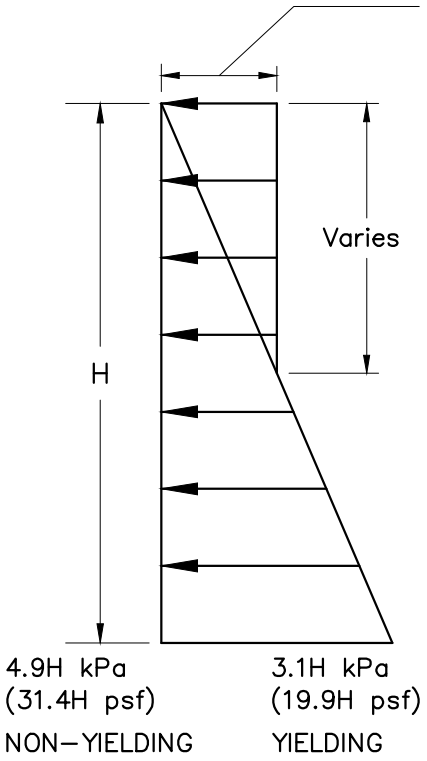
- Granular backfill adjacent to foundation walls as per city requirements and/or the Geotechnical Report.
- Lateral loads indicated are subject to review of actual soil conditions exposed at time of excavation.
- Wall pressures are approximate, actual pressures will depend on wall stiffness, groundwater conditions, backfill slope, type of backfill, compaction equipment, and surcharge pressures.

ASSUMPTIONS:

- 30% sloping backfill lightweight aggregates backfill (10kn/m^3 unit weight).
- Active loading conditions (i.e. top of wall is free to rotate 0.1% of wall height). Other conditions subject to review by Braun Geotechnical.
- Fully drained backfill.
- Seismic peak ground acceleration of 0.284g.
- All surcharge loads to be reviewed by Braun Geotechnical.

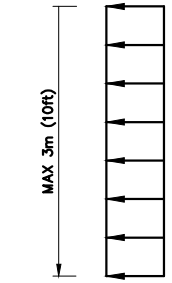
ALL LOADS ARE UNFACTORED

Metric Units m & kPa Imperial Units ft & psf



- Compaction Induced Pressure of 15kPa (300psf).
- A lower value may be feasible based on review of compaction equipment and procedure
- Compaction pressure need only be used for structural design not overall stability

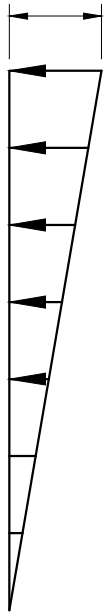
STATIC



0.3 x Surcharge Press.

SURCHARGE

See Table for Wall Pressure Based on Tolerable Displacement of Wall away from Soil Backfill

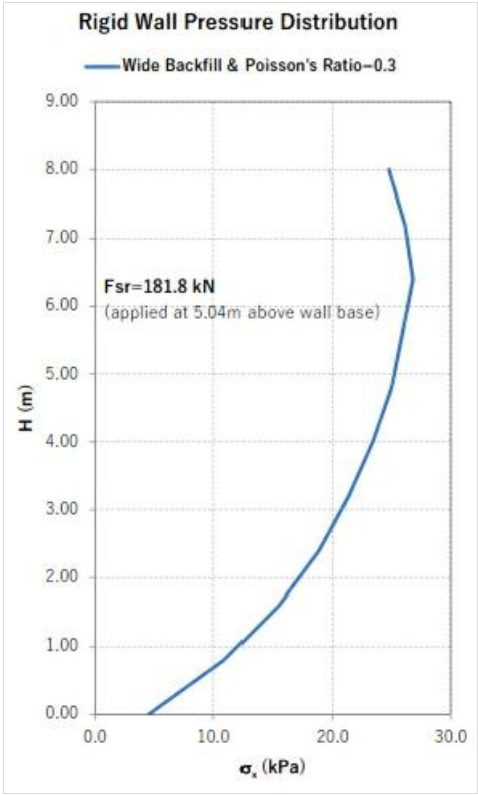


Tolerable Displacement[1]	Wall Pressure
0	3.1H kPa (19.9H psf)
25mm (1")	1.9H kPa (12.2H psf)
50mm (2")	1.5H kPa (9.6H psf)
75mm (3")	1.4H kPa (9.0H psf)

Note:
1. Wall height dependent values provided for 8m wall

(Based on Richard & Elms Procedure)

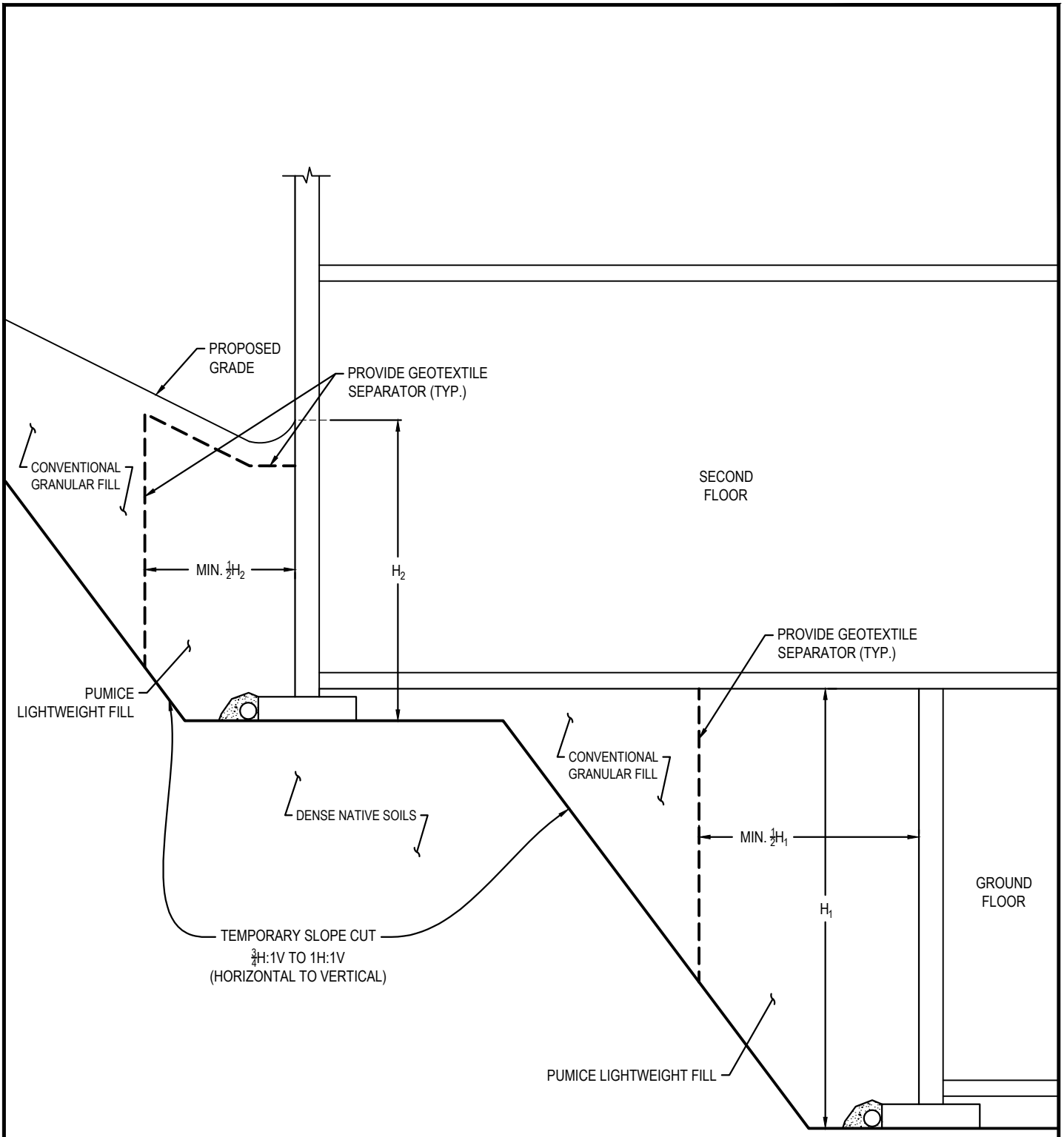
SEISMIC–YIELDING



SEISMIC–NON–YIELDING

BRAUN GEOTECHNICAL LTD.

Client: Access Property Development				Title: Horizontal Wall Loading Diagram Lightweight Aggregate Backfill		
Project: Storage For Your Life Facility - Phase 2, 33433 North Railway Avenue, Mission, BC						
Project no. 16-6985	Drawn JD	Design JW	Approved SS	Date January 09, 2017	Scale NTS	Drawing no. 16-6985-02



BRAUN GEOTECHNICAL LTD.

CLIENT: Access Property Development					TITLE: PUMICE LIGHTWEIGHT FILL CONFIGURATION		
PROJECT: Storage for Your Life Facility - Phase 2 33433 North Railway Avenue, Mission, BC							
PROJECT NO. 16-6985	DFTR. JD	DSGN. SS	CHK. JW	DATE January 9, 2016	SCALE: NTS	DWG NO. 16-6985-01	